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Wisconsin lakes are in better shape than many lakes nationally.  
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## June 2011

### A watershed year

Discover the state of the lakes.

Lisa Gaumnitz

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It's a watershed year for Wisconsin lakes. New studies suggest they're in better shape here than nationally and are demonstrably cleaner than 40 years ago when the federal Clean Water Act triggered a generation of investments in

wastewater treatment improvements. The baby boomers hired to carry out that landmark federal law and groundbreaking state laws have done their job well and are heading toward the exits – if they haven't already left.

As Wisconsin lake managers, educators and volunteers come together in 2011 to chart the course for the next 10 years, they recognize that protecting and restoring water quality alone isn't enough, that habitat is king, and that tackling new threats will require new approaches and leadership.

"We had a huge influx of staff in the 1970s as a result of the Clean Water Act and the funding available to states. Those people have done a good job in implementing it, and we're seeing that in cleaner water in the middle of the lake," says Carroll Schaal, who leads the lakes team for the Department of Natural Resources.

"Now that they're moving on, another generation needs to come forward and deal with these other challenges: habitat loss, water levels, toxic algae, invasive species and climate change. Those weren't on the radar 10 years ago, but they are now."

Sandy Gillum, a longtime lake volunteer, scientist and author who lives on Anvil Lake in Vilas County, is seeing those challenges up close.

Anvil Lake and others like it – groundwater fed and perched high on the topography – are suffering significantly lower levels during the prolonged northern drought, while lakes sitting lower in the topography are in better shape or in some cases may be getting too much water.



Sandy Gillum

© Photo submitted by Sandy Gillum

"Anvil Lake's profile is that of a classic glacial kettle lake that is shifting to a shallow water lake system," Gillum says. "Water clarity has been decreasing, algae, some toxic, have been a growing problem, and the assemblage of fish, aquatic plants and other aquatic creatures is shifting. It's not fun to watch." She hopes that some of the Anvil Lake watershed studies will open

opportunities for improved management decisions for many lakes experiencing a shift to a shallow water regime.

Gillum, vice president of the board of directors of Wisconsin Lakes, a statewide nonprofit organization previously known as the Wisconsin Association of Lakes (representing over 80,000 citizens), says that state laws, administrative rules and policies need to be flexible in order to respond to emerging situations on a regional or local basis and that grant and other assistance programs should be available accordingly.

"Lake stressors vary across the state. In some cases, we have one-size-fits-all laws and action responses," she says. "We also need to learn to live with the lakes. We try to manipulate the environment to fit our needs when we should manipulate our habits to fit the environment."

### **Progress at the end of the pipe**

The federal Clean Water Act of 1972 sought to assure that all lakes and rivers nationwide would be safe for swimming and fishing. It set national standards for "point source" pollution – the liquid wastes flowing out of discharge pipes from factories and sewage treatment plants and into lakes, rivers and streams. The law also launched a massive grant program to help communities rebuild aging sewage treatment plants and included a "citizen suit" provision that allowed environmental watchdogs and other groups to sue polluters and the agencies regulating them.

Wisconsin was the first state to gain federal authorization to issue its own permits limiting point source pollution and, a decade later, the first state to have its point source permits require a greater level of treatment. The state was also a leader, starting in the late 1970s, in tackling the diffuse sources of pollution to lakes and rivers, so-called runoff pollution or "nonpoint source pollution."

These investments have paid off in those lakes where point sources were a problem, according to the first ever baseline study of the nation's lakes. In summer 2007, EPA's National Lakes Assessment looked at 1,028 inland lakes across the country, including 32 in Wisconsin. Sampling crews from each state followed uniform procedures for collecting information on water quality, habitat, biological health, and presence of toxic algae on randomly selected lakes intended to provide insight on a regional basis.

Nationally, and in Wisconsin, most lakes sampled 35 years ago that were impacted by wastewater discharges have shown improvement or no increase in phosphorus.

Wisconsin also fared relatively well in other measures of lake health, with northern lakes in better shape than southern lakes, and with different stressors affecting them.

Northern Wisconsin lakes were part of the Upper Midwest eco-region, which also included northern Minnesota and Michigan, and which came out strong:

- 91 percent of lakes were in good biological condition, compared to 56 percent nationally.
- 64 percent of lakes had good shoreline condition, compared to 47 percent nationally.
- 91 percent of lakes had low to moderate levels of nutrients, compared to 80 percent nationally.
- 77 percent of lakes didn't have detectable levels of a toxin produced by excessive blue-green algae, compared to 70 percent nationally.

