NEWS OF
THE GREAT LAKES
FROM MICHIGAN
SEA GRANT COLLEGE
PROGRAM

upwellings

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River Revival

FISH RESPOND TO NATURAL WATER FLOW IN MANISTEE RIVER; ECONOMIC BENEFITS COULD FOLLOW

For 80 years, water flow in western Michigan's Manistee River fluctuated dramatically each day--ranging from 10-year flood to drought conditions. The variation was caused by hydropower dam operations known as peak flow management, a practice that permits the periodic release of large amounts of water. Studies have shown that such erratic flows can cause aquatic organisms to alternately become stranded or swept downstream, negatively impacting the fish that rely on them for food.

Research assistant David Swank collects juvenile chