Summer 2008

ASC
Aquatic Sciences Chronicle
www.aqua.wisc.edu/chronicle
UNIVERSITY OF WISCONSIN SEA GRANT INSTITUTE UNIVERSITY OF WISCONSIN WATER RESOURCES INSTITUTE

INSIDE:

UW SEA GRANT

The Value of Clear Water

Two satellite images of lower Green Bay. The inset photo, taken May 20, 2000, shows the variation in water clarity. Highly turbid water enters the southern bay from the Fox River; water clarity improves farther north near Little Sturgeon Bay. Source: ERSC, UW–Madison

Prospective home buyers with school-aged children often are willing to pay more for a house that is located in a school district with an excellent reputation. Others are willing to pay more for a second bathroom or a remodeled kitchen, but how much more are landowners willing to pay for a house located by a body of water that has high-quality water than one that does not?

UW–Madison researchers Bill Provencher and Rich Bishop and PhD student Rebecca Moore tackled this question by conducting a mail survey of 610 landowners who lived on or near Green Bay. They were interested in knowing what the benefit of improving water clarity would be to inland and shoreline property owners in 14 townships adjacent to the Bay in Brown, Oconto, Kewaunee, and Door Counties.

Green Bay has long suffered from water-quality problems ranging from PCB contamination to over-enrichment from nutrients and sediment causing excessive weed and algae growth. Water-quality managers in the region are looking to improve water clarity in the bay by controlling polluted runoff from agricultural and urban sources. The costs of clean-up measures, such as fencing cattle out of a stream or pretreating urban stormwater, can be fairly straightforward, but the value of the resulting water-quality improvements to property owners is less obvious.

The researchers wanted to know how much landowners would be willing to pay to improve the water quality in their region by four feet. (See the sidebar on measuring water quality, p. 7.) Landowners were asked, "If you were voting in a referendum on steps to reduce nutrients and runoff to Green Bay and the cost to your household in increased state and local taxes would be $35 per year (or another randomly assigned dollar amount) for the foreseeable future, how would you vote?"

The researchers used responses to the question to determine the average price that property owners in the area were willing to pay for better water quality.

Not surprisingly, the willingness to pay for the benefit of improved water quality varied according to two things: existing conditions and

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Aquatic Sciences Chronicle

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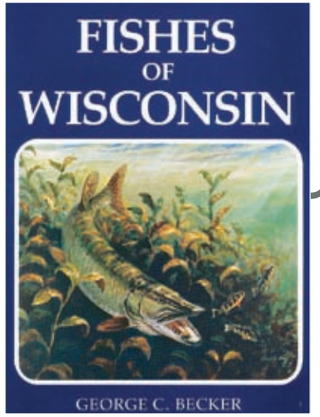

FEATURED WEB SITE

Fishes of Wisconsin
by George C. Becker

http://digital.library.wisc.edu/1711.dl/EcoNatRes.FishesWI

George C. Becker's *Fishes of Wisconsin* was the first comprehensive survey of the state's fish species and the environmental challenges they face. Published in 1983, it remains the seminal reference to 157 fish species found in Wisconsin, many which are also found throughout much of the Great Lakes and Mississippi River basins.

Becker began collecting specimens in 1958, the summer after he started teaching at UW–Stevens Point. His entire family participated in the field work, with help from hundreds of ichthyology students over the course of 18 years.

Wisconsin's Water Library coordinated with the University of Wisconsin Press and University of Wisconsin Digital Collections to digitize the 1,052-page book and make it available for free on online.

A helpful companion resource, *Wisconsin Fishes 2000* by John Lyons, is available from the ASC Publications Store *aqua.wisc.edu/publications*. Also available online for free, is the Wisconsin Fish Identification Database at *www.wiscfish.org/fishid*. Produced by the Wisconsin Department of Natural Resources, the UW Center for Limnology, and UW Sea Grant, the site features more than 4,000 photos covering all 162 native Wisconsin species and 12 invasive species that have taken up residence in the state's waters. It also includes a taxonomic key, an illustrated guide to fish anatomy, and an illustrated glossary.

programpeoplenews


Photo by Rich Dellinger

Chancellor John Wiley and Linda Campbell

Linda Campbell, Publications Sales & Distribution Coordinator, received a surprise visit from UW–Madison **Chancellor John Wiley** when he stopped by Goodnight Hall to present her the Classified Employee Recognition Award. "Linda deeply deserves such recognition," said ASC Director **Anders Andren**. "For 27 years in our office, she has been extremely hardworking, meticulously organized, highly productive, and a pleasure to work with year after year. Her contributions to our operations have been enormous." Campbell is one of five UW–Madison staff to receive the award out of a total of 52 people who were nominated this year.

