# Workshop Summary

Transcribed by Tara Fortier of The Cadmus Group, Inc.
*(and revised by the individual speakers)*

## Agenda and Speakers List

<table>
<thead>
<tr>
<th>A. Nutrients and Pesticides in Source Water - What are the Concerns?</th>
<th>Go To</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pesticides in the Nation’s Streams and Ground Water, 1992-2001,</strong> Jeff Martin, USGS</td>
<td>p 2</td>
</tr>
<tr>
<td><strong>Nutrient Pollution in our Nation’s Waters,</strong> Santina Wortman, USEPA</td>
<td>p 3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>B. Watershed Monitoring – What Type of Data are being Collected?</th>
<th>Go To</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IDEM’s Surface Water Quality Monitoring Strategy,</strong> Stacey Sobat, IDEM</td>
<td>p 4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>C. Rapid Watershed Assessment for the Patoka River Watershed</th>
<th>Go To</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Where Do You Go for Information?</strong> Connie Cousins-Leatherman, IDEM</td>
<td>p 6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>D. What Has Been Done and What More Can Be Done?</th>
<th>Go To</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Source Water Protection Efforts along the Patoka River,</strong> John Wade, Patoka Lake Watershed Steering Committee;</td>
<td>p 7</td>
</tr>
<tr>
<td><strong>Conservation Practices To Protect Water Quality,</strong> Judi Brown, Dubois County SWCD and Bart Pitstick, District Conservationist for Dubois County</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>E. Special Session for Pesticide Applicators *</th>
<th>Go To</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Agrochemical Use and Water Quality Concerns: Atrazine Management and Future Work</strong> Leighanne Hahn, Office of the Indiana State Chemist and Kenneth Eck, Purdue Extension</td>
<td>p 9</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>F. Special Session for Water System Operators *</th>
<th>Go To</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Indianapolis’ Enhanced Atrazine Monitoring Program 2006 - 2011</strong> Alan Wiseman, Citizens Water of Indianapolis and Mary Hoover, IDEM</td>
<td>p 12</td>
</tr>
</tbody>
</table>

*Optional Tour of Huntingburg Water Treatment Plant during these sessions.*

A special thank you to Greg Miller and the staff of the Huntingburg Municipal Water Plant as well as the staff at the Huntingburg Event Center for their assistance. A listing of all those who helped on the planning team for this workshop includes the above speakers plus: Chi Ho Sham, The Cadmus Group, Jim Sullivan, IDEM, Bonny Elifritz, IDEM, Bill Spaulding, EPA, Cary McElhinney, EPA, Steve Ainsworth, EPA, Toby Days, Alliance of IN Rural Water, and Todd Williams, Winslow.

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**Welcome**

*Connie Cousins-Leatherman, Indiana Department of Environmental Management (IDEM)*

Ms. Cousins-Leatherman started the day by welcoming and thanking everyone for attending the workshop. She outlined the agenda for the day and invited members of the planning committee to stand and share their name and affiliation.
A. Nutrients and Pesticides in Source Water - What are the concerns?

*Pesticides in the Nation’s Streams and Ground Water, 1992-2001*

Jeff Martin, U.S. Geological Survey (USGS)

Pesticides are a high priority, yet there has been an information gap. USGS’ National Water-Quality Assessment (NAWQA) Program studies have produced reports on pesticides in specific areas of the country and USGS synthesized these findings into a national assessment. Today he plans to address two questions: One, what is the extent and nature of pesticide occurrence in streams and ground water? And two, do pesticides occur at levels that may affect people or stream ecosystems? There were 52 NAWQA study areas with consistent site selection and uniform sampling and analytical methods. The studies were organized by land-use, as are most of the results that we will see today. There were 186 stream water sites and 187 groundwater network sites (about 25 wells per network). Water samples were analyzed for 83 pesticide compounds, most of which are still in use. The studies used highly developed analytical measurements that pick up detections below regulatory levels. Land use was a primary design criterion in the study. All sites were classified into 4 bins: agriculture, urban, undeveloped, or mix based on the percentage of land use in a watershed or above an aquifer that fell into those categories. NAWQA is not a statistical sampling of the nation’s streams or ground waters, the studies target agricultural and urban streams and the results are similarly biased towards agricultural and urban streams.

What is the extent and nature of pesticides in streams and ground water? Regardless of land use setting, streams have much more frequent detections than ground water, reflecting the greater vulnerability of streams. Streams in all three categories of developed land uses had detectable levels of pesticides more than 90 percent of the time, indicating virtually year-round presence. Pesticides were detected in more than half the wells tapping shallow ground water in agricultural and urban areas. And lastly, more than 30 percent of the wells sampled in major aquifers, many of which are public water-supply wells, had detections of one or more pesticides.