Overall, habitat loss was the biggest stressor for northern lakes.

Southeastern Wisconsin lakes, grouped in the Temperate Plains region that included Indiana, Illinois, Iowa, Missouri and parts of the Dakotas, didn't fare as well nationally but beat the regional averages. These lakes had a variety of major stressors, from high nutrient loads to aquatic invasive species to habitat loss.

The national results are consistent with Wisconsin's monitoring results as reported in the DNR's 2010 Water Quality Report to Congress, notes Tim Asplund, DNR's statewide limnologist.

Seventy-five percent of the 3,200 lakes assessed exhibited excellent or good water quality, and the number of lakes judged as such has grown since 1980 in each of the classifications DNR has assigned lakes based on their size, depth, water sources, drainage area and position within the landscape.

"I'm encouraged by these findings that most of our lakes are in excellent or good condition overall," Asplund says. "We should be proud we have an important resource and we have maintained that. But keeping Wisconsin lakes in good condition is going to take vigilance and investing dollars where we know we can make a difference because the cost and effort to restore a lake once it's degraded can be so great."

## **Habitat is king**

One of the most significant findings of the National Lakes Assessment, Asplund says, points to one of the biggest challenges to lake management in the 21st century – keeping habitat intact.

"The stressors affecting the largest proportion of lakes are in fact habitat alterations to the lake shorelines and shallow water areas," Asplund says.

"What we've increasingly realized, from multiple lines of evidence, and what the national study confirmed, is that both water quality and biological condition are driven by what happens on the shoreline and shallow water areas of the lake."

Nationally, lakes with poor lakeshore habitat were three times as likely to have poor biological health as lakes with good lakeshore habitat. Good biological health is characterized by the composition of the zooplankton and phytoplankton community, key to the production of oxygen and food to support a diverse and healthy population of fish, insects, algae, plants and other organisms.

Asplund says those national findings also suggest that Wisconsin's existing protections for shorelands and shallow water areas are benefitting lakes by preserving natural habitats and their filtering capabilities. Wisconsin was the first state to adopt statewide minimum development standards and many counties have gone beyond those state minimums to enact more protective standards.

And Wisconsin for decades has required environmental review for dredging, grading, aquatic plant management and other activities in the shallow water that can disturb or destroy habitats.

"The Lakes Assessment says that shoreline development in and of itself doesn't automatically make lakes worse — it's how you develop it that determines the impact on the lake," Asplund says. "It also says that if people who live on the lake engage in proper stewardship and restoration activities, it does benefit the lake. Some of the damage can be undone."

### **New threats surface**

As point source pollution has been controlled, runoff pollution from farms, cities, roads and construction sites has become the leading cause of poor lake water quality. Rules to address these so called "nonpoint sources" have been tightened in the last decade. But because of the sheer number of these diffuse sources, it will take a lot longer to control them and see the kind of improvement witnessed after point sources were controlled, Schaal says.

The spread of aquatic invasive species like zebra mussels, rusty crayfish, common carp and Eurasian water-milfoil, along with water level issues, have emerged as some of the most concerning challenges. Algae blooms, sometimes toxic, are a growing problem on lakes, especially large reservoirs, where nutrient levels are still too high.

The lower water levels Gillum observes on Anvil Lake, which is down 6.5 to 7 feet from its all-time high in 1943, and about 3.8 feet since 1995, is a problem in other parts of Wisconsin. Some central Wisconsin lakes are particularly susceptible because of a combination of factors including their reliance on groundwater, their location in the watershed, weather patterns, and increasing groundwater use by humans. Central Wisconsin now contains the highest density of high capacity wells in the state – those pumping 100,000 or more gallons a day – with about 2,100 wells in Adams, Marquette, Portage and Waushara counties.

Seepage lakes located close to a groundwater divide (a high point where water divides and flows in different directions) have less area to draw water from than lakes farther down the hill which intercept more groundwater sources. So when a lack of water lowers the water table, "high" lakes are more susceptible to fluctuations.



Mary Jane Bumby

© Photo submitted by Mary Jane Bumby

In other parts of Wisconsin, lake lovers are coping with effects associated with too much water.

Mary Jane Bumby, a retired high school biology teacher who lives along Green Lake, has been monitoring water quality and aquatic plants in the lake for 40 years, and for some years, had recorded improved water quality on the lake, Wisconsin's deepest natural lake at 236 feet. Then came the flood of 2008. The Ripon area received 13 inches of rain in a few days and water from the 114-squaremile watershed rushed toward the lake.

