Office of Water Management
Indiana Department of
Environmental Management

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Pesticide Monitoring Project Helps Protect Waterways

It's an unusually cool, rainy June morning as Sean Grady, clad in hip waders and a waterproof jacket, emerges from the swiftly flowing waters of Wildcat Creek near Kokomo.

"We're taking samples to determine the levels of pesticide in the water," Grady says as he caps the bottle he has just filled with murky brown water. "This will help us determine the overall water quality in the Wildcat and establish benchmarks from which we can follow trends."

Grady, an Indiana Department of Environmental Management environmental scientist, is spending a lot of time in Wildcat Creek these days. "Because of the priority we are putting on the Wildcat, I've got as many sampling sites here as I do in the rest of the Upper Wabash basin," he said.

Grady's Pesticide Monitoring Project tests Indiana's lakes, rivers, and streams for the presence of more than 100 water soluble pesticides. And it's just one of the projects underway in the Wildcat Creek, where IDEM has launched a pilot project that addresses water quality from a watershed perspective.

"We're using the Wildcat as a focus for several on-the-ground projects," said Bryan Hummel, IDEM's Wildcat Creek Watershed Initiative project manager. "For example, it's going to be the first TMDL we do."

IDEM is establishing Total Maximum Daily Loads, or TMDLs, for Indiana waters as required by the federal Clean Water Act. States must evaluate the quality of their waterways and set the types and maximum amounts of pollution that can be discharged into them.

Pending approval from the U.S. Environmental Protection Agency, IDEM also plans to provide $80,000 in grant funds to the Indiana Association of Soil and Water Conservation Districts to hire three people to implement soil conservation projects in the Wildcat watershed, Hummel said. And the agency's water assessment branch, which is assessing overall water quality in Indiana's six watersheds, is evaluating the Upper Wabash basin and the Wildcat this year. (IDEM Report)

The Direction of Eutrophication

Lakes are temporary (in a geologic sense) features of the landscape. The natural lakes of northern Indiana, for example, have had their current shapes for only about 12,000 years. Over tens to many thousands of years, lake basins change in size and depth as a result of climate, movements in the earth's crust, shoreline erosion, and the accumulation of sediment. Eutrophication is the term used to describe this process.

The classical lake succession sequence is usually depicted as a one-direction progression through the following series of phases or trophic states having these general characteristics:

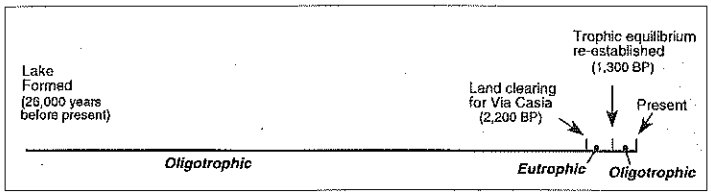
- Oligotrophy: lack of plant nutrients keep productivity low, lake contains oxygen at all depths, clear water, deeper lakes can support trout.
- Mesotrophy: moderate plant productivity, hypolimnion may lack oxygen in summer, moderately clear water, warm water fisheries only—bass and perch may dominate.
- Eutrophy: contains excess nutrients, blue-green algae dominate during summer, algae scums are probable at times, hypolimnion lacks oxygen in summer, poor transparency, rooted macrophyte problems may be evident.
- Hypereutrophy: algal scums dominate in summer, few macrophytes, no oxygen in hypolimnion, fish kills possible in summer and under winter ice.

(continued p. 2 . . .)

(EUTROPHICATION . . .
continued from page 1)

These lake trophic states correspond to gradual increases in lake productivity from oligotrophy to eutrophy.

Evidence obtained from sediment cores, however, indicates that changes in lake trophic status are not necessarily gradual or unidirectional. If their watersheds remain relatively undisturbed, lakes can retain the same trophic status for many thousands of years. For example, the Italian lake, Lago di Monterosi, remained oligotrophic for nearly 24,000 years until the Romans constructed a road through the lake's watershed in 171 B.C. This disturbance boosted productivity in the lake to hypereutrophic proportions. The lake naturally reverted back to an oligotrophic (less productive) state as the watershed restabilized and delivered less nutrients to the lake. Lessons to learn from this and other examples like it are that eutrophication is not necessarily a "natural" process, and when it does occur, it is reversible.



Trophic state time line for Lago di Monterosi in Italy

In contrast, rapid changes in lake nutrient status and productivity do occur as a result of human-induced disturbances to the watershed rather than gradual enrichment and filling of the lake basin through natural means.

