LAKE TIDES
A newsletter for people interested in Wisconsin Lakes
Volume 20 Number 2 Summer 1995

Mercury, Power Plants and Lakes

Mercury is a word with which we are all familiar—an outboard motor, a make of automobile, a Greek god, a planet or some strange metal-like fluid used in thermometers. But how does mercury impact our lakes? The recent attention given to a proposed coal fired power plant near Rhinelander has brought concern over mercury to the forefront.

Mercury occurs naturally in the environment. Mercury is also released by numerous human activities. It is emitted when coal is burned; from the mining and smelting of metals such as copper and lead; hazardous, municipal and medical waste incinerators; lime, cement, chlorine, and caustic soda manufacturing. It was once used as a paint additive, but is now banned in the United States.

Mercury Forms and Health

Mercury exists in the environment in three forms: elemental mercury, organic mercury (primarily methylmercury) and inorganic mercury compounds.

While elemental mercury (silver fluid stuff) is poorly absorbed by the body, high doses in humans may result in adverse health effects. Methylmercury is the most toxic organic form. It is easily absorbed into body organs and tends to bioaccumulate (build up) in animals, including fish and humans, which is why predatory fish such as walleye have higher mercury levels. This becomes a health concern for people who eat fish regularly. Currently, 231 lakes in Wisconsin have mercury advisories warning against eating frequent meals of fish, especially by children and women of child bearing age. Some lakes have warnings against eating any fish caught in them.

The main source of mercury in Wisconsin's lakes and steams is atmospheric deposition of inorganic mercury with precipitation. The DNR estimates that mercury air emissions from sources in Wisconsin total about 6300 pounds/year. Burning coal in utility and industrial boilers contributes around 3300 pounds, almost 53% of the state total.

Accumulation of Mercury in the Food Chain

In lakes and wetlands, bacteria can convert inorganic mercury into toxic methylmercury. Researchers believe that this conversion is intensified in acidic environments. Methylmercury then moves up the food chain from plankton (microscopic plants and animals) through small fish, medium and large fish to fish-eating birds, mammals and humans.

Animals are mainly exposed to methylmercury through their food. Extremely high levels of mercury can permanently damage the central

nervous system and impair muscular coordination and vision. Thus far, no evidence has been found that fish in Wisconsin lakes are being permanently damaged by high mercury levels. In wildlife, mercury levels tend to be higher in fish-eating mammals and birds such as mink, otter, eagles and loons.

adults. In adults, methylmercury exposure has been related to heart problems. A recent study of Finnish men who regularly consumed high-mercury fish showed a significant increase of heart attacks and deaths from heart attack.

Human Exposure to Mercury

The dangers of human exposure to mercury have long been recognized. Hat makers during the 19th century developed symptoms of shaking and slurring of speech from occupational exposure to large amounts of inorganic mercury, which was used to give a metallic sheen to felt hats. This gave rise to the expression "mad as a hatter." Methylmercury also attacks the central nervous system. In severe cases with adults, nerve cells are destroyed and specific areas of the brain are damaged irreversibly. These effects have been documented in instances of acute dietary methylmercury poisoning in Japan and Iraq.

Fish and fish products are the primary source of human exposure. In Wisconsin, the groups most likely to be exposed to excessive levels of mercury are Native Americans and recreational fishermen who routinely eat large amounts of their catch.

The greatest risk to humans is from low-level prenatal exposure. Methylmercury affects developing nerve cells. Recent studies suggest that prenatal effects occur at levels 5 to 10 times lower than the safe intake levels defined for

Air Pollution Control Technologies

The primary source of mercury emissions is burning coal. Small quantities of mercury are emitted as fugitive particulate matter (PM) from coal storage and handling. Air pollution control equipment for boilers is primarily designed to reduce emissions of PM, sulfur dioxide and oxides of nitrogen. PM emission control systems such as fabric filters and electrostatic precipitators (ESPs) remove most of these hazardous pollutants; however, because of the volatile nature of mercury vapor, ESPs and fabric filters are not effective in reducing those emissions. One option may be switching to a fuel other than coal—the mercury content in residual oil is approximately ten times less than coal on a heat specific basis, and there is virtually no mercury in natural gas.