Most detections were among nine pesticides. Three herbicides that were used most heavily in agriculture during the study were atrazine, metolachlor, and cyanazine, and these compounds were found most frequently in agricultural streams. Simazine, prometon, and tebuthiuron are commonly used in urban areas, such as in construction sites to keep weeds from growing, and were found more often in urban streams. Insecticides such as diazinon, carbaryl, and chlorpyrifos were found more frequently in urban streams than agricultural streams.

Maps of pesticide detections over the U.S. show that for the most part, you find pesticides in streams where they are used. The association between use and groundwater is less. There are also repeatable patterns of detections. Pesticide concentrations are at their highest during planting season and when rainfall washes the fresh applications into streams, in April, May, and June. Levels fall throughout the summer and there are fewer detections/lower levels over fall and winter, before the cycle repeats in the spring. Seasonal patterns vary by region of the U.S. For instance, in San Joaquin valley, they apply pesticides in December and January on almond crops. Another important item to note is mixtures: When we collect a water sample, how many pesticides do we detect in that sample? For streams, we detect two or more pesticides in 95% of the samples. We detect 5 or more pesticides in 75% of samples and 10 or more pesticides in 25% of samples. For ground water samples, 40% have detections of two
pesticides. Many studies only study the effect of one pesticide, and those that study two or more frequently find synergistic effects. This suggests that the frequency of mixtures may result in increased risk.

Although NAWQA found that pesticides occur frequently, the detections measured were often at low levels, below water-quality benchmarks. What is the potential for adverse effects of pesticides on humans and aquatic life? Should we be concerned? To answer this we performed a screening-level assessment to compare measured concentrations to water-quality benchmarks. The benchmarks used are EPA standards. Many pesticides were not measured and some measured pesticides do not have benchmarks. Of the 83 pesticides measured, only half have a human benchmark and 25% do not have any kind of biological benchmark. Most benchmarks are a “no-effects level” which means that effects are not expected when concentrations are below a benchmark, but may occur when levels are able a benchmark. Almost ten percent of agricultural and urban streams sampled had human-health benchmark exceedances, but none of these were located at drinking water intakes and across the United States relatively few water-supply intake are location on any streams in these land-use settings. Exceedances were even less frequent in groundwater samples. Benchmarks for aquatic life were derived from EPA Water Quality Criteria and were frequently exceeded. Exceedances were widespread and changing. Fifty-seven percent of agricultural streams had exceedances of standards (for 20 pesticides); 83% of urban streams had exceedances (for 10 pesticides). To summarize, the potential for harmful effects on humans were low and limited, but widespread and changing for aquatic life.

**Nutrient Pollution in Our Nation’s Waters: What are the causes and concerns?**

_Santina Wortman, U.S. Environmental Protection Agency Region 5_

Nutrients are essential to growth but too many nutrients pose a problem of excessive growth. Nitrogen and phosphorus are considered pollutants when they occur in excess in our streams, rivers, lakes, estuaries, and ocean waters. Nutrient pollution can cause harmful algal blooms that produce toxins harmful to humans and aquatic life, deplete oxygen necessary for aquatic life, smother vegetation, and discolor water. In Ohio, the Grant Lake St. Mary’s suffers from such algal blooms and its watershed has been classified as a “distressed watershed”, which allows the State to regulate nutrients. Hypoxia is caused when high algal growth results in large bacterial communities that feed on decomposing algae, creating an oxygen-deprived state. Hypoxia has decimated fish populations.

Both groundwater and surface water sources are threatened by nutrient pollution. Contaminated groundwater is particularly harmful to children, the elderly and those with suppressed immune systems. The number of nutrient violations has nearly doubled in the past 7 years and is expected to increase. Algal compounds affect taste and odor of water and contact between algae and disinfection agents necessary to drinking water treatment can lead to elevated levels of disinfection by-products in drinking water. The cost of removing nitrates is very high and every one dollar spent on source water protection saves an average of $27 in water treatment costs. Nutrient sources are runoff from urban and agricultural areas which picks up manure from livestock and fertilizer from row crop agriculture.

Nationally, nutrient pollution is one of the top causes of water quality impairment and is widespread across the United States. One third of U.S. estuaries are eutrophic with 168 hypoxic zones in U.S. waters. The dead zone in the Gulf of Mexico is 17,520 square kilometers, or 6,765 square miles. The
goal is to reduce the dead zone to 5,000 square kilometers. States and local communities are best positioned to restore and protect the waters by setting forth criteria designed around their specific needs. All major sources of nutrients need to be held accountable for their contributions.

**Questions:**
- What personal and community level actions work to reduce nutrient loads?
  - Ms. Wortman: Most communities find that a watershed approach is the most successful. Often action is instigated by a local concern such as an unswimmable lake that prompts stakeholders to come together and develop a plan. Plans often take one to two years to develop. First the community must identify the source of the problem and how to address it. The key is to get those who can have an impact to participate. A homeowner can take simple steps such as controlling runoff from property, refraining from washing cars on driveways and allowing wash water to go into the drain, and picking up after the family dog.