Human-induced cultural eutrophication occurs when nutrient, soil, or organic matter loads to lakes are dramatically increased. A lake's lifespan can be shortened drastically by activities such as forest clearing, road building, cultivation, residential development, and wastewater treatment discharges because these activities increase soil and nutrient loads that eventually move into the lake.

The bottom line is that all lakes do not necessarily become eutrophic—*on their own.* It is almost entirely because of human activities that eutrophication is such a problem in our lakes.

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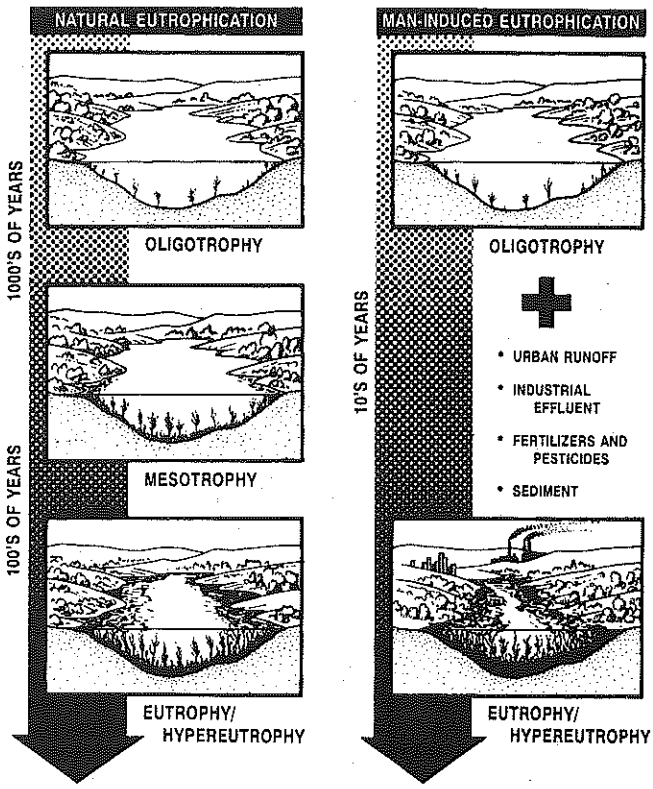


(left column) The progression of natural lake eutrophication through nutrient-poor (oligotrophy) to nutrient-rich (eutrophy) stages. The diagram depicts the natural process of gradual nutrient enrichment and basin filling over a long period of time (e.g., thousands of years).

(right column) Human-induced or cultural eutrophication in which this process is greatly accelerated by increased inputs of nutrients and sediments into a lake, as a result of watershed disturbance by humans.

Source: Olem and Flock. 1990. *The Lake and Reservoir Restoration Guidance Manual*, 2nd Edition. EPA 440/4-90-006. Prep. by N. Am. Lake Manage. Soc.

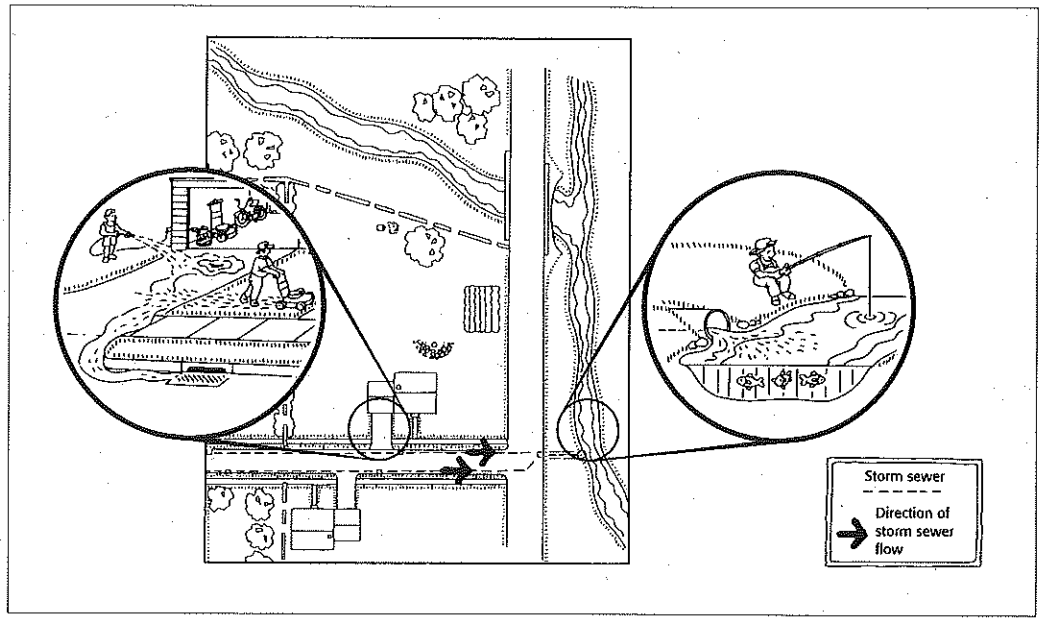
An Environmental Risk-Assessment Guide for the Home