"Water is a mighty force," Bumby says. The rains washed sediment and nutrients from surrounding rich farm fields into the lake, shorelines collapsed, adding more sediment, and piers and boats floated away with the high water levels.

"It's very sad to look out and see how muddy the lake can be when we have high winds," Bumby says. During the drought of 1992, she measured water clarity down to 50 feet. Last summer, clarity was 20 feet. "The lake is changing because of runoff from its watershed of two counties and water retention in the deep lake of 17 to 19 years."

That story has been repeated elsewhere in the state. The improving water quality seen across all classifications of lakes since 1980 has dropped off somewhat in the last five years, possibly due to extreme weather conditions, including the drought in northern Wisconsin and a series of unusually wet

years in southern Wisconsin, Asplund says. Such flooding and drought are expected to intensify as a result of climate change in Wisconsin.

## **New leadership and approaches needed**

For the last 30 years, a partnership involving the Department of Natural Resources, UW-Extension and citizen and lake communities has helped Wisconsin keep its lakes healthy.

The partnership builds on the efforts of other DNR programs and local, state and federal agencies to control pollution sources and other stressors that can impact lakes. The state provides educational, financial and technical support to lake communities. Citizens provide local leadership, initiative and the political will.

The Wisconsin Lakes Partnership is considered a national, if not international, model for successful lake management.

But key architects are now sailing into retirement, including Bob Korth, lakes team leader for UW Extension's Lakes program at UW-Stevens Point, and Jeff Bode, the longtime leader of DNR's lakes and wetlands section.

New leaders are grabbing the tiller. Eric Olson has been hired to take on the Korth job; Karen von Huene is leading Wisconsin Lakes. Together with DNR's Carroll Schaal, they are steering an effort to develop a new strategic plan for the Wisconsin Lakes Partnership.

"Collaboration has been a critical component to addressing lake issues over the past decades," Olson says. "As we look to the future, the Wisconsin Lakes Partnership hopes to extend their collaborative network to ensure that everyone who cares about lakes can take an active role in protecting and restoring them."

Gillum says the new strategic plan needs to embrace adaptive management and replace the one-size-fits-all approach. This is already happening. Wisconsin Lakes is developing regional leadership teams to be the ears and sounding boards for Wisconsin lakes. These will be non-agency representatives who have solid backgrounds in lake issues and will be helping identify some of the most important concerns in their areas, she says.

For its part, the DNR has been classifying its waters in 10 classes based on lake size and depth, water sources, how much land drains to the lake, and its position within the landscape. Sediment core studies help give an idea of what the water quality was before statehood for a particular lake class. From those measurements, data collected by the Department of Natural Resources, other agencies and by volunteers through the self-help lakes monitoring program can be used to determine if a lake is good, fair or poor in certain health indicators.

"There are different expectations for different lakes, so we expect shallow drainage lakes with large watersheds to be different than deep seepage lakes with small watersheds," Asplund says. The classifications are helping set realistic expectations for lakes and can help better steer funding to where it will make the most difference.

The DNR is hoping that Wisconsin's involvement in the Midwest Glacial Lakes Partnership, one of several emerging national fish habitat protection efforts, can help bring new information, recommendations and resources to the fight. When all is said and done, though, the success of the strategic plan rests on the shoulders of citizens like Gillum and Bumby.

Their energy and involvement seem limitless. Gillum, former education director and past president of the Vilas County Lakes Association, served on the Loon Watch Advisory Council of the Sigurd Olson Environmental Institute at Northland College in Ashland and designed and supervised a number of shoreline restorations in Vilas, Oneida, Forest and Florence counties, in addition to conducting and publishing research on the habitat values of natural shorelines and other topics. She now serves as Chairman of the Town of Washington Water Resources Committee and is involved in studies on Anvil Lake that she hopes can help lead to improved management decisions for lakes shifting to shallow water states.

Bumby also has a very hands-on approach.

She pilots her small motorboat to two sites in Big Green Lake, taking water clarity measurements by lowering a state-supplied Secchi disk into the water until she can no longer see its black and white markings, before recording the depth. She takes the water temperature, and completes her other sampling. This summer she'll be working with a group of volunteers to conduct a survey of submersed aquatic plants. The first such survey was done in 1921; she repeated that study in 1971 and has done it every decade since.

"I love to see what's going on in the lake," she says.

**Lisa Gaumnitz** is the public affairs manager for the DNR Water Division.



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