**B. Watershed Monitoring – What type of data are being collected?**

*Stacey Sobat, IDEM*

IDEM’s Water Quality Monitoring Strategy outlines a plan to gather data and assess Indiana’s water resources, protect human health and fulfill reporting requirements, and provide information to other programs and agencies. Monitoring data is used to support public health advisories, assess water quality in lakes and streams, develop water quality criteria, generate Total Maximum Daily Loads for pollutants, support source water protection and watershed planning, and respond to citizen complaints, among other uses. Monitoring at targeted sites is utilized to provide local water quality information, look for watershed improvements and address contaminants of concern or previous impairments. Sites are usually placed near bridges or where previous sample collections have taken place. The data collected includes chemical, physical, and biological impairments.

Water and bacteriological data are collected monthly at 161 fixed station locations all around the State of Indiana. This data measures the waterbodies’ ability to support recreational use, drinking water use or aquatic life use. Recreational use for full body contact or partial contact is assessed on the basis of the number of colony forming units of *E. coli*. The parameters for drinking water use include metals, pesticides, PCBs, total cyanide, total dissolved solids, specific conductance, sulfate, chloride, and nitrate or nitrite. Drinking water use is not supported if there is more than once exceedance of acute or chronic criteria in three years. For aquatic life use, sample results are compared to the Indiana Administrative Code (IAC) Water Quality Standards is not supported if more than one exceedance of acute or chronic criteria occurs from a data set consisting of three or more measurements. Resources available on the internet for more information on the IAC at [www.IN.gov/legislative/iac](http://www.IN.gov/legislative/iac) and assessing designated uses at [www.watersheds.IN.gov/2639.htm](http://www.watersheds.IN.gov/2639.htm). IDEM monitors bio-accumulating contaminants in fish tissue including select metals, pesticides and organic compounds. Fishable use is determined by levels of mercury and/or PCBs in tissue samples. A workgroup of State Agencies review and make changes to the fish consumption advisory each year which lists safe consumption levels of fish (type and amount) per waterbody. The advisory is available on the internet at [www.IN.gov/isdh/23650.htm](http://www.IN.gov/isdh/23650.htm).
Blue-green algae is being monitored monthly June-September at several State Park Beaches due to increased health concerns (skin and eye irritant, nausea and tingling fingers and toes) as well as taste and odor problems. A lake that applies for an algaecide permit to control blue-green algae will not be supporting for drinking water use.

Lake water quality monitoring is a random sampling of 600 lakes each year. Approximately 80 lakes are sampled per year, plus volunteers monitor another 100 lakes per year. The lakes are sampled to assess aquatic life use and recreational use (aesthetics). Aquatic Life use for lakes and reservoirs includes measurements for temperature and pH, as well as information on trout stocking or native cisco populations. Recreational use for lake and reservoir aesthetics includes measurements for total phosphorus, ammonia, dissolved oxygen, light transmission and penetration in the water column, and plankton densities.

Probabilistic monitoring is performed for randomly generated sites in rotating basins. Monitoring includes characterization of water quality and site-specific assessments for aquatic life and recreational uses. This random monitoring allows for generation of trends over time within each basin and basin-to-basin comparisons. The data collected includes chemical, biological, and physical characteristics.

Water chemistry sampling occurs three times between May and October and includes analysis of general water chemistry, metals and nutrients for drinking water use and aquatic life use.

Algal sampling is performed once between September and October for aquatic life use.

Bacteriological sampling is performed once a week for five consecutive weeks in April through October for human health recreational use and aquatic life use. These samples are time sensitive and the analysis is often performed using a modified sampling van.

Other indicators used to measure aquatic life use support include a well-balanced fish or macroinvertebrate community which is diverse in species composition and contains several different trophic levels. Ideally, the aquatic community is not composed of strictly pollution tolerant species. The Index of Biotic Integrity (IBI) uses fish and macro-invertebrate assemblage characteristics to assign a minimum score of zero (no fish or macro invertebrates) to 60 (excellent aquatic community). An impaired waterway is one that receives a score of less than 36 on the IBI. The macroinvertebrate community includes insects, crayfish, and mussels. Sampling occurs once between July and October using D-frame nets to collect macro invertebrates from rocky riffles in the stream and along the woody debris on river banks. The macro invertebrates are then identified to the lowest taxonomic level and IBI scores calculated for aquatic life use support. Electro-fishing is used to collect a representative fish community sample once between mid-July and October. From 1990-1995, over 1000 sites in Indiana were sampled to develop IBI expectations for fish communities in Indiana, so there is a good sense of the species that should be present in a least impacted stream. The fish specimens are sorted by species, counted and examined for deformities, eroded fins, lesions, and tumors. After the macroinvertebrate and fish sampling, habitat evaluations are conducted.

