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UNIVERSITY OF WISCONSIN SEA GRANT INSTITUTE UNIVERSITY OF WISCONSIN WATER RESOURCES INSTITUTE

INSIDE:

John Groenler/ Great Lakes Bioenergy Research Center

WATER RESOURCES RESEARCH

WRI Fuels Research on the Ecological Impacts of Biofuel Cultivation

University of Wisconsin-Madison undergraduate students with Randy Jackson at the GLBRC plots at Arlington.

At the Great Lakes Research Center's research plots in Arlington, Wis., a key part of the biofuel industry's future is taking shape, one model cropping system at a time.

Or, more accurately, through eight different model cropping systems, planted across a gradient of diverse ecosystems.

Successful biofuel (read: ethanol) crops require a high yield—hence the industry's current preference for continuous corn, a crop with routinely spectacular yields. But while corn has obvious yield advantages, a lack of crop diversity also carries some significant ecological drawbacks for both soil and groundwater, which has led farmers and researchers to explore other options, from switchgrass to leaves from certain types of hybrid trees.

Since 2008, a team of researchers led by Randy Jackson, a UW-Madison associate professor of grassland ecology, has been assessing the characteristics of these different types of crops in the hopes of developing a database of information to guide future cropping efforts.

A group led by Anita Thompson, a UW-Madison associate professor of biological systems engineering, is working with Jackson to examine

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Aquatic Sciences Chronicle

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Here's what you're missing if you're not dialed into the UW Sea Grant and the Water Resources Institute's Facebook page.

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PROGRAM NEWS

Research Rolls on in 2012

As grant-making programs, the Water Resources Institute (WRI) and the Sea Grant Institute (SGI), are continuing strong commitments to scientific exploration of Wisconsin's water resources—lakes, rivers and groundwater—as well as Wisconsin waters of Lakes Michigan and Superior in 2012.

WRI completed a request-for-proposal process in late 2011 and the submitted projects underwent scrutiny by external reviewers from across North America—leaders in their respective fields. Further panel review is in store and funded work will begin in July.

SGI researchers get underway this year, and some in 2013, on more than a dozen projects such as assessing climate change impacts, fish pathogens and adding coastal geospatial tools to an online resource for local decision makers.

Both SGI and WRI are the only sources of federal and associated funding in the state for the National Oceanic and Atmospheric Administration and the U.S. Geological Survey, awarding more than $5 million in funding annually to Wisconsin public and private universities and colleges.

Send an email to tklousie@aqua.wisc.edu with "RFP mailing list" in the subject line to be added to the mailing list for new RFPs.

SEA GRANT RESEARCH

LITTLE FISH. BIG PROBLEM.

To look at it, the round goby doesn't seem like much. A small fish the approximate size of an average pickle, it seems like the sort of creature that'd be among the dominated in the aquatic universe, not the dominator.

However, the voracious goby has used strength of numbers to inflict serious damage on the Great Lakes food web. Sometimes found in groups of several hundred or more, round gobies have made short work of the food sources that sustain the young of many Great Lakes sport fish—bass, walleye and yellow perch—and they also dine on sport fish eggs when the opportunity arises. The sport fish are fighting back, feeding heavily on gobies, but goby populations are usually too large to be affected.

Unfortunately, the gobies haven't limited their invasive ways to the Great Lakes. Over the past decade, they've also migrated to Wisconsin's streams and rivers, where they could have a similarly devastating effect on the ecosystem.

Beginning in 2007, using funding provided by Wisconsin Sea Grant, UW-Madison ecologist Jake Vander Zanden and graduate student Matt Kornis set out to discover what kind of effects the gobies were having. Using nets and a portable electro-fishing system, Kornis and a team of student researchers sampled and analyzed goby populations at 150 different stream locations along Wisconsin's Lake Michigan coast.

Of the 75 streams Kornis's team sampled, 26 contained gobies. In more than 80 percent of those sample sites, the goby population was deemed small, with the remaining populations described as "superabundant."

The most surprising finding? At most of the sites, gobies have yet to devastate the ecosystem the way they have in the Great Lakes.

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Kornis team / Center for Limnology

Matt Kornis (l) and Gabrielle Leherer-Brey (above) surveyed 75 Lake Michigan tributaries to assess the impacts of invading round gobies. One of their captives (bottom).