Mercury Deposition Monitoring

In 1994, DNR placed a network of mercury deposition collectors with ultra-clean sampling, handling and analytical techniques at Trout Lake, Brule River, Suring, Lake DuBay, Wildcat Mountain, Devil's Lake and Lake Geneva. The new sampler may be used at other locations

in Wisconsin for additional monitoring of wet mercury deposition.

DNR Regulation of Mercury Emissions

Wisconsin's present mercury standards deal with direct human inhalation. These standards are inadequate to prevent health problems due to low-level emissions, methylmercury and food chain interactions.

The Wisconsin Department of Natural Resources uses three regulations that limit the emissions of mercury. The *Prevention of Significant Deterioration* (PSD) program is a federal program delegated to WDNR and implemented through Chapter NR 405, Wisconsin Administrative Code (WAC). The *Federal National Emission Standard for Hazardous Pollutant* (NESHAP) for mercury is implemented through Chapter NR 446, WAC. Wisconsin's *Hazardous Air Pollutant* rule is found in Chapter NR 445, WAC. Recent amendments to NR 445 added sections to regulate the long-term effects of some non-cancer causing pollutants including inorganic mercury.

In 1993, the Wisconsin legislature passed two other laws concerning mercury. One limits the mercury content in batteries and required manufacturers to inform consumers of the need for proper disposal and to identify and publicize authorized sites to dispose of batteries containing mercury. The other bans the sale of toys containing toxic substances, including mercury. This law was used to prohibit the sale of tennis shoes with lights that used mercury switches.

The DNR is considering many approaches to deal with the dilemma caused by mercury emissions. In March 1995, the DNR Secretary's staff created a special Mercury Work Group to generate a strategy to control and reduce mercury sources to the environment. The agency expects to develop a multi-media strategy that takes the state towards a goal of reducing the risks to fish, wildlife and humans. Controlling combustion sources to the degree allowed by law will be part of this approach.

Post Script: It was recently announced that the coal fired power plant on Rhinelander's Boom Lake will not be built due to economic reasons.

Wetlands Reform Act?

A new bill is presently proposed that could have significant impacts on Wisconsin's wetlands and associated resources: Congressional Senate Bill 851 - "Wetlands Regulatory Reform Act of 1995." This bill provides a statutory definition of wetland that will substantially modify the U.S. Army Corps of Engineers 1987 Wetland Delineation Manual and NRCS Food Security Act Delineation Manual. The primary change pertains to the hydrological requirement that "water must be at or above the surface for at least 21 consecutive days during the growing season." This modification would eliminate federal regulation (404 and Swampbuster) for all sedge meadows, fresh (wet) meadows, low prairies, fens, open bogs, coniferous bogs, shrub-carrs, alder thickets, lowland hardwood swamps, coniferous swamps, floodplain forests, and seasonally flooded basins, or approximately **80 percent (4.25 million acres)** of Wisconsin's wetlands. The only wetland types left under the new definition would be shallow and deep water marshes that are essentially regulated under Chapter 30 (Navigable Water Law) of the Wisconsin Statutes.

There is concern that the deregulation of these wetland ecosystems will have cumulative adverse impacts on existing problems such as flooding, degradation of surface and ground water quality, erosion and sedimentation. Loss of wetlands can also further jeopardize threatened and endangered plant and animal species and their habitats.

If you have questions or concerns on this issue, contact your senator at: Herb Kohl, 708 Hart Senate Office, Washington DC 20510, Phone: 202-224-5653; Russ Feingold, SDB 40, Room 1, Washington DC 20510-4904, Phone: 202-224-5323.

CAPITOL REPORT

Design for the Future—
Wisconsin DNR Reorganization

Most citizens are unaware of the internal structure of governmental agencies. Their expectations are simple: Accomplish the duties and mission to which you are entrusted. Be efficient and even-handed. Be accessible, responsive and accountable.