Congratulations to **Electra Enslow**, ASC project assistant, on her recent graduation from UW–Madison with a Masters of Arts degree in library sciences. Enslow previously earned a Bachelor of Arts degree in environmental sciences from The Evergreen State College in Olympia, Wash. Everyone at ASC wishes her well with her new job as reference and instruction librarian at the University of Alaska-Anchorage.

SEA GRANT RESEARCH

BRADFORD BEACH ON THE REBOUND

Photos by Carolyn Rumery Betz

Like many beaches on the Great Lakes, Bradford Beach in Milwaukee is frequently closed because of polluted water. The beach and swimming area suffer from high bacteria concentrations, making it unhealthy for swimming. Zebra mussels, mats of the algae Cladophora, and large flocks of sea gulls have also made the beach undesirable as a recreation destination. But Sue Black, director of the Milwaukee County Parks Department, has a vision.

"I can just see this whole area with people enjoying one of the best assets of Wisconsin," Black said. "I see a renovated boathouse building and the area around it alive with rentals, cabanas, volleyball tournaments, bands, and food. Those are the things that will bring people back to the beach."

In the same five years that Black has been parks director, Sandra McLellan also has been looking at Bradford Beach, but from a totally different perspective—that of a molecular biologist with the UW–Milwaukee's Great Lakes WATER Institute. McLellan has made it her mission to determine where the bacteria are coming from that result in "Beach Closed" signs. This is not an easy task since the main culprit, *E. coli*, lives in the gut of all mammals—human and non-human.

Determining that the source is from humans, as opposed to other animals, allows resource managers to decide what course of action to take to improve water quality. "Bacteria from sewage is a very serious health risk, because we know that human sources cause human diseases," says McLellan. "We don't really know the health risk from other sources. But we do know that identifying the sources will tell us how to address them. For example, if we find sewage, we look for broken sewer pipes. If it is mostly from birds, we look for bird control measures."

With funds from UW Sea Grant, students from McLellan's lab have been sampling the numerous stormwater outfalls (structures that discharge water) in the area, including the seven that drain directly onto Bradford Beach. With every rainfall, stormwater carrying pollutants from nearby neighborhoods, roads, and parking lots drains directly into Lake Michigan via these outfalls. The outfall samples and water samples from Lake Michigan itself are analyzed in the lab by looking for specific sequences in the DNA.

McLellan's work showed that most of the bacteria in the stormwater is of non-human origin. Based on these findings, a team of park managers, biologists, government agencies, and members of the general public agreed that on-site stormwater treatment was needed. Milwaukee County has contributed $1.5 million to the clean-up effort that is currently underway. Rain gardens are being constructed at each of the outfalls, allowing the stormwater to infiltrate into the sand instead of flowing over the beach to the lake. In addition, the beach is mechanically raked to aerate the sand, reducing the harm caused by high concentrations of bacteria from sea gull feces. Better garbage management and educational efforts will also be used to decrease the nuisance caused by the gulls.

"The beauty of the plan," says Park Manager Sue Black, "is that it's the science that is dictating the engineering at the end of the day. Without the baseline water quality data, none of this would have happened." Project success will be measured by decreased *E. coli* counts, fewer beach closures, and flocks of people, not sea gulls, enjoying the beach each summer. — CRB

Watch video at *www.aqua.wisc.edu/chronicle*.

Photo by Richard Betz

wisconsin'swaterlibrary

Summer means travel!

Explore our natural world this summer by discovering the wonders of the Great Lakes. From lighthouses to dunes, the wonders of the Great Lakes are many—and Wisconsin's Water Library has many books to help you find the jewels of the region. Whether you love a good travel narrative or good travel itself, these titles will inspire and educate.

