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ASC
Aquatic Sciences Chronicle
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UNIVERSITY OF WISCONSIN SEA GRANT INSTITUTE UNIVERSITY OF WISCONSIN WATER RESOURCES INSTITUTE

INSIDE:

UW SEA GRANT RESEARCH

Sedges under Siege

HYBRID CATTAILS RUN AMOK IN LAKE MICHIGAN WETLANDS

Since the 1800s, half of Wisconsin's primeval wetlands have been drained and filled in for agriculture, roads, houses, and industry. Now the remaining wetlands face another threat—a pernicious, pushy invasive plant. UW–Madison restoration ecologist Joy Zedler is studying how this invader lays siege to Lake Michigan wetlands and drives out diversity.

Cattails blowing in the wind may be a familiar sight, but a closer look reveals they're not all alike. The native species typically grow straight, sparse leaves that leave room for other types of plants to thrive. But the hybrid *Typha x glauca*, a cross between native and invasive cattails, is less hospitable.

"The hybrid cattails form very dense stands that use all the light above ground, and below ground the rhizomes fill up all the space. Hardly anything can coexist with it," said Zedler, who was awarded Sea Grant funding to study the problem.

At risk, said Zedler, are sedge meadows, one of the region's most diverse types of wetland. The roots of native sedges, which are grass-like plants, form mounds that create nooks and crannies for other types of plants to live. They also provide excellent cover for birds and small animals.

The fluctuating water levels of the Great Lakes historically have sustained sedge meadows and kept cattails in check. Native cattails hug the waterline, while sedges grow just inland. Both plants prefer wet soil, and together they move upslope when water is high and recede when water levels drop.

It's a different story with hybrid cattails, according to Christin Frieswyk, who received her doctorate working with Zedler. Using GIS technology to compare aerial photos of several Green Bay wetlands from the past 40 years, Frieswyk found that the sedge meadows had shrunk in recent years with the drop in Green Bay water levels. During the same time, hybrid cattail populations had expanded rather than receding like native cattails. Because they are much hardier and more aggressive,

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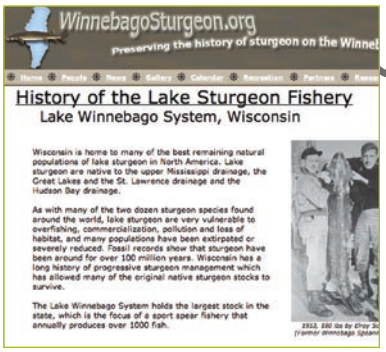


FEATURED WEB SITE

History of the Winnebago Lake Sturgeon Fishery

www.winnebagosturgeon.org

Sturgeon enthusiasts are fishing for stories, photos, and other artifacts to document the history and culture surrounding North America's largest and healthiest population of lake sturgeon.

This spring, the Wisconsin Department of Natural Resources, University of Wisconsin–Milwaukee Great Lakes WATER Institute, Sturgeon for Tomorrow, UW Sea Grant, and Oshkosh Public Museum launched the "History of the Winnebago Lake Sturgeon Fishery" project.

Photo: Bob Rashid. Decoy carved by Mary Lou Schneider

Family stories, old photos, fishing records, decoys, and spears will be compiled in a book to tell the full story of sturgeon in the Winnebago Lakes and the Wolf and the upper Fox rivers.

Lake sturgeon are an ancient species of fish that can live to be 150 years old and grow to 200 pounds. While loss of habitat and overfishing have threatened the fish nearly everywhere in North America and around the world, they are thriving in and around Lake Winnebago. Wisconsin has been managing its lake sturgeon population since 1903. The annual sturgeon spearing season draws thousands of spearers and is a boon to the local economy.

For more information, contact Lisa Sharkey, Fisheries Program Assistant at the Wisconsin DNR office in Oshkosh, at *winnebagosturgeon@dnr.state.wi.us* or (920) 303-5444.

program news

During May 30–June 2, 2006, the University of Wisconsin Sea Grant College Program will undergo a performance evaluation and management review by a federal Program Assessment Team (PAT).