Total Maximum Daily Loads identify sources of impairments, recommends limits for pollutants, and suggests actions for improving water quality. Watersheds are targeted based on type and number of
impairments as well as the presence of active groups to implement recommendations. Data collected are analyzed for human health recreational use, drinking water use, and aquatic life use.

Baseline monitoring is performed at targeted sites in small watersheds to provide comprehensive data which identify sources of impairment and critical areas for watershed restoration efforts. This information will be used to measure performance of best management practices. Physical, chemical, and bacteriological data is collected monthly for one year and biology data is collected once per year.

In order to receive Clean Water Act Funds, watershed improvements must be reported to EPA showing the beneficial impacts of federally funded initiatives. Targeted monitoring is conducted in previously impaired watersheds after a period of sufficient recovery time.

Probabilistic monitoring will occur in Patoka River mainstem and tributaries in 2012. Of the 100 sites potential sites randomly generated in the watershed, approximately 38 will be sampled.

Questions:

- A few questions were asked regarding specific results of different monitoring programs.
  - Ms. Sobat noted that she did not bring specific numbers for her presentation, but rather aimed to give an overview of all of the monitoring activities that occur in Indiana’s waterways. She directed anyone interested in the findings of these monitoring programs to visit the websites linked in the slides discussing monitoring programs or to start at the IDEM Water Quality Assessment webpage available at [http://www.in.gov/idem/5512.htm](http://www.in.gov/idem/5512.htm).

- Regarding the use of data collected by others for determining designated use status (i.e. drinking water or waste water treatment plant operators reporting information)
  - Ms. Sobat said that information from other groups can be used for water quality assessments if the data meets a certain level of quality. Refer to IDEM web page at [http://www.IN.gov/idem/nps/2639.htm](http://www.IN.gov/idem/nps/2639.htm).

- In regards to macro-invertebrates, what is a sprawler?
  - Sprawlers have modifications to their bodies which allow them to inhabit many different substrate types while keeping as much sediment off their respiratory surfaces as possible. This is one of 12 different IBI metrics which is used to assess the health of the macro-invertebrate community. The percent of sprawlers will decrease with the increased habitat disturbance because fine sediments may smother the respiratory surfaces increasing mortality.

C. Rapid Watershed Assessment – Where do you go for information?

*Connie Cousins-Leatherman, IDEM*

This workshop is dedicated to bringing information together and enabling you to find informational sources and making connections in order to address concerns. To get the right information, we need to ask the right questions. What source are we dealing with? What scale? Which contaminants? We need to consider both regulatory and non-regulatory approaches to source water protection. Often real change requires community involvement to educate the community, promote good practices, and police the neighbors. We need to consider the different vocabularies that people use. There are
differences in what unit of area people and studies focus on: delineations, watersheds, land use, and
land cover. Available here today at the registration table are several handouts with a number of
resources listed. These include a very informative Rapid Watershed Assessment of the Patoka River
Watershed put together by NRCS. These assessments are available online for all 8 digit watersheds in
the State. In addition, a document download website has been set up specifically for this workshop for
the posting of presentations and related materials (e.g., factsheets on atrazine and reports on the Patoka
Lake watershed). The workshop document download website can be accessed at:
http://inswp.cadmusweb.com/default.aspx Moreover, at the back of the room, maps are on display
illustrating watershed data and information. The Patoka River Watershed provides drinking water to
over 65,000 people in SW Indiana. Please, share this information with them!!

D. Source Water Protection Efforts along the Patoka River and Best Practices to Protect
Drinking Water Supply Sources – What has been done and what more can be done?
Patoka Lake Watershed
John Wade of Patoka Lake Regional Water & Sewer District

Patoka Lake is an 8,800 acre reservoir located in parts of the counties of Crawford, Orange, and
Dubois. The reservoir was constructed by the U.S. Army Corps of Engineers and became operational
in February 1978. The economic benefits of the lake include the prevention of more than $117.4
million in flood damage since impoundment through 2008, tourist spending $12.07 million in the
region, and 197 jobs created in local community. The Patoka Lake Regional Water and Sewer District
is a surface water treatment Public Water System that obtains raw water from the intake structure
within Patoka Lake and supplies 11 counties with drinking water, serving over 37,150 households and
businesses or approximately 100,000 people. The Water and Sewer District consists of two water
treatment plants, a wastewater treatment plant, 7 booster stations, 10 water storage tanks, and over 800
miles of transmission mains. Current water consumption averages between 6.5 and 7 million gallons a
day. The Patoka watershed is in the Southern bottomlands and Southwestern lowland regions and
receives runoff from Dubois, Orange, and Crawford counties. It is divided into 11 different sub-basins.

The Patoka Lake Regional Water and Sewer District received an EPA 319 grant in 2007. The award
period lasted from August 2007 to August 2010. The grant was provided to assess the water quality of
the Patoka Lake Watershed and promote watershed health. The project was divided into five parts:
develop a cost-share program, map best management practices (BMPs) installed, implement cost-share
BMPs, conduct sampling in the watershed, and provide outreach and education. The project involved
numerous partnerships and came in under budget. Three lessons learned from the grant work were: the
necessity of dedicated volunteers, a great steering committee, and an excellent coordinator.