DISCOVERING GREAT LAKES DUNES
BY ELIZABETH BROCKWELL-TILLMAN AND OTHERS. EAST LANSING: MICHIGAN SEA GRANT, 1998.

The sand dunes along the Great Lakes are the most extensive freshwater dunes in the world. This book combines beautiful color photos of the dunes plus information about their ecology.

WISCONSIN LIGHTHOUSES: A PHOTOGRAPHIC & HISTORICAL GUIDE
BY KEN AND BARB WARDIUS. 1ST ED. MADISON: PRAIRIE OAK PRESS, 2000.

If you are interested in visiting or learning more about Wisconsin's lighthouses, you will be interested in the photographs, descriptions, history, and travel tips contained in this volume.

WILD SHORE: EXPLORING LAKE SUPERIOR BY KAYAK
BY GREG BREINING. MINNEAPOLIS: UNIVERSITY OF MINNESOTA PRESS, 2000.

This book is a true story of adventure that is part travel guide, part memoir, part history, and part outdoor adventure.

THE LIVING GREAT LAKES: SEARCHING FOR THE HEART OF THE INLAND SEAS
BY JERRY DENNIS. 1ST ED. NEW YORK : THOMAS DUNNE BOOKS, 2003.

This is the most complete book ever written about the history, nature, and science of these remarkable lakes at the heart of North America. From the geological forces that formed them to the industrial pollution that nearly destroyed them, and to the greatest environmental success stories of our time—the lakes are portrayed in all their complexity.

Please visit the Water Library at *http://aqua.wisc.edu/waterlibrary* for more information.

Anyone in Wisconsin can borrow these books.
Just email *askwater@aqua.wisc.edu*

Photos by Gene Clark

SEA GRANT OUTREACH

Harbor Corrosion Studies Continue

STATE AND FEDERAL GOVERNMENTS TARGET OVER $400,000 TOWARD NEW RESEARCH

The state of Wisconsin and the federal government have earmarked a combined $410,000 to continue to address a mysterious corrosion problem affecting the Duluth-Superior Harbor and possibly other sites around Lake Superior.

The new research efforts will be coordinated by the project steering team, which includes the UW Sea Grant Institute, the Duluth Seaway Port Authority, the U.S. Army Corps of Engineers, the city of Superior, and others.

Routine inspection dives in the Duluth-Superior Harbor in 2004 revealed that steel piling is corroding at an accelerated rate when compared to other locations. While most of the steel is covered with small pits the size of a quarter, some of the steel structures had holes as large as a football.

The cost of replacing all of the damaged steel is estimated to be as much as $100 million, so the project steering team is continuing a coordinated effort to determine both the causes of the accelerated corrosion and ways to mitigate the problem.

A $30,000 grant from the Wisconsin Coastal Management Program, combined with $100,000 approved by the Wisconsin Legislature and $280,000 from the U.S. Army Corps of Engineers, will fund several new tests or continuation of existing tests. While some studies will continue to probe the cause of the aggressive corrosion, others will begin to investigate ways to protect new or existing steel structures from further damage.

One such promising method for protecting the steel is the use of protective coatings. Gene Clark, coastal engineering specialist with UW Sea Grant, said the harsh Lake Superior winters will give protective coatings a difficult environment in which to work.

"The scouring action of the Lake Superior ice will probably present the biggest challenge to finding an effective coating that will stay adhered to the steel," said Clark, who is overseeing the Wisconsin Coastal Management grant.

Because this type of rapid corrosion is rare in other freshwater harbors, Clark wants to get the word out to other Great Lakes port authorities and marina owners to examine their steel structures closely this summer while water levels remain low. Clark said "the more we get the word out about our accelerated corrosion work in the Duluth/Superior harbor, the more we are finding out that other Lake Superior facilities may also have corrosion issues. These problems may be the result of totally different causes, but the results of our work will be useful for them as well as they consider repair alternatives for their docks."

For more information about the ongoing studies, visit *www.seagrant.wisc.edu/coastalhazards*. — KSK

UM–Duluth research assistant Jenna Bergin holds a steel "coupon" used to observe the corrosion process and collect lab samples.