The purpose of the PAT evaluation is to (1) assess program accomplishments and management quality and (2) make recommendations for improving the program's overall productivity and effectiveness. Future program evaluation and merit-based federal funding decisions will rely in part on the PAT's evaluation and recommendations.

During the PAT review, UW Sea Grant management and principal investigators will present and discuss the impacts and accomplishments of the program's research, outreach, and education programs.

Interested parties are invited to send written comments on any aspect of the program or its work by May 9, 2006, to either PAT Chair Robin Alden, c/o Program Director, Wisconsin Sea Grant College Program, 1975 Willow Drive, Madison, WI 53706-1177, or Dorn Carlson, Wisconsin Program Officer, National Sea Grant College Program, NOAA R/SG, 1315 East-West Highway, Silver Spring, MD 20910.

UW WATER RESOURCES RESEARCH

Flower Power

RAIN GARDENS FOUND TO BE HIGHLY EFFECTIVE

If only all woes of urban development could be addressed so simply and beautifully.

The buildings, roads, and parking lots covering the ground in urban areas prevent rainwater from soaking in, and that can be hard on a community's water supply and water quality. The impervious surfaces prevent rainwater from refilling the underground storage areas, or aquifers, from which households, businesses, and industries pump millions of gallons of water every day. So water tables fall. And, as rainwater flows off rooftops and concrete, it picks up contaminants and heads directly into sewers—and from there into rivers and lakes—bypassing the natural filtering that happens when water slowly seeps though the tiny pores of underground rock, gravel, and sand.

New research, however, shows that rain gardens—essentially depressions in the ground filled with water-loving plants—can be a highly effective way to funnel rainwater into the ground. And the most effective rain gardens are quite modest in size, making it feasible to incorporate them into new developments.

The findings come from Ken Potter, a UW–Madison professor of civil and environmental engineering. With support from the UW Water Resources Institute, Potter worked with former graduate student Alejandro Dussaillant and others to develop a theoretical model to estimate how the size, depth, and soil characteristics (especially "hydrological conductivity") of rain gardens affect the amount of water they channel into the ground. They then built an experimental, real-world rain garden to test the model's predictions.

The actual rain garden supported the model's predictions, yielding two happy conclusions. Across most of Wisconsin, a rain garden on developed property can funnel two to three times more water into the ground than comparable undeveloped property. And the optimal area for a rain garden is only 10 to 20 percent as large as the impervious surface area it drains. (That's because larger gardens lose more water to evaporation.)

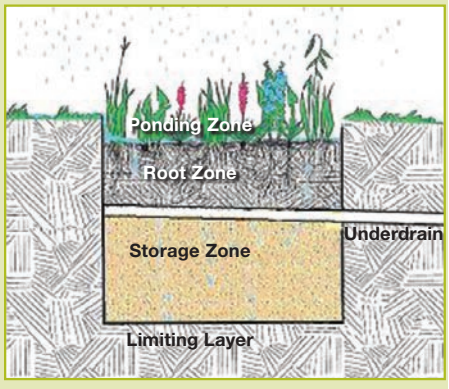
Potter's "enhanced" rain gardens feature three layers. The top layer is simply the depression itself, where rain water collects when it runs off rooftops and other impervious surfaces. This is the "ponding zone." Below that is the root zone, where plant roots help the infiltration process by maintaining channels that water can flow through. The bottom layer is a storage zone. It's filled with sand or crushed rock, which supports the layers above and, when it rains hard, it holds large amounts of water until it can seep into the surrounding soil.

If local topography permits, an underdrain pipe at the top of the storage zone leads to a ground-level opening, allowing water to drain out of the ponding zone when the storage zone fills up. This prevents water from remaining in the ponding zone longer than the plants can tolerate.

The Wisconsin Department of Natural Resources allows developers and landscape architects to use Potter's model software, called RECARGA, to demonstrate compliance with new regulations requiring large-scale commercial and residential developments to meet targets for infiltrating runoff. To help developers and others use the software, Potter and his former students Linda Severson and Dustin Atchison have published a manual, called *Design Guidelines for Stormwater Bioretention Facilities*. Both the manual and the software may be ordered or downloaded free of charge from the ASC Publications Store (*aqua.wisc.edu/publications*).