Confined Feeding Operations (CFOs) are farms that maintain large numbers of animals in spaces
covered with less than 50% vegetation for 45 days or more during the year. Indiana law defines a CFO
as any animal feeding operation engaged in the confined feeding of at least 300 cattle, 500 horses, 600
swine or sheep, or 30,000 fowl (such as chickens, turkeys, or other poultry). There are more than 80
CFOs within the counties that the watershed spans, with Dubois County having the highest
concentration. It is important to note the location of these CFOs with respect to the Patoka Lake
Watershed boundary because of their close proximity to the watershed and the possibility of the tile
drainage system transporting water across watershed boundaries.
Nine sample sites were selected for watershed sampling. Water quality monitoring is the assessment of physical, chemical, and biological elements in a watershed. Sixty-four volunteers were trained by Hoosier Riverwatch to perform chemical and biological sampling throughout the course of the project. Many partners were instrumental in conducting this sampling. Local high school students involved in Future Farmers of America dedicated their time to the sampling effort. Overall, a few parameters were classified as fair, but the remainder were classified as good.

BMPs include installing fencing to keep livestock out of a lake and instituting intensive rotational grazing to reduce erosion. Raising turkey is a significant industry in the state and they produce a lot of waste; one best management practice is to build litter stacks for manure. Cost share funds were provided for three BMP projects - one fencing project to exclude livestock from woods and water bodies, and two waste storage facilities to safely store manure from 50,000 turkeys.

The grant also funded three clean up days for collecting litter along the reservoir shoreline. These were held in September 2008, September 2009, and April 2010. In April 2010, over 12,000 pounds of litter was collected, but that was mostly due to removing two abandoned cars that were found due to the low water levels when the reservoir is drawn down in the winter. Each successive clean-up day attracted more volunteers and resulted in more pounds of collected trash.

The application for a new grant was unsuccessful, but many of the efforts have continued despite the lack of funding including education efforts in schools, clean up days, and water sampling. A new steering committee was formed and is continuing the coordination of activities.

Questions:
- How does intensive rotational fencing reduce erosion?
  - Intensive rotational fencing works by reducing the impact of livestock on any one area of a grazing field. By dividing a grazing area into several smaller areas and moving the livestock from one to another over the course of several weeks it gives the land time to recover in between times of grazing. This improves the health of the plants and grasses and also improves the health of the livestock by giving them access to recovered, healthier grasses rather than allowing them to graze on the same shortened grasses.

Utilizing Conservation Practices To Protect Water Quality

Bart Pitstick, USDA, Natural Resources Conservation Service, District Conservationist for Dubois County

The Dubois County Soil and Water Conservation District (SWCD) completed its watershed management plan for the Upper Patoka watershed in 2006. This was a project funded by an EPA 319 grant. The study involved chemical water monitoring from 2004 to 2006 and resulted in water samples that exceeded standards for E. coli, dissolved oxygen, pH, nitrate, orthophosphate, and total suspended solids. The Upper Patoka Lake watershed is 80,000 acres, with 23,000 acres of cropland or grassland. Four hundred and thirty-one of those acres are involved in conservation programs. Conservation tillage practices have become more prevalent in the past 10 years, including 32% of cropland acres that are no till. The recommendations from the study were to apply cost share funds for the installation of BMPs, including no till farming practices and management intensive grazing; to use conservation tours and
other methods to share information with landowners; and to develop a water quality monitoring program.

In the Middle Patoka, a watershed management plan was drafted in 2011 by the Alliance for Indiana Rural Water. A source water protection study was undertaken to examine impacts on a drinking water intake. The project used information from assessments of existing land uses and public complaints. The recommendations for this study were: to apply cost share funds for the installation of BMPs, including no till farming practices and management intensive grazing; to use conservation tours and other methods to share information with landowners; and to develop a water quality monitoring program. Similar studies and recommendations were provided for the Lower Patoka watershed.

The Indiana Conservation Partnership consists of the National Resources Conservation Service, Farm Service Agency, Soil and Water Conservation Districts, and Purdue Cooperative Extension Service. The partnership provides technical and financial assistance to landowners. Many conservation practices focus on improving options for rotational grazing including installing fencing and use exclusion; development of farm ponds for water sources, including wells and pipeline; installing cattle watering facilities to promote rotational grazing and allow livestock water sources in every field; and installing pads to reduce runoff and erosion. For stream crossings of equipment or cattle, it is recommended to install a material to lock gravel into place and reduce bank erosion and to use large gravel to encourage the cattle to move through the stream quickly by making it less comfortable. The partnership also provided assistance on the construction of mortality facilities to allow for the composting of deceased animals as well as litter facilities. Conservation practices for crops include using no till agriculture to prevent loosening of the soil, installing wet grasslands and water and sediment control basins (or dry dams or basins), and planting cover crops to protect soil through the winter. Cover crops trap and produce nitrogen and prevent soil erosion; common cover crops include radish, clover and oats. Other conservation practices for crops include the inclusion of a field border or riparian buffer to protect stream from runoff and provide habitat.