Do you want to insure that your home is safe for you and your family? Do you want to make certain that your activities at home have minimal impact on your lake? If so, then you need to get hold of *Home*A*Syst. Home*A*Syst* is a 116-page soft-cover book written to help you keep and maintain an environmentally safe home. While this publication contains important information for all of our homes, it is especially valuable for lakeside homeowners.

The well-illustrated, plain-language booklet contains chapters on: protecting water quality around the home, stormwater management, drinking well management, home water treatment, septic systems and other wastewater treatment methods, managing hazardous household products, yard and garden care, and other topics.

*Home*A*Syst* is a national program supported by the USDA Cooperative State Research Education and Extension Service, the USDA Natural Resources Conservation Service (NRCS) and the U.S. Environmental Protection Agency (EPA). Single copies cost only $8.00 plus $3.50 shipping. They are available from NRAES, Cooperative Extension, 1532 Riley-Robb Hall, Ithaca, New York 14853-5701; phone (607) 255-7654;fax (607) 254-8770; or e-mail <NRAES@CORNELL.EDU>. There are discounts for multiple copies.

Purchase one for yourself and ask your public library to order a copy, too.



Home runoff that flows into storm sewers or off paved surfaces can go directly into streams and lakes without treatment.

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Nation Is Using Less Water

Newly released statistics by the U.S. Geological Survey (USGS), Department of the Interior, show that the nation is using less water. Water use in 1995 was 2% less than in 1990 and 10% less than in 1980, despite an increase in population over that same period. This decline in water use marks a reversal from the increases reported from 1950 to 1980. Indiana used just over 9.1 billion gallons per day of water in 1995, about a 3% drop from 1990.

The USGS has compiled and reported national water-use statistics once every five years since 1950. The most recent report, "Estimated Use of Water in the United States in 1995," includes information on Indiana's water use as well as national statistics. Included in the compilation are withdrawal data provided by the Indiana Department of Natural Resources and wastewater data provided by the Indiana Department of Environmental Management.

"If you were to ask people if the nation was using more or less water now than 15 or 20 years ago, the vast majority probably would say that we are using more water now," said Robert Hirsch, USGS chief hydrologist. "The overall decline in water use is an encouraging sign.

"The nation is clearly using surface- and ground-water resources more efficiently," Hirsch said. "Enhanced citizen awareness of the value of water and conservation programs in many communities across the country have helped to cut water use in spite of continued population growth. Improved irrigation techniques and more efficient use of water by industry have contributed to reduced water use as well."

Indiana ranked first in the nation in industrial water use in 1990. According to Lindsay Swain, chief of the USGS District Office in Indianapolis, "An 8 percent decrease in industrial water use from 1990 to 1995 moves Indiana to third place for industrial water use, behind Louisiana and Texas." Swain pointed out that irrigation, at 134 billion gallons per day, was the top freshwater-use category nationwide. "Irrigation is not as big in Indiana as it is in some of the other regions of the country. We used 116 million gallons per day for irrigation in 1995, but that is more than twice the amount used for that same category in 1990.

"It's interesting to see that more and more Hoosiers are depending on public suppliers as their source of water," said Swain. From 1990 to 1995, the number of people serviced by public water systems in Indiana increased 7 percent. Public supply withdrawals were 11 percent greater in 1995 than during 1990.

Indiana ranked thirteenth in the nation in freshwater use in 1995. In a state-by-state comparison, California accounted for the largest total water use at 46 billion gallons per day, followed by Texas, Illinois, and Florida. Two dozen states and Puerto Rico has less water withdrawn in 1995 than during 1990.

The USGS Circular 1200, "Estimated Use of Water in the United States in 1995," is available on the World Wide Web at <http://water.usgs.gov/public/watuse>.

New Agricultural Conservation Initiative Launched

Producers serious about profitability and long-term productivity are experiencing real progress by applying four key or "core" management practices. They're voluntarily using these practices as an integrated approach. The approach benefits both crop production and natural resource conservation.

The Conservation Technology Information Center (CTIC) at Purdue University and its agricultural partners in the private and public sectors want to help more producers realize the benefits of the "Core-4." They understand how critical these management practices are to natural resource conservation and cropland productivity.