The Wisconsin Department of Natural Resources is charged with managing the state's natural and environmental resources on behalf of its citizens. To efficiently work toward that mission and to better meet the challenges beyond the year 2000, the Department is reorganizing internally.

In January 1995 the Department of Natural Resources hired a consulting firm to review its organization and to recommend internal restructuring that would help the Department accomplish the following goals:

- Increase efficiency and effectiveness;
- Manage resources and the environment on a natural geographic basis;
- Better integrate resource and environmental programs;
- Facilitate public and private partnerships that benefit environmental management and increase department effectiveness;
- Meet increasing demands for "front line" services; and
- Better empower the department's staff to get the job done.

Some of the proposed changes include:

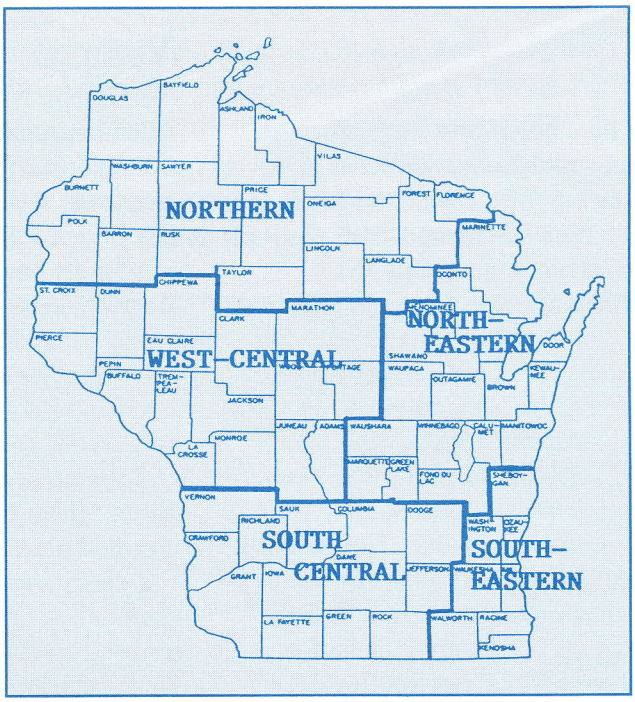
1) Reduce the six field administrative districts to five "regions" which align more naturally with state geographic features.

2) Organize field staff into water basin management teams. The teams would match department specialists to the unique needs of water basins and would share common goals and priorities within that water basin context.

3) In order to increase efficiency and effectiveness, the department would structure its field offices to better meet the needs of local citizens and communities. Under the proposal, the department would develop between 26 and 40 "customer service centers" that would offer expanded evening and weekend hours and would be staffed and equipped to satisfy most local customer needs. "Service centers" would be placed so that most citizens would be within no more than a 30-minute drive.

The staffing to handle direct service duties would come from decentralizing DNR's Madison and district office personnel. The remaining central office staff will focus on developing and supporting uniform statewide programs and policy.

Look for more information on DNR reorganization and how it will affect lakes in future issues of Lake Tides.



Proposed Five Region Model

Predators of the Plant World—BLADDERWORTS

by Susan Borman, WDNR - Western District Aquatic Botanist
Illustrations by Carol Watkins

Beneath the surface of Wisconsin's waters lurks a meat-eating plant. It has lightning-fast traps that capture unsuspecting prey and slowly digest them. Fortunately the prey species only range in size from tiny one-celled protozoans called *Euglenas* to relatively huge creatures like mosquito larvae.

These free-floating green carnivores are **bladderworts**. The pitcher plants and sundews of Wisconsin bogs are better-known carnivores, but the aquatic bladderworts are more widespread. Bladderworts can be found in lakes, ponds, bog pools and even in the standing water of roadside ditches.