Controlling Coastal Challenges

Just about 40 percent of Wisconsin residents live along the Great Lakes. These coastal communities face challenges. Wisconsin Sea Grant assists in protecting coastal environmental resources, strengthening economies and enhancing quality of life. The library recently received a grant from the Friends of the University of Wisconsin-Madison Libraries to purchase coastal engineering books in support of this work.

FUTURE FLOODING AND COASTAL EROSION RISKS

By Colin Thorne, Edward Evans and Edmund C. Penning-Rowsell. London: Thomas Telford, 2007.
Offering a comprehensive insight into the flooding system, this book forecasts the manner in which flooding and coastal erosion risks may increase during the 21st century due to climate change and socio-economic development. It also examines ways to manage these changes and risks.

PORT DESIGNER'S HANDBOOK (2ND EDITION)

By Carl Thoresen. London: Thomas Telford, 2010.
This book provides recommendations for the layout, design and construction of modern port structures, including developments in navigation safety, port planning and site selection, cargo handling, and fender and mooring principles.

PIERS, JETTIES AND RELATED STRUCTURES EXPOSED TO WAVES: GUIDELINES FOR HYDRAULIC LOADINGS

By Kirsty McConnell, William Allsop and Ian Cruickshank. London: Thomas Telford, 2004.
Marine structures require careful assessment of their hydraulic loads. This volume includes guidance on hydraulic design, including wave conditions, prediction of scour and vessel mooring loads. New methods for the prediction of wave loading, including forces on the underside of jetty decks, are also discussed.

MANUAL ON THE USE OF TIMBER IN COASTAL AND RIVER ENGINEERING

By Matt Crossman and Jonathan Simm. London: Thomas Telford, 2004.
This manual covers the principal issues surrounding the use of timber in coastal river engineering.

If you wish to see more books on this topic, visit our recommended reading list at *aqua.wisc.edu/channel/9*

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

OUTREACH

Wisconsin Trails Explore State's Maritime History

They are watery, not dusty, but these Wisconsin trails draw the adventurous just as a Wild West excursion would. Wisconsin's Maritime Trails feature interpretative signs, websites, public presentations and marked shipwreck moorings. The trails also document, preserve and protect the state's submerged archaeological sites. With 42 shipwrecks listed on the National Register of Historic Places, Wisconsin has more than any other state.

That's all due to a collaborative effort by Sea Grant, the Wisconsin Historical Society and other partners to foster knowledge and exploration of the state's maritime history. Check out the website, maritimetrails.org, now for cold-weather explorations and upcoming events. Then, make plans this summer for a road trip. That's when the maritime curious can check out three new historical markers and the replacement of a temporary marker.

One of the new trail markers highlights early steamboat tourism. It's in Ephraim, where early 20th-century tourists escaped the summer heat and pollution of Milwaukee and Chicago via the Goodrich Transportation Co.'s steamboat. Steamboats also carried hundreds of tons of freight until the 1920s, when the automobile and improved roads allowed easier access to Door County.

A second marker is in Sturgeon Bay, commemorating the area's quarrying past. The local Niagara dolomitic limestone