The Core-4 approach includes:

Conservation Tillage—leaving crop residue (plant materials from past harvests) on the soil surface reduces runoff and soil erosion, conserves soil moisture, helps keep nutrients and pesticides on the field, and improves soil, water, and air quality.

Crop Nutrient Management—fully managing and accounting for all nutrient inputs helps ensure nutrients are available to meet crop needs while reducing nutrient movement off fields. It also helps prevent excessive buildup in soil and helps protect air quality.

Insect, Weed, and Disease Management—varied methods for keeping these and other pests below economically harmful levels while protecting soil, water, and air quality.

Conservation Buffers—from simple grassed waterways to riparian areas, buffers provide an additional barrier of protection by capturing potential pollutants that might otherwise move into surface waters.

Amid estimates that worldwide food demand could triple in the next 50 years, it's obvious sustainable soil and water practices that help enhance production are vitally important. Research and practical application show the Core-4 approach can deliver such benefits and is adaptable to virtually any farming situation.

By merging the Core-4 with the latest and most appropriate technologies, producers increase the opportunity to achieve higher levels of environmental protection, economic efficiency, and cropland productivity. (Adapted from *CTIC Partners*, Vol. 16, No. 4)

Ed. Note: Examine the Core-4 practices above and see how you can implement them on your own yard. The same principles apply at home, too!

Got a question about your lake? Or lakes in general? Or about something you've read? Write to us at the *Water Column* and we will do our best to answer it.

Silence is Golden: Noise Pollution

It's 6:30 Sunday morning. You shuffle over to the coffeepot, pour a steaming cup of brew and head for the dock. The morning is perfect...it promises to be an exquisite autumn day. The early sun reflects a tangerine color in the mist rising from the water. A chickadee calls, a fish jumps, you can hear the wing beats of a blue heron as it passes by—peace and quiet. Then, like fingernails dragging down a blackboard, the solitude is shattered by the snarl of a leaf blower springing to life. The mood is broken, your pulse quickens, and after a few more minutes of the droning noise you decide to head for the house and turn on the morning news.

The term noise is derived from the Latin word for "nausea," meaning seasickness. The sounds of our world can be beautiful and enlightening, but when does sound turn to noise? Noise is among the most pervasive pollutants of our times. Unwanted sounds, unnatural sounds, and overwhelming sounds can become noise. The noise from leaf blowers, chain saws, boom boxes, personal watercraft, and many other unwanted sounds are routinely broadcast into the air. The technology of sound reproduction has advanced to the point that speakers can faithfully reproduce music at 120 decibels (at 120dB your ears begin to hurt and there is a risk of hearing loss). The allure of noisy recreational activities seems to be greater now than it was a decade ago.

The air through which second-hand noise travels is a public "commons," used by all but belonging to no one and everyone. The Noise Pollution Clearinghouse, based in Montpelier, Vermont, believes that people do not have unlimited rights to broadcast noise as they please, as if the effect of noise was limited only to their private property. People who disregard the obligation to not interfere with others' use and enjoyment of the commons by producing unnecessary noise are like schoolyard bullies.

Unwanted sound, "noise," is one type of pollution that disappears when the source is shut off. But noise can have long-lasting effects. Exposure to loud sounds can have a harmful impact on hearing. Annoying and loud sounds can also speed up your pulse and respiratory rates and increase stress.

The American National Standards Institute (ANSI) recommends a maximum sound level of 55dB for parks and residential neighborhoods. The World Health Organization (WHO) recognizes noise as "a major threat to human well being." WHO also recommends 55dB for residential neighborhoods. The Environmental Protection Agency (EPA) recommends certain limits to exposure (see graph). This means your exposure to 100dB should be less than 85 seconds per day.

Noise can also impact wildlife. Disturbances range from mild, such as an increase in heart rate, to more damaging effects on metabolism and hormone balance. Panic and escape behavior results from more severe disturbances.

What's Noise?

To better understand the effects of sound and noise, let's take a brief look at its physical properties. Sound is the result of pressure change in a medium (usually air) caused by vibration

or turbulence. The range of these pressure changes is stated in terms of sound levels and the rate of the vibrations is its frequency. Sound is measured in decibels (dB) and sound frequency is stated in terms of cycles per second, or Hertz (Hz).

The sound pressure level corresponds to loudness, and the frequency to the pitch. In general, a 10dB increase in sound pressure is equivalent to a doubling of the loudness. A typical Wisconsin lake, with no wind or waves, and without the sound of internal combustion engines, is typically 30-40dB, depending on loons, frogs, and crickets. A typical suburban neighborhood (without leaf blowers and lawn mowers) will have noise levels in the 40-50dB range. The sound pressure level generally decreases by 6dB for every doubling of distance. Noise from watercraft therefore varies depending on the distance from shore.