ASC DROPLETS

Video promotes Wisconsin Coastal Guide website

Check out our new video promoting the Wisconsin Coastal Guide Web site. The piece stars Matthew Purdy, former project assistant for UW Sea Grant GIS Specialist David Hart. Mary Lee Haughwout, a current Knauss Fellow who picked up a music performance degree on her way to a master's degree in water resources management, played flugel horn. Sea Grant Exhibit Developer John Karl directed, filmed, and edited the video and recorded the music in his basement. Jeff Burns, a friend of Karl's, composed the music and played electric guitar, piano, cello, bass, and percussion.

Watch video at *www.aqua.wisc.edu/chronicle*.

Fall lecture series on water resources and climate change

This fall, UW Sea Grant will co-sponsor a lecture series to enhance public awareness and understanding of water resources issues in the context of a changing climate. The lecture series is part of the public programming accompanying "Mami Wata: Arts for Water Spirits in Africa and its Diasporas," a major traveling exhibition opening at the UW–Madison Chazen Museum of Art on October 8. The exhibit presents the dynamic visual arts associated with a host of African and African Diaspora water spirits, from west, central, southern, and eastern Africa, as well as the African Atlantic world of the Carribean, Brazil, and the United States.

Historical Marker for Fox Lock Unveiled

In 1856, the opening of the locks on the Lower Fox River was greeted with ceremonies, bands, and cheering crowds. Speedy travel between the Great Lakes and the Mississippi River — via the Fox and Wisconsin Rivers — was a reality. The first in a series of markers commemorating the building and history of the 17 locks on the Lower Fox was unveiled May 16 at Appleton Lock No. 2. The marker is the 24th sign installed as part of Wisconsin's Maritime Trails, a project led by the Wisconsin Historical Society and supported by Wisconsin Sea Grant and other partners. The Fox River markers were funded with grants from the Community Foundation and the Fox Cities Convention and Visitors Bureau.

Photo: (L to R) Harlan Kiesow, Chief Executive Officer, Fox River Navigational System Authority; Tamara Thomsen, Historic Preservation Specialist, Wisconsin Historical Society; Sharon Clothier, Curator, The History Museum at the Castle; Bob Stark, Chairman, Fox River Navigational System Authority; John Karl, Exhibit Developer, Wisconsin Sea Grant. Photo courtesy of The History Museum at the Castle, Appleton, Wis.

For more information, see *wisconsinmaritimetrails.org*.

Watch video at *www.aqua.wisc.edu/chronicle*.

The Value of Clear Water

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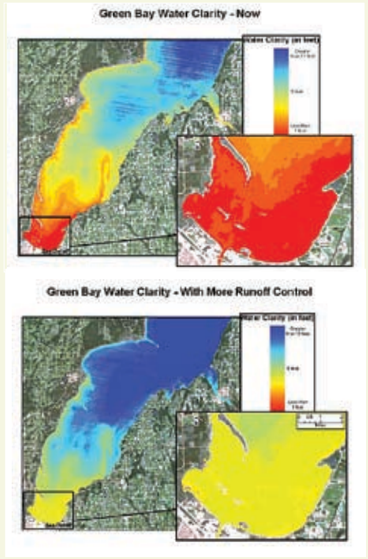

The top figure shows existing water clarity in Green Bay. The inset shows more detail for specific property owners living in the southern-most area of the bay. The bottom figure shows four feet of water clarity improvements for the same areas. Source: Jonathan Chipman, Environmental Remote Sensing Center, University of Wisconsin-Madison, 2005, www.ersc.wisc.edu/

how close the property owner was to the water. Water clarity improves as you travel north from Green Bay to Door County. Shore-front property owners with the worst existing water clarity were willing to pay more for improvements than those who lived near better existing water clarity and those who lived further inland. The estimated annual value residents were willing to pay ranged from near zero for inland residents of Oconto County to $513 for shorefront residents of Brown County. Overall, for landowners in the 14 townships of the study area, the value of the water-quality improvements is about $10 million per year.

Resource economist Provencher explained that the benefit is really intrinsic rather than monetary. "If improving water quality will result in improving their life satisfaction by so much, then that is worth something. We know how much the cost is to make the improvements, but we also need to assign a value to the benefits. That's why we use the dollar value."