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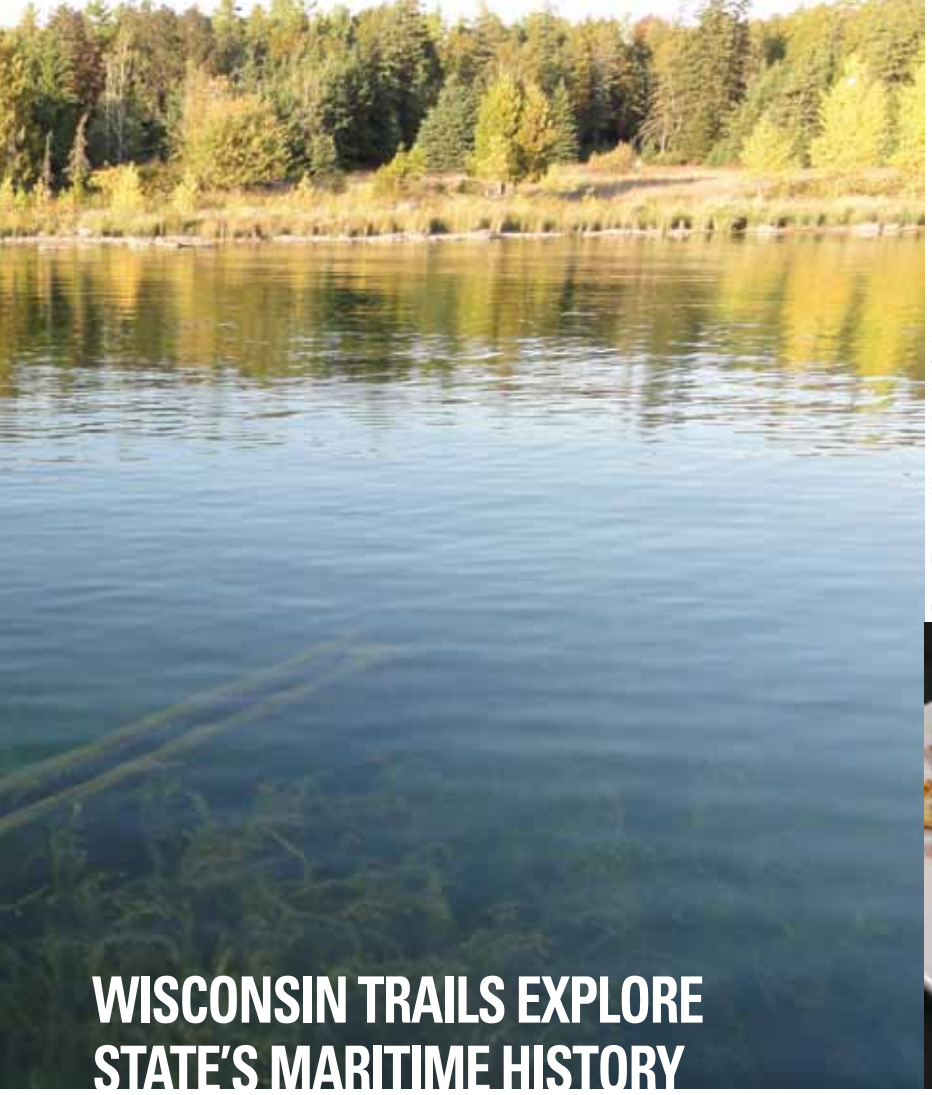

More than 700 historic shipwrecks rest in Wisconsin waters. The state's maritime trails allow exploration from dry land.

Tamara Thomsen / Wisconsin Historical Society

Bell Aquaculture uses a recirculating aquaculture system to produce tasty yellow perch, destined for dinner tables.

Bell Aquaculture

WISCONSIN TRAILS EXPLORE STATE'S MARITIME HISTORY

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was ideal for constructing breakwalls and piers, and by 1917 almost every harbor around Lake Michigan had been constructed in part with Sturgeon Bay limestone.

Lake Michigan's very first shipwreck, *Le Griffon*, will be commemorated with a marker Rock Island State Park. The French brig landed near present-day Green Bay in September 1679. A few days later, Native Americans saw it sail into a storm on northern Lake Michigan—the last anyone ever saw of *Le Griffon*. Today, the disappearance of *Le Griffon* remains one of the Great Lakes greatest mysteries.

A temporary version of a fourth marker is already installed in the Egg Harbor marina. It is a memorial to the crew of the *Erie L. Hackley*, which sank on Oct. 3, 1903. That night, the *Hackley* departed Menominee, Mich., bound for Egg Harbor. About an hour later, a violent squall tore the pilot house and cabin from the hull. Only eight of the 19 people aboard lived through the ordeal, some by hanging on to the floating cabin, others by clinging to debris. Survivors were rescued the next morning by the steamer *Sheboygan*.

The frigid, fresh waters of the Great Lakes preserve shipwrecks for a longer time than those resting in saltwater. With more than 30,000 ships plying the Great Lakes throughout history, it is not surprising that there are more than 700 historic shipwrecks in Wisconsin. Additionally, Wisconsin has a lot of Great Lakes shoreline, so there are a lot of opportunities to visit and explore these underwater cultural relics—accessible to both divers and those who read about them on historical markers on-shore.