EPA Recommendations for Noise Exposure

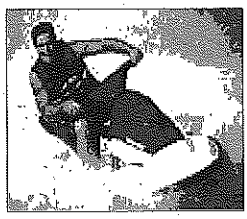
Decibels	*Time In Hours*
70	24.0
73	12.0
76	6.0
79	3.0
82	1.5
85	0.75
88	0.375
91	0.1875
94	0.0935
97	0.04687
100	0.024375

Your exposure to noise of 100dB should be less than 85 seconds per day to prevent hearing loss.

If the sound pressure is 86dB at 50 feet it is likely to be 80dB at 100 feet, 74dB at 200 feet, and 68dB at 400 feet.

Long-lasting, high sound levels are the most hazardous to hearing and the most annoying. Forty dB is considered quiet; 80dB is perceived as noisy.

Sources of Noise



There can by many sources of noise found near the lake: chain saws, loud boom boxes, lawn mowers, gas weed cutters, dogs barking, and power tools, to name a few. A fairly new product is the gas-powered leaf blower with sound levels at the operator's position ranging from 103 to 112dB. On the water, the most annoying noise award goes to personal watercraft (PWCs); operators experience sound levels of 80-100dB.

Legal Remedies

1998 has seen some landmark legislation dealing with noise pollution on the water. According to Jerry Banta, supervisor at the Apostle Islands National Lakeshore, "PWC noise is a complaint from many park users. PWCs have been banned from National Parks (on a park-by-park basis) until each park passes rules regarding their use in that park." Banta reminds us that "all loud noise sources are discouraged in our national parks."

In July the Washington State Supreme Court upheld a county ordinance that bans PWCs in the San Juan Islands. In Maine, new state laws went into effect regulating noise from all motor boats on certain lakes and ponds. Maryland and Idaho are also adopting similar legislation and Vermont bans PWCs on lakes smaller than 300 acres.

What Is Being Done and What Can I Do to Limit Noise?

The distance relationship rule (6dB drop per doubling of distance) suggests that 200 feet is not sufficient to protect residents or meet the EPA, WHO, or ANSI recommendations. In August a new law went into effect in Wisconsin that requires PWCs to proceed at no wake speeds within 200 feet of the shore on all lakes. According to some experts, 200 feet is a start; but reduction of noise at the source is another important step.

PWC manufacturers are aware of the noise issue and are working on it. Bombardier has introduced the D-Sea-Bel sound reduction system that will lower sound pressure levels by as much as 50%. They will quiet all models for 1999. Most major outboard manufacturers are quieting down outboard motors; the new four stroke engines are very quiet (and run cleaner than two strokes), especially at idle speeds.

You can also lessen annoying sounds around your lake home. Try dampening sound through a vegetative buffer. There are many good reasons to leave native trees and shrubs in front of your home—limiting noise from reaching your home may be another. So, an important reminder: be aware of the noise you make and the time of day that you do it.

Remember—silence is golden.

(Adapted from *Lake Tides*, Vol. 23, No. 4, a publication of the Wisconsin Lakes Partnership)

Meetings

March 24-27, 1999. *Annual Meeting of the Southeastern Lake Management Society Developing Watershed Solutions: Community Partnerships.* Clemson University—Clemson, South Carolina. Contact: Dr. Barbara Speziale, 415 Tillman Hall, Clemson University, Clemson, SC 29634; Phone: (864) 656-1398; Fax: (864) 656-7243; E-mail: <bjspz@clemson.edu>

April 8-10, 1999. *Communities Working for Wetlands—Third Annual American Wetlands Month Conference.* Omni Indianapolis North Hotel, Indianapolis, Indiana. Contact: Terrene Institute: (703) 548-5473; web: <www.terrene.org>

May 23-28, 1999. *Sustaining the Global Farm —10th International Soil Conservation Organization Conference.* Purdue University - West Lafayette, Indiana. Contact: Phone: (765) 494-8683; Fax: (765) 494-5948 (c/o ISCO99); E-Mail: <isco99@ecn.purdue.edu>

PERSPECTIVES

During the massive D-day landing on Normandy to free Europe and end World War Two, the entire Allied armada totaled 5,333 ships of all shapes and sizes. In a recent census of resident boats on 3,060-acre Lake Wawasee, the largest natural lake in Indiana, 4,501 boats were counted!

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