Description

There are a variety of bladderwort species in Wisconsin. Some of the smaller species have their stems anchored in the mud or sand of shallow water and are only noticed when their delicate, snapdragon-like flowers appear. Other species, such as the greater bladderwort and purple bladderwort are larger, free-floating species that can grow in a variety of water depths.

Greater bladderwort (*Utricularia vulgaris*) is the most common bladderwort in Wisconsin. It has floating stems that can reach two to three meters in length. Along the stem are leaf-like branches that are finely divided, forking three to seven times. Scattered on these side branches are the bladders that trap prey. When the bladders first develop, they are transparent and green-tinted, but they become dark brown to black as they age.

The flowers are produced on stalks that protrude above the water surface, with 4 to 20 flowers per stalk. At the point where the flower stalk arises from the floating stem, the plant is branched in several directions creating a stable base that keeps the top-heavy flower stalk from capsizing. The flowers are yellow and two-lipped. The upper lip creates an awning over the lower lip, which has a sac-like pouch and a spur.

Habitat

Because bladderworts can supplement their nutrient needs by capturing prey, they are able to grow in low nutrient waters. They are most successful in still waters where the traps can function properly and the finely divided stems are not broken up by wave action or propeller damage.

Mid-summer is a good time to look for bladderworts as the yellow or purple blossoms stick up out of the water. If you lift the plant out of the water to take a closer look at it, you will hear the snap—crackle—pop of traps quickly closing.

Special Adaptations

Most Wisconsin bladderworts survive the winter by forming winter buds. These are compact balls of small "leaves" that develop on the tips of the stems in late summer and fall. As the plants sink to the sediment and decay in the winter, the winter buds become detached. In the spring the winter buds develop air spaces and float to the surface where new growth begins.

The most unique adaptation of the bladderworts is the bladder-like trap. The trapping function has been studied by botanists for many years and the mechanism is quite intricate.

The entrance to the bladder is sealed with a flap-like hinged door and a smaller flap called the velum. The whole thing is made water-tight by a glue-like mucilage produced by glands on the bladder. On the interior of the bladder there are specialized four-pointed glands that are thought to regulate the water pressure in the trap. When the trap is set, the walls are cupped and there is a negative pressure inside.

The trap entrance is surrounded by antennae-like projections and shorter trigger hairs. The antennae seem to help guide prey toward the door where they are further attracted by a sugar and mucilage secretion. When the prey brushes against the trigger hairs, it breaks the tension on the door seal and is swept into the trap with a rush of water. The speed of a trap being sprung has been estimated to be faster than 1/500th of a second. After the intake of water, the trap becomes swollen. Then water is gradually withdrawn over about 20 to 30 minutes, resetting the trap.

The fate of the prey inside the trap varies. The tiny protozoans like *Euglena* may actually live and multiply inside the bladders, but many other organisms soon die and are digested by enzymes. Larger prey are also consumed, including worms and mosquito larvae. In the case of these larger catches, only a portion of the soft-bodied prey is captured and the trap door closes around a segment of it. When negative pressure is re-established in the trap, more of the prey is taken in and digested. This process is continued until the worm or larva has been drawn in and consumed.

Significance in Aquatic Community

Bladderworts provide habitat for fish and invertebrates in low nutrient waters that may not be favorable for many other submersed plants. Because they are free-floating, they can colonize areas with very loosely consolidated sediments.

The next time you are looking in your lake, see if you can spot these alluring predators of the plant world. Three of Wisconsin's bladderworts are listed as rare and of special concern by the DNR's Bureau of Endangered Resources: Purple bladderwort (*Utricularia purpurea*), small purple bladderwort (*Utricularia resupinata*) and twin-stemmed bladderwort (*Utricularia geminiscapa*).

Budget Bill is Good to Lakes!

New rules for the state lake management grant program and special funding for large shallow lakes are included in the new state budget. Despite threats to reduce the annual appropriation for lake protection grants, the final budget signed by Governor Thompson on July 27th maintained funding for both the planning and protection grant programs at their current levels. In a move supported by the Wisconsin Association of Lakes and the Department of Natural Resources, the budget bill also included changes to state law that will:

- Make non-profit conservation organizations eligible for receiving planning grants;

- Increase the state share for protection grants from 50% to 75%;

- Raise the maximum protection grant award cap from $100,000 to $200,000.