The estimated value of the water-quality improvement does not include the value to those who make Green Bay a tourist destination but do not own property in the area. Knowing the value of both the costs and benefits of improved water clarity will allow policy makers to decide whether or not to implement water quality improvement practices in the land areas that drain to Green Bay. — CRB

MEASURING WATER CLARITY

Water clarity is used as one indicator of water quality, but Green Bay's water clarity is quite variable.

Capturing this variability was important since the researchers suspected that willingness to pay for water-quality improvements would be tied to existing conditions closest to each property owner's home.

Traditionally, water clarity is measured using a Secchi disk, a dinner-plate-sized black-and-white disk that is lowered over the side of the boat; a Secchi depth measurement is taken when it disappears from view.

Since Secchi disk data to map water clarity throughout the bay was not available, doctoral candidate Rebecca Moore used data collected from satellites to generate maps to show survey participants. Each person was given two color-coded maps—one of the entire bay and one of the area closest to that person's house.

Two additional maps were then produced showing the same areas with water clarity improvements of four feet. Researchers feel that the use of satellite-generated maps was so successful that this technology will be used in studies that examine other potential environmental improvements, such as fishing quality or managing forest fires.

Marshfield Students Take Gold, Head to Alaska

Marshfield High School took top honors in the Lake Sturgeon Bowl, an annual tournament that tests the marine and freshwater science knowledge of Wisconsin high school students. Twenty-four teams from around the state participated in this year's event, held February 23 at the UW–Milwaukee.

As the first-place winner, the Marshfield High School team won an all-expenses-paid trip to the national finals in Seward, Alaska, where 25 teams from around the country competed April 25–27.

The Lake Sturgeon Bowl is a regional competition of the Consortium for Ocean Leadership's National Ocean Sciences Bowl. Teams of five students compete in multiple rounds of rapid-fire quiz questions and written team-challenge exercises. Students are tested on the physics, chemistry, biology, and geology of the oceans and Great Lakes, as well as on history, navigation, geography, current events, and other related topics. Marshfield battled its way to the double-elimination portion of the competition, where it was ultimately defeated by the eventual third-place winner.

In addition to help from more than 100 volunteers, the Lake Sturgeon Bowl is made possible by support from the Consortium for Oceanographic Research and Education, UW–Milwaukee Great Lakes WATER Institute, UW Sea Grant Institute, Brunswick Public Foundation, Wisconsin Energy Corporation Foundation, and the UW–Milwaukee Bookstore.

For more information about the competition, including photos of the 2008 teams, visit *www.glwi.uwm.edu/sturgeonbowl*.

From left to right, top row: Elisa Prebble & Priya Pathak, Bottom row: Alex Jensen, Seth Burger, & Adam Denny

Photo by Caroline Joyce

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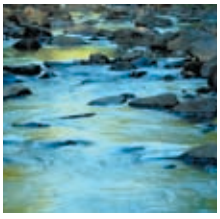

CALENDAR OF EVENTS

JUNE 2008 – MARCH 19, 2009

"Mysteries of the Great Lakes"
Milwaukee Public Museum
Milwaukee, Wis.

www.mpm.edu/imax

OCTOBER 6–7, 2008

2008 Annual Meeting of the Great Lakes Commission
Quebec City, Quebec, Canada

www.glc.org

OCTOBER 18, 2008 – JANUARY 11, 2009

"Mami Wata: Arts for Water Spirits in Africa and the African Atlantic World"
Chazen Museum of Art
Madison, Wis.

www.chazen.wisc.edu

VISIT THE ONLINE STORE

Now available at the ASC Publications Store
aqua.wisc.edu/publications/

Climate Change in the Great Lakes Region: Starting a Public Discussion
Summary report
by Stephen Wittman

Price: $13.50

A summary of a series of nine different seminars on climate change and some of its likely effects on Wisconsin and the Great Lakes region that were held at seven locations around the state in 2007. (See *www.seagrant.wisc.edu/ClimateChange*.) Three members of the Nobel Prize-winning Intergovernmental Panel on Climate Change were among the speakers for this series.

Also available as a free PDF download.

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