More information on rain gardens is available from the Wisconsin Department of Natural Resources at *www.dnr.state.wi.us/org/water/wm/nps/rg*. — JK

"Basic" Facility



"Enhanced" Facility

An enhanced rain garden (bottom) features a water storage zone and underdrain.

Sheltering Boats — and Birds, Fish and Frogs

Marinas offer shelter and safety to boaters, but constructing them often means losing wildlife habitat. Natural areas that provide fish and wildlife with shelter and food can be destroyed when shorelines are encased in rip rap, shallow areas are dredged, and trees are chopped down.

But building a marina can actually offer opportunities to create habitat, as UW Sea Grant Habitat Restoration Specialist Victoria Harris helped demonstrate with the South Bay Marina. Located immediately east of the mouth of the Fox River in Green Bay, the new marina features wetlands, natural beaches, rock reefs and ideal fish spawning grounds.

Harris' role in developing the marina was pivotal, according to Chet MacDonald, co-owner of the McDonald Lumber Company, which owns the property and built the marina.

"Vicky really brought the ideas to us," he said. "She makes a good case for doing these things."

Harris' involvement began in the late 1990s, when she worked for the Wisconsin Department of Natural Resources (WDNR). She coordinated development of the Green Bay/Fox River Remedial Action Plan (RAP) and served on the RAP's Biota and Habitat Work Group, which was charged with identifying opportunities to preserve and restore wildlife habitat in the area.

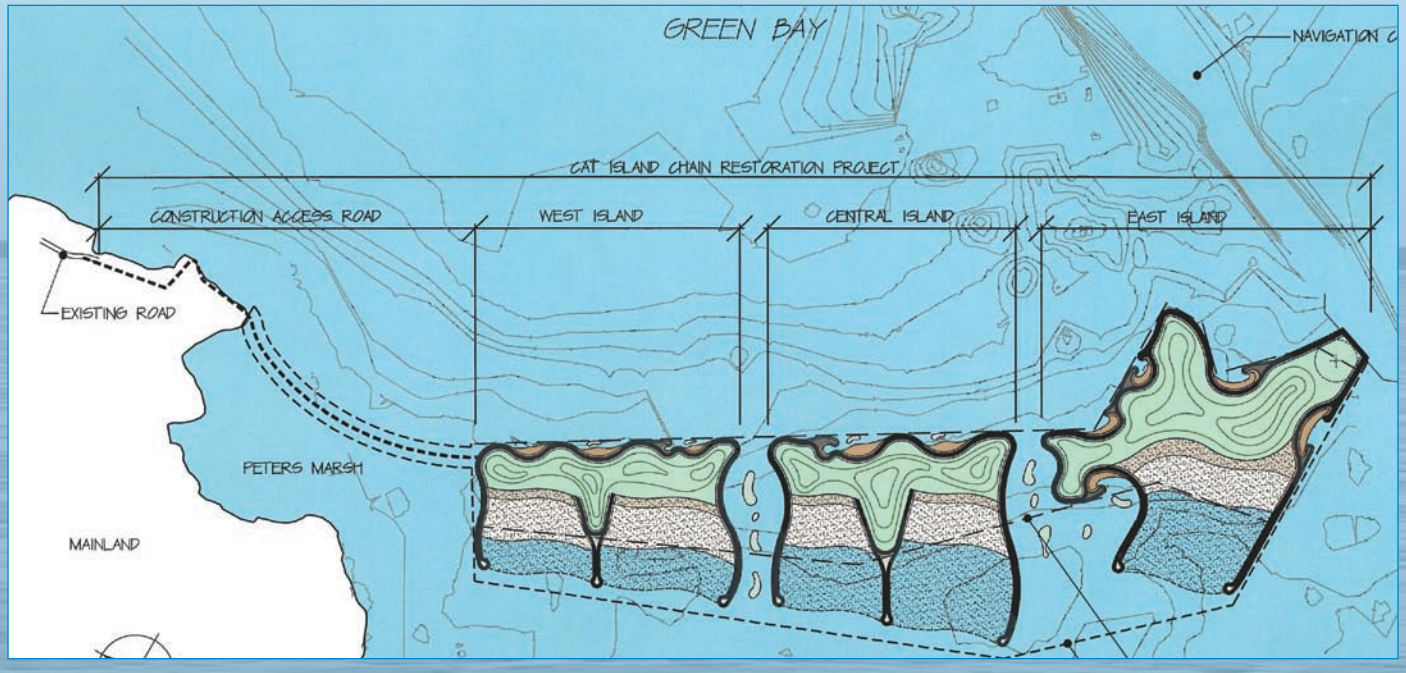
When McDonald Lumber applied for a permit from the U.S. Army Corps of Engineers, the Corps sought input from the Biota and Habitat Work Group, which also includes representatives from the U.S. Fish and Wildlife Service, UW Sea Grant and UW–Green Bay. The group visited the proposed site and offered to work with McDonald Lumber to identify wildlife-friendly features that could be incorporated into the marina design.