Visit **maritimetrails.org**

Bell Rings in New Aquaculture Production Facility

CREDITS SEA GRANT'S ASSISTANCE

Sea Grant's Fred Binkowski, an aquaculture outreach specialist, provides technical advice and assistance to Bell Aquaculture in Redkey, Ind. Yellow perch fisheries in the Great Lakes have been depressed, and Bell is meeting consumer and restaurant demand for the tender, flaky fish with an estimated 1 million pounds sold in 2011. That makes it one of the largest, if not the largest, suppliers in the nation.

Late last year, the company began operations in an expanded $5-million production facility. Plans are underway for another production-facility expansion later this year.

Bell President and CEO Norman McCowan said, "Our customers come to us for a quality food that they can share with their families or that restaurants can feature to enhance their menus. Thanks to Wisconsin Sea Grant, we can deliver."

Damodhar Mailapalli

WATER RESOURCES RESEARCH

WRI FUELS RESEARCH ON THE ECOLOGICAL IMPACTS OF BIOFUEL CULTIVATION

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and evaluate the groundwater quantity and quality in five of the eight systems at the research center: continuous corn; switchgrass; hybrid poplar trees; a mix of corn, soybean and canola; and, finally, *Miscanthus x giganteus,* a tall-growing tropical grass with invasive properties. The Water Resources Institute provided funding for the project.

Anita Thompson (left) is contributing to a regional research project on biofuel-based land use changes in the Great Lakes region.

Every few weeks, Thompson's crew heads out to Arlington to collect leachate water out of tube lysimeters and measure their findings. Through leachate volumes and levels of nitrogen, phosphorous and organic carbon Thompson reveal truths about how each cropping system contributes to groundwater recharge, the process through which surface water becomes groundwater.

Despite pressure from several camps in the biofuel industry, the ultimate goal of Jackson and Thompson's research isn't to rank cropping systems.

"It isn't our goal to say that this cropping system is better than this other one," said Thompson. "What we're really looking for is a better understanding of the complete profile, so farmers and policy makers can make better-informed decisions."

Groundwater quality and quantity are critical in a cropping system's ecosystems service model, which is what makes Thompson's efforts so important.

"Some of what we're discovering comes down to the characteristics of the plants," said Thompson. "How deep do the roots penetrate? Crops without a lot of ground cover have more potential for runoff. Those with more dense vegetation tend to absorb water better."

The data Thompson's compiling will eventually be combined with regional water quality and quantity data to further develop, parameterize and validate a new biogeophysical hydrology model developed by her project collaborators at Michigan State University, where these same model cropping systems are being duplicated. Researchers hope the model can be used to explore the implications of climate change and biofuel-based land use changes for Great Lakes Basin water quantity and quality.

Thompson's part of the project is still in its earliest phases and her group is still another full growing season away from generating their first round of meaningful results. That said, small discoveries are beginning to emerge. Like the fact that during the first year nitrate loads in leachate were significantly higher for continuous corn than for switchgrass.

"Of course, that also could be due to differences in fertilizer," cautioned Thompson. "Long-term monitoring is what's really important here. That's what's going to help us determine the sustainability of these cropping systems. We're just looking at one piece of the picture."— ARC

SEA GRANT EDUCATION

Survey Reveals Lack of Knowledge About Dangers of Rip Currents

Visitors' lack of concern about health hazards at Milwaukee beaches is a wake-up call.

Visitors to Milwaukee-area beaches want to use the Web to get real-time weather reports before hitting the sandy shores. They also don't know much about rip currents and aren't deterred by how healthy their beach may—or may not—be.

So say the results of a survey of beachgoers at five popular Milwaukee County beaches by Gene Clark, Wisconsin Sea Grant coastal engineering outreach specialist.

Last August, Project Specialist Kim Smith surveyed 223 beach visitors to gauge what type of beach information they'd want to know and use, as well as the places they'd most like to access it.

Visitors' desire to receive their information electronically was not a surprise to Smith and Clark. Beachgoers' lack of awareness and concern about rip currents and the environmental health of the beaches was.

LITTLE FISH. BIG PROBLEM.

Kornis team / Center for Limnology.