Coupled with recent amendments to the state's Administrative Codes (see the Spring Lake Tides), lake groups should find the already popular grant program even more accessible and flexible to their needs. In the works is another rule change that, if approved early next year, will allow donated labor and services to qualify as the local match for planning grants.

Also included in the biennial budget was what is hoped to become an annual appropriation of $197,300 earmarked for shallow lake improvement projects. The first two years of the appropriation will go toward restoration activities at Big Muskego Lake in Waukesha County.

The deadline for submitting applications for protection grants is November 1. Contact your DNR District Lake Management Specialist for application materials and assistance in preparing the grant proposal.

Wisconsin Gets WET!

Wisconsin educators can now immerse themselves in the watery world of Project WET (Water Education for Teachers), an exciting new addition to the nationally renowned environmental curricula, Project WILD and Project Learning Tree (PLT).

Project WET focuses on all aspects of water, from water quality and quantity to usage and unique characteristics. The core of the program is the Project WET Curriculum and Activity Guide, a collection of water-related, fun, hands-on, and easy-to-use activities for grades K-12. The guide is available to people who attend a Project WET workshop.

Project WET-Wisconsin is sponsored by the Wisconsin Lakes Partnership, a collaborative effort among the University of Wisconsin-Extension, Department of Natural Resources, and the Wisconsin Association of Lakes.

Project WET works hand in hand with the Adopt-A-Lake Project. Both Adopt-A-Lake and Project WET are interdisciplinary in their approach, looking at water issues from a variety of perspectives and disciplines while working with kids of all ages and grade levels.

In addition to Libby McCann, Adopt-A-Lake/Project WET Program Coordinator, we're happy to welcome Ilene Grossman to the Wisconsin Lakes Partnership as the Project WET Assistant Coordinator. For more information on Project WET and/or Adopt-A-Lake call Libby or Ilene at 715/346-3366 or write: UWEX-CNR, UWSP, Stevens Point, WI 54481.

Marinette County's "Go-To" Guys!

Sterling Sharpe, Green Bay's all-pro end, was called the "go-to" guy for the Packers. When the going got tough and the job had to be done, the Pack went to Sharpe. When it comes to lakes in Marinette County, the "go-to" guys are a group of seasoned professionals that really know their way around water. Bill Kowalski, county conservationist, heads the Land and Water Conservation Department team that has assumed the lead in protecting Marinette County's aquatic resources. Bill and his staff, including Chuck Druckrey, Wally Sedlar and Steve Zander, are the people to see for lake issues. The extensive experience and background of this all-pro team make them a real force in dealing with all aspects of lake management.

The enthusiasm pouring from Bill and the LWCD staff is contagious and has spilled over to the Land Conservation Committee and the County Board. Working with these lake partners, Bill and his crew have laid the groundwork to deal with water issues on many fronts:

- The county may be the first in the state to offer up to $1500 in financial assistance to help lake organizations pay their local shares of grants.
- They have established a non-lapsing account for continual water quality expenditures.
- The LWCD team attends lake meetings to inform the public of opportunities at the federal, state and county level.
- They have been pacesetters in the development of new and creative ways to use natural vegetation to reduce pollution from shoreline development.

Bill's crew was instrumental in establishing, and now leads, the priority watershed effort on Lake Noquebay (27 lakes) and will soon begin inventory and planning on the Middle Peshtigo/Thunder Rivers Priority Watershed Project (40 lakes). The Bass Lake Small-Scale Priority Watershed Project was reopened in 1995 to fund treatment of inflow practices and in-lake treatment with aluminum sulfate as part of the Wisconsin Nonpoint Source Pollution Abatement Program. Their efforts to develop aquatic plant management plans qualified Lake Noquebay and the city of Peshtigo for new plant harvesters through the Waterways Commission. This team has worked with lake groups to sponsor planning grants, conduct plant and land use surveys, perform water quality monitoring and develop lake plans.