The company readily embraced the idea, according to McDonald.

"I had been interested in this sort of thing for a long time," he said. "This was an opportunity to do something about it."

McDonald Lumber agreed to work with the group in designing and constructing habitat features for the marina.

Shortly before accepting her current position with UW Sea Grant in 1999, Harris began researching habitat-friendly construction. She visited parks and marinas in Toronto, Hamilton, and Thunder Bay, Ont., where similar efforts had been made. She talked with project managers, collected detailed plans and studied reports on the sites. Based on this information, Harris sketched preliminary designs for the marina. She continued working with the habitat group, McDonald Lumber, and their consultant for several years as plans, designs, cost-estimates and, finally, construction were completed. She also helped raise money for the project by writing a successful proposal for a habitat enhancement grant from the U.S. Environmental Protection Agency's Great Lakes National Program Office.



W.F. Baird & Associates, U.S. Army Corps of Engineers

David Wentland, STS Consultants, Ltd.

A safe harbor for all. *The South Bay Marina, located at the mouth of the Fox River in Green Bay, provides shelter for fish, plants, and wildlife — in addition to boaters.*

Inset photo: US Fish and Wildlife Service

The marina was finished in the spring of 2003, and it features a variety of habitat. Two narrow spits of rock "headlands" jut out from the marina, sheltering part of the shoreline from large waves and allowing sediment to collect and aquatic plants to grow. Such wetlands are nurseries for many species of fish, amphibians and birds. Deposits of cobble, gravel and sand in these sheltered waters make natural-looking beaches, which provide resting and foraging places for waterfowl and shorebirds. Submerged "spawning stones," each two to five inches in diameter, were placed along the break wall to provide optimal spawning beds for walleye and bass. Nooks and crannies between the stones are deep enough to shelter eggs from wave action, yet shallow enough to allow well-oxygenated water to flow over the eggs. A wooded area once designated for a parking lot was left standing, providing resting places and foraging bases for migrating songbirds, raptors and roosting herons.

The South Bay Marina is now open and welcomes large power boats and sailboats at competitive rates. No charge for birds, fish and frogs.

Resurrecting Lost Islands

Students in Joy Zedler's UW–Madison Adaptive Restoration class are lending a hand in restoring a chain of small islands in southern Green Bay. Known as the Cat Islands, they were washed away in the 1970s by the combined forces of high lake water levels, heavy storms, and mainland shorelines hardened with rip rap.

Victoria Harris, UW Sea Grant's habitat restoration specialist, has spent nearly a decade working with the U.S. Army Corps of Engineers, Brown County Port Authority, U.S. Fish and Wildlife Service (USFWS), Wisconsin Department of Natural Resources, and coastal engineers W.F. Baird & Associates to design a restoration plan for the island chain using navigation channel dredged materials.

With those blueprints nearly completed, Harris and USFWS Green Bay office team leader Janet Smith sought the help of Zedler and her students to draft a habitat restoration plan for the islands.