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"Over the last three years, at most of our sites and streams, we haven't seen the population level declines in the native species we would have expected based on what we know from the Great Lakes," said Kornis.

That doesn't mean it couldn't eventually occur. Kornis notes that goby numbers are still rising.

"Streams are different enough from lakes in terms of the amount of habitat and type of food available that maybe round gobies can't reach the same densities as in the Great Lakes," said Kornis. "Nonetheless, goby populations are growing in most streams. Since 2007, we've observed at least a doubling of round goby abundance at 65 percent of our sites."

Vander Zanden agrees that vigilance is critical. "This species is on the move, their inland spread is really rapid, and there is a lot of suitable habitat for them," he said. "We're worried about them making their way into inland lakes all around the state. We expect that they will have big impacts in these systems. Anglers and boaters need to be aware and not transport these fish into new waters." — ARC

Mapping AIS Threats

One of the most useful outgrowths of Jake Vander Zanden's research has been the development of interactive maps that predict which Wisconsin lakes are most likely/at risk to become suitable habitats for key aquatic invasive species. Based on statistical analysis (not actual field research), Vander Zanden was able to create models that predict the possible migratory patterns of four invasive species: zebra mussels, round goby, rusty crayfish and rainbow smelt. The maps differentiate areas where aquatic invasives could invade naturally—i.e, through undammed streams connected directly to Lake Michigan—and those where transportation through human assistance would be required.

To check out the map and aquatic invasive workshop materials, visit **aissmartprevention.wisc.edu.**

Gabrielle Leherer-Brey coddles one of the gobies she helped capture.

William Karasov

Watch video at **youtube.com/UWASC**.Select Aquatic Invasive Species "What Will Round Gobies Do to Great Lakes Streams?"

"People told us that beach health test results would make very little difference in their decision to visit a beach or not," said Clark. "The results also make it clear that few people know much about rip currents at all. Truthfully, it was kind of a 'wow' moment for us."

To Clark, beachgoers' lack of rip current knowledge is a big wake-up call. "It's telling us that putting up signs to warn people and doing radio interviews to educate them aren't enough," said Clark. "We have to do more."

Clark hopes the survey results will provide momentum for efforts to develop a beach-specific website and/or apps that could gather and automatic distribute daily real-time updates about beaches and water conditions in a manner users could easily access.

The survey was funded by a Great Lakes Restoration Initiative grant that also includes Minnesota and Michigan Sea Grant.

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Aquatic Sciences Chronicle

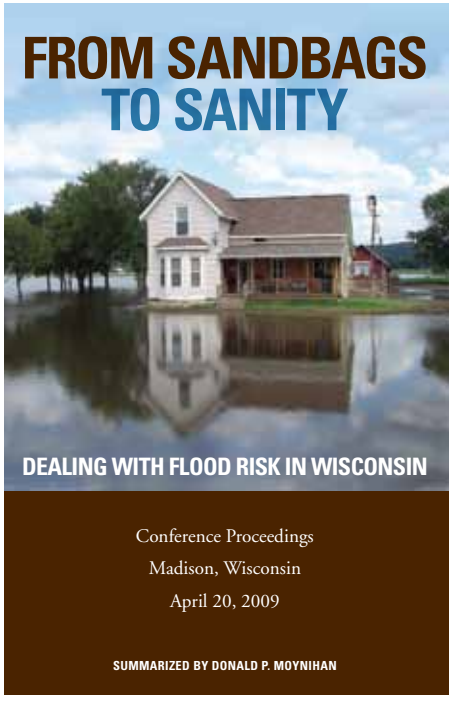
a joint newsletter from UW Sea Grant and UW Water Resources

CALENDAR OF EVENTS

MAY 13 – 17, 2012
International Association for Great Lakes Research
Cornwall, Ontario
iaglr.org/conference/news.php

MAY 20 – 25, 2012
Association of State Floodplain Managers
San Antonio
asfpmconference.org

JUNE 3 – 6, 2012
23rd Conference of the Coastal Society
Miami
thecoastalsociety.org/conference/tcs23/



Be Ready for Spring Flooding

Download the free conference proceedings *From Sandbags to Sanity: Dealing with Flood Risk in Wisconsin* at ***aqua.wisc.edu/publications.***