The National Resources Conservation Service runs an Environmental Quality Incentives Program (EQUIP), a voluntary program with a commitment of a minimum of three years, which can be expanded for up to ten years. The program provides technical and financial assistance, up to 75% of the cost of installing the conservation practice. The program works with interested landowners to determine what resource concerns they have and want to address.

E. Special Session on Agrichemical Application and Best Management Practice – how to keep the chemicals out of our waterways and groundwater

Agrochemical Use and Water Quality Concerns: Atrazine Management and Future Work
Leighanne Hahn, Office of Indiana State Chemist (OISC)

This presentation begins with a review of the results of atrazine water quality assessments in surface waters of Indiana, followed by a discussion of how atrazine behaves when it is applied to soil and measured results of potential mitigation strategies. If time allows, we will discuss Office of Indiana State Chemist future work related to nutrient applications and the protection of Indiana’s water resources.

As an outcome of the most recently completed atrazine reregistration activity, atrazine is no longer
classified as a possible human carcinogen by US EPA Office of Pesticide Programs (OPP). The US EPA OPP is currently evaluating atrazine along with other pesticides for their potential to behave as endocrine disruptor compounds.

In addition to pesticides being regulated by the US EPA OPP, the US EPA Office of Water, under the Safe Drinking Water Act (SDWA), requires communities to analyze for synthetic organic compounds (SOCs), most of which are applied as pesticides. During the initial sampling period that began in 1994, one hundred percent of surface water public water systems in Indiana detected atrazine and 47% of all the samples analyzed contain detections. As a result, the primary pesticide manufacturers of atrazine voluntarily sponsored monitoring programs and later through an agreement with US EPA OPP as part of the atrazine reregistration monitoring programs.

The EPA OPP atrazine reregistration monitoring program features a 5-year, 2-step monitoring process. In the first step, surface water is sampled and concentrations determined on an annual average atrazine in treated water and 90-day Total Chlorinated Triazine (TCT) in raw water concentration, respectively. The TCT concentration represents the total amount of triazine herbicides plus the three primary breakdown products of these herbicides. The EPA OPP drinking water trigger levels are 2.6 ppb annual average concentration for treated surface water sources of public drinking water and 37.5 ppb for 90-day average raw water concentrations. If the trigger level is met, water samples are collected weekly from April to October, during peak herbicide application season, and twice each month, October – March. In addition, the development of a mitigation plan is required. If the annual or 90-day trigger levels are exceeded during the 5 year accelerated monitoring process, atrazine use is banned within the watershed.

The graphs shown display atrazine results beginning January of each year from 1994 to 2004 for several watersheds for both raw and treated samples. Treatment reduces levels of atrazine, but treatment is costly in terms of both management skills and equipment and these costs are passed on to the drinking water customers, rather than the users of atrazine. Many public water systems in Indiana may not have the physical infrastructure, expertise or budget to provide these treatment options. Several graphs show intermittent elevated concentrations of atrazine in untreated water during spring in various Indiana watersheds.

Atrazine management practices include understanding how atrazine behaves in the environment, considering alternative weed management strategies, following label requirements and identification of resources to implement site specific mitigation needs.

Currently, the use of atrazine in Indiana is trending down. According to USDA Ag Census data 6 million pounds of atrazine was applied during 2003 compared to 4.5 million pounds during 2010.

In general, when atrazine is applied during the growing season it degrades at a half-life rate of 45 days in silt loam soils common to Indiana, but this degradation rate may slow to 450 days if the compound reaches lake sediments. These degradation rates are controlled by the ability of soil microbes to break down these products. The soil microbe activity levels are controlled by temperature and aerobic/anaerobic conditions with warmer soil and aerobic conditions encouraging higher activity levels. The cooler temperatures and anaerobic conditions found in rivers, ponds and reservoirs reduce the activity of soil microbes known to break down atrazine.
Atrazine is highly water soluble; therefore, moves off site in solution during saturated soil conditions rather than attached to soil particles during soil erosion. Tillage practices that leave residue on the surface slow the movement of water (and atrazine in water solution) from the fields to nearby streams. This strategy is not true for the clay soils with a restrictive layer found in southeast Indiana. In these fields, the potential for runoff increases in fields that practice reduced tillage. On these fields, incorporation of soil-applied atrazine is recommended to increase the atrazine-soil particle partitioning effect. Adequate drainage also reduces off-site atrazine movement by reducing surface water sheet water drainage effects. Based upon the behaviors described above, the implementation of atrazine label setback requirements are extremely important to prevent this compound from reaching and residing in water bodies located near agricultural fields.