The students found that the island chain provides an excellent opportunity for adaptive restoration, testing a variety of restoration strategies on one island and using the most effective techniques on others. Because the newly constructed islands will be bare, the students gave highest priority to improving soil quality to support vegetation and using rocks, logs, and trees to reduce erosion and wind.

Harris and Zedler hope future classes can visit the site and continue to refine the restoration plan.

Background photo: Gary Van Vreede, USFWS

(Background image) Site of Cat Island restoration in southern Green Bay. (Left) Preliminary plans for construction of the island chain.

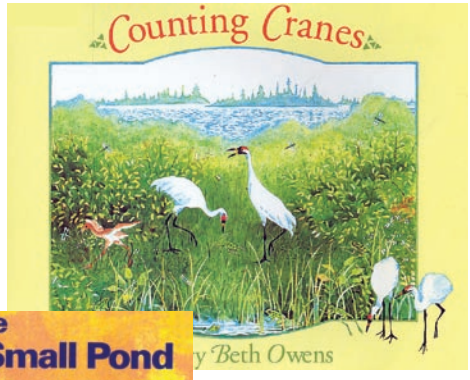
ONE FISH,
TWO FISH,
RED FISH,
BLUE FISH.

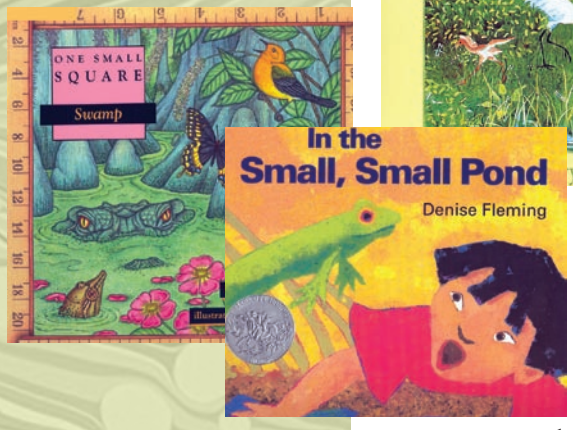
—DR. SEUSS

Wisconsin's Water Library for Kids

From Dr. Seuss to a simple explanation of the water cycle, our newest Web site, "Wisconsin's Water Library for Kids" (*aqua.wisc.edu/waterlibrary/kids*), features children's books with aquatic themes that have won awards or appeared on best books lists.

Most books are for preschool through second grade children, although there are also materials for older kids. Besides fiction and nonfiction books, the Web site also has ideas and resources for story hours.





Users can browse recommended reading lists by topic (frogs, fish and fishing, Great Lakes, water pollution, etc.) and age group. Any adult Wisconsin resident can check out books online and pick them up at their local public library. Librarians, teachers, parents, grandparents, and kids are particularly encouraged to surf this latest addition to Wisconsin's Water Library.

The site was constructed with the help of three graduate students enrolled in the UW School of Library and Information Studies Information Architecture course: Molly Kliss, Jodi Leslie, and Ellsworth Rockefeller. ASC Art Director Tina Yao used pictures from the Water Library's Allied Drive Story Hour series to design the site. — JS

Many of the books featured in the library were purchased with a grant from the Friends of the UW–Madison Libraries. These books inspired the Water Resources Library to start a series of reading programs in Madison's Allied Drive Neighborhood, and several other campus libraries are now participating in the monthly story hours.

Cattails *continued from page 1*

she explained, the hybrid cattails can withstand a broader range of water levels.

The cattails are gaining ground in areas with stable water levels as well. Aaron Boers, another graduate student in Zedler's lab, found that hybrid cattails thrive in the presence of abundant phosphorus, and they grow bigger and take up more of the nutrient when they are constantly flooded.

A likely reason, according to Boers, is that flooding alters soil chemistry so that phosphorus previously locked up in the soil becomes available for uptake by plants. It's a mechanism that has been researched in lake sediments and some wetland soils, but this is the first study to document it in invasive wetland plants. Scientists call it "internal eutrophication." It explains why cattails dominate the wetlands of Lake Ontario, which has had regulated water levels since the St. Lawrence Seaway opened in 1959.