Bill Kowalski is a modest man. He is more comfortable giving credit than taking it. Bill praises the "the program direction support from LCC members" and the excellent network involved in water quality. Bill said, "every great success is a matter of teamwork." UW-Extension, DNR, lake organizations and local government have played a supportive and cooperative role in developing direction for Marinette County's response to water issues. The LWCD recently received the Chappee Rapids Audubon Society Environmental Achievement Award for 1995.

Marinette County's water resources are truly unique in Wisconsin and North America, with 442 lakes and more miles of Class I trout stream than any other county in the state. With these "go-to" guys, one thing is sure—this county is on the right track to making its lakes and rivers the best they can be!

Calendar

Sept 23: Adopt-A-Lake Fall Workshop, Lake Wapogasset, Amery WI (715-485-3725)

Nov 1: Lake Protection Grant Deadline. Contact your DNR District Lakes Coordinator for application materials and assistance.

Nov 6-11: North American Lake Management Society, 15th Intl. Symposium, Toronto, Ontario (303-781-8287)

March 7-9, 1996: Wisconsin Lakes Convention: Through the Looking Glass—The Ecology of Lakes, Stevens Point, WI (715-346-2116)

Wisconsin's Lake Courtesy Code

Curbing Conflict

More and more of us are enjoying the water in a wide variety of ways. Some are seeking peace and quiet and a little bit of nature. Some are looking to let it all hang out and test athletic skills. How do we share our small world with the creatures that *need* to live there and the people that *prefer* to live there?

Watercraft ordinances can be hard to pass and even harder to enforce, so some innovative lake users are putting a new spin on the principle of getting along at the lake. We call it a "Courtesy Code." Here are some examples:

How can I lower my stress and increase my pleasure? The answer is easy... before you go out on the lake think through this simple question—***How will what I want to do affect others?***

Can I be... ***Considerate—*** ***Respectful—*** ***Polite—*** ***Understanding—***
Think about...

NOISE... *Silence is golden*
SPEED... *Watch your wake*
LITTER... *Leave nothing but ripples*
SPACE... *Give critters and your lake neighbors some room*

Think More——React Less!

R—E—S—P—E—C—T

Respect: The rights of others
Environment: Enjoy wildlife from a distance
Safety: Heed the boating regulations, go slow
Peace: Watch your noise, and your wake
Enjoy: Have fun, share the moments with your friends
Consider: The other people and creatures on the lake
Trash: Take your trash home

Contemplate how much nicer your day would be if everyone showed just a little more respect.

From Lisa Conley, President, Wisconsin Association of Lakes

SUPERB = **S**afe, **U**nderstanding, **P**olite, **E**thical, **R**espectful, **B**etter

From Mark Sesing, DNR Horicon Area

We are looking for additional ideas on a Wisconsin lakes "Courtesy Code." We envision a very short, simple set of statements that sums up and epitomizes the reasons it is important to get along when we are using the lakes. If you have some proposals or ideas for a courtesy code please send your comments to Robert Korth, UWEX/CNR Bldg., UWSP, Stevens Point, WI 54481.

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BETSIE GRAHAM
BIOLOGY

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One final paragraph of advice: Do not burn yourselves out. Be as I am—a reluctant enthusiast... a part-time crusader, a half-hearted fanatic. Save the other half of yourselves and your lives for pleasure and adventure. It is not enough to fight for the land; it is even more important to enjoy it. While you can. While it's still here. So get out there and hunt and fish and mess around with your friends, ramble out yonder and explore the forests, encounter the grizz, climb the mountains, bag the peaks, run the rivers, breathe deep of that yet sweet and lucid air, sit quietly for a while and contemplate the precious stillness, that lovely, mysterious awesome space. Enjoy yourselves, keep your brain in your head and your head firmly attached to the body, the body active and alive...

Edward Abbey