In Indiana, atrazine detections peak after a rainfall, it is important to separate times of heavy rainfall from application times. Up to 20% of atrazine application can be lost during a heavy rainfall event. It is important for applicators to follow the following guidelines identified in the following study because atrazine lost to the stream means weed control dollars lost. No one wins when atrazine enters surface water.

This study focuses on the potential impact of four alternative management practices: no-till throughout watershed, delayed rate of atrazine until July 1st to avoid heavy rains, reduced rate of application, and implementation of filter strips on all streams. Filter strips resulted in a 54% reduction in annual average atrazine concentration. Applying at a reduced rate resulted in a 32% reduction, delayed application to July 1st resulted in a 11% reduction and no-till practices resulted in a 0.05% reduction. In summary, installing filter strips and riparian buffers are can be extremely effective in reducing off site movement of atrazine when properly designed and maintained.

When planning your filter strip and riparian buffer activities, consider the specific label setback requirements including application setbacks for wells and sinkholes to protect groundwater. The setback requirements are “Do not apply within 50 feet of a well or sink hole; do not mix and load” within 50 feet of stream, river, or lake. Do not apply within 66 feet of where runoff enters a stream or river. Do not apply within 200 feet of a lake or reservoir. For standpipes, the setback requirement is 66 feet if the tile outlet is within 66 feet of a point where runoff from the field enters surface water.

Looking forward, OISC is adopting rules to ensure the safe and effective use of fertilizers. OISC rules will complement the authority of IDEM. EPA is very concerned with nutrient use and is pursuing the logic that it is much better to act than react. IDEM has authority over CAFOs and manure and fertilizer until it is distributed. OISC has been granted authority over the distribution and use of fertilizers. Use refers to the application, handling and transportation of fertilizer materials for the purposes of producing an agricultural crop, with the exception of those with a small garden plot. OISC requires that a person develop an application plan prior to application, apply in accordance with the plan for the target application site, and does not apply directly to surface water or saturated ground. OISC is also implementing setback requirements to applications between application and water supply wells, surface water, sinkholes, drainage inlets, and property lines. Application restrictions also apply for highly erodible land and frozen or snow-covered land. Monitoring requirements include monitoring for predicted rain for 24 hours before application; monitoring effluent for a change of color, flow or volume during and immediately following application; and if there is a change to the effluent, stopping the application and capturing and storing the effluent.
The staging requirements for inorganic fertilizers include restrictions within 300 feet of surface water, drainage outlets, or wells; in standing water or floodway, and for more than 72 hours unless covered and applied within 30 days. The staging requirements for organic materials is restrictions within 300 feet of waterways unless there is a cover or gradient barrier; on an area with slope greater than 6% unless runoff is controlled; and on any standing water or floodway. Stockpiling organic fertilizer for more than 72 hours requires that it is protected by cover or gradient barrier, applied within 90 days, set back from property lines and public roads 100 feet, and set back from residential buildings 400 feet. Those with category 14 certification, for hire “use” and CAFO manure application are required to keep records for 2 years and make available for OISC inspection. Records include information on the application site, rate, and time and information on the fertilizer used. The effective compliance date for these rules is anticipated to be May 2013.

Handouts and additional information can be found at:


F. Special Session on Monitoring for and Regulatory Issues on Agrichemicals in the Water Treatment Process - Indianapolis’ Enhanced Atrazine Monitoring Program 2006 - 2011

Alan Wiseman, Citizens Water of Indianapolis

Indianapolis’ Enhanced Atrazine Monitoring Program was initiated in 2006. The goals of the program were to document current practices, improve monitoring and control strategies, improve powdered active carbon (PAC) dosing and effectiveness, and recommend capital improvements to reduce the risk of operational failures.

The program increased process control sampling and analysis in quarters 2 and 3 (April 1 through September 30). During that timeframe, the plant operator analyzes daily raw and finished water samples and the data is entered into the carbon-dosing model for suggested PAC dosing rates. A central laboratory also analyzes raw and finished water to confirm plant process data. During the rest of the year, the central laboratory analyzes raw and finished water from each plant twice per month. The program increased compliance sampling and analysis in quarters 2 and 3. During that timeframe, plant discharge samples were collected twice per week (Monday and Thursday) and analyzed using EPA Method 525.2. During the rest of the year they were collected once per month.

A carbon-dosing model was used to help predict rapid changes to concentrations in raw water. Systems need to reduce response time to raw water changes in order to more effectively treat atrazine/triazine. The model incorporated data on river or stream flow, rainfall events, well water blending, plant flow, raw and finished water values, and previous values and carbon dose. The carbon dose was aimed at a
finished water target of less than 2.5 micrograms per liter at all times. Using the carbon dose model, the triazine concentrations for the White River Treatment Plant had only one event above the target of less than 2.5 micrograms per liter in finished water, with concentrations as high as 17.5 micrograms per liter in raw water samples. The White River North Treatment Plant was also able to control high levels of triazine in raw water. When compiling the finished water data for White River, Fall Creek, TW Moses and White River North, the highest data point is still less than the 3 micrograms per liter for an event in June at the White River plant. The concentrations largely remained below 2.5 micrograms per liter.