Once an area is taken over with hybrid cattails, it may be difficult to restore, the researchers say. Frieswyk found that soils under hybrid cattails had few seeds to regenerate sedge meadows. In fact, the most common seed found was purple loosestrife, another notorious invasive plant. According to Zedler, this is a red flag for wetland managers seeking to restore sedge meadows by simply removing hybrid cattails with fire or herbicides.


Aaron Boers

Graduate student Aaron Boers immersed in his work.

"You'd be trading one problem for another," she said.

Zedler will continue to look for ways to restore sedge meadows, using segments of the UW-Madison Arboretum as testing grounds. To aid the process, Frieswyk developed a formula that quantifies which species dominate a certain wetland and in what manner. Her formula—called a species dominance index—provides an objective way to track changes in wetlands and measure progress during restoration efforts.

The constant threat from invasive species can be daunting, but Zedler claims two rewards.

"Two marvelous students received excellent training through this Sea Grant study," she said. "They're becoming well equipped to solve the critical problems facing our wetlands." — KS


Dylan Stolley, UW-Oshkosh

KNOW YOUR WATER LAB

AQUATIC RESEARCH LABORATORY

UNIVERSITY OF WISCONSIN–OSHKOSH

One of Wisconsin's newest water research facilities is the Aquatic Research Laboratory at the University of Wisconsin-Oshkosh.

The facility opened last fall after completion of the first phase of a state-funded major renovation of the former "field studies building." Once a dilapidated storage area, the building has been transformed into modern laboratories and classrooms.

A planned second phase will renovate the boathouse and add offices and a visiting area. An $189,000 grant from the National Science Foundation supported the purchase of advanced instruments to measure streamflow, nutrients, algae, and suspended sediments.

Perched on the shores of the Fox River, the facility is poised to tackle local water research questions, as well as reach out to the surrounding community, said Director Michael Lizotte.

"The lab will not only advance research to help area waterways and communities in the Fox-Wolf watershed," he said, "but also educate people of all ages about water resources, 'incubate' aquatic business development, and provide significant information to citizens and resource managers." Lizotte added that funded outreach programs include citizen-based water monitoring and professional development opportunities for teachers.

For more information, contact Director Michael Lizotte, *lizotte@uwosh.edu* or (920) 424-0848.

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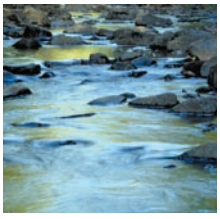
Aquatic Sciences Chronicle

a joint newsletter from UW Sea Grant and UW Water Resources



CALENDAR OF EVENTS

APRIL 27, 2006

Bay-Lake Regional Mini-Conference Series:
"Creative Solutions to Runoff Pollution"
Cosponsored by UW Sea Grant Institute
Green Bay, Wis.
www.seagrant.wisc.edu/coastalcommunities

MAY 22-26, 2006

International Association for Great Lakes Research
2006 Annual Conference
Cosponsored by UW Sea Grant Institute
Windsor, Ontario
www.iaglr.org/conference/2006

JUNE 11-14, 2006

Great Lakes Sea Grant Network Meeting
Hosted by Michigan Sea Grant
Alpena, Mich.
miseagrant.umich.edu/greatlakes06

AUGUST 6-11, 2006

8th International Conference
on Mercury as a Global Pollutant
Cosponsored by UW Sea Grant Institute
Madison, Wis.
www.mercury2006.org

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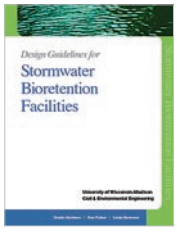

Design Guidelines for Stormwater Bioretention Facilities

by Dustin Atchison, Ken Potter and Linda Severson
edited by Stephen Wittman and Elizabeth White
36 pages, technical manual
Free

FishID 1.0

the CD version of Wisconsin's fish identification database
www.wiscfish.org
by John Lyons, Paul Hanson, and Elizabeth White
$5.00

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www.aqua.wisc.edu/chronicle/reprints