The program implemented process control monitoring during run-off season utilizing the Beacon test, developed carbon dosing models, conducted jar testing for optimum carbon product selection and dosage, updated standard operating procedures (SOPs) for atrazine removal, provided training for plant personnel, and provided recommendations on capital improvements. These capital improvements included enhanced mixing systems, conversion to Supervisory Control and Data Acquisition (SCADA) pumps, enhanced absorption and flocculation treatment, and installation of flood switched, transfer pimps, redundant injection systems, and upgraded discharge lines.

As far as accomplishments of the program, it decentralized compliance monitoring to the operators so that they have more control and can be more responsive to needs (rather than having one central control). It also fortified spike control to proactively mitigate spikes and ensure that annual averages remain within an acceptable range. The program implemented an effective carbon-dosing model and funded much needed improvements to the carbon feed process in the treatment plants. Lessons learned included that raw water characteristics can change rapidly, a systematic program is necessary to respond to these variations, and focused operator training combined with an effective carbon dosing tool yields better control strategies than relying on a central control system.

Questions:

- What is the cost for this type of sampling and compliance monitoring?
  - Mr. Wiseman noted that he does not have the exact numbers with him, but it is within the $250,000-350,000 range.
- What is the process for the Beacon tests?
  - The samples are placed in small wells, reagent is added and produces a color reaction. A spectrometer or similar equipment is needed to read the color differences, but results are available within a matter of minutes. The tests are $6 a piece and made by Beacon.
- Did you learn anything about indicators that can help small operators?
  - The most effective strategy would be to share the carbon-dosing model.
- What are some differences between the watersheds studied and those that are local to here?
  - The topography here is rolling hills rather than the flat land in central Indiana. So the watersheds here are smaller than those involved in this program.
- How was precipitation measured in the study?
  - Precipitation was one of the biggest factors in the model. We used the national weather service and Indianapolis’s rain gauge data. Citizens Water also has one rain gauge from which they collect data.
Mary Hoover, IDEM

Environmental Working Group (EWG) is a clearinghouse of data from across the nation that gathered atrazine data and made it available in 2008 to 2009. In response to the growing awareness of atrazine and concern related to its prevalence following the release of this data, IDEM sent out a letter to surface water plants in 2010 asking for information on their methods for handling atrazine during seasons when it was likely to be prevalent. IDEM followed up with phone calls to the systems and spoke to 31 systems. From this effort, IDEM found that large systems have developed a method for handling atrazine, it was the smaller systems that had less refined methods. The methods of smaller systems varied, but included using information from larger systems to shift to ground water when stream levels of atrazine were high, turning off intakes during high atrazine events (which they assumed were timed around rain events), using more activated carbon during rain events, increasing dosage and changing carbon type during spring and summer, and cleaning and optimizing filters before spring to increase filtration efficiency. Some smaller systems already implemented watershed management tools, such as buffer strips, and did not need to take additional action.

IDEM also asked systems what assistance would be most beneficial to them. Several requested help with understanding when atrazine could be found. In response, the Environmental Technology Verification (ETV) Program approved four different tests for atrazine (qualitative and quantitative) that were not approved for regulation. The test involved strips that changed color based on the quantity of atrazine present in the sample. Due to the drought during this time, there were no rain events after the tests were distributed in the first year. During the second year, tests were available during the appropriate seasons. Systems were instructed to test twice per week or after a rain event in raw and finished water. Systems were also asked to report if they noted results above the maximum contaminant level (MCL) of 3 ppb. None reported results above the MCL. Systems also requested information on watershed coordination. This workshop is a response to those requests. Lastly, systems requested additional information on confined feeding operations and expressed their concerns about the additional treatment needs and associated costs with those treatments.

Evaluation and Wrap Up

Following the presentations, the audience broke out into small groups for conversation. Ms. Cousins-Leatherman spoke to several presenters and audience members about the potential for future workshops.

- Ms. Stacy Sobat said she could do her presentation again with more results included.
- Mr. Jeff Martin said he could present more recent information when it becomes available, at least one year from now.
- Mr. Todd Williams would have liked to see more applicators at the workshop. He also thought the wastewater operators would be interested in attending one of these.
- Mr. Jeff Robinson said he thought a good area for another workshop like this would be around the Kokomo, Muncie area along the White River.
- Mr. John Allen thought that we needed more information on best management practices (BMPs) for the operators to hear about because he thinks a lot of them are no longer being supported by farmers.
- Both Ms. Leighanne Hahn and Mr. Kenny Eck said we would get a better response from applicators in December. They had several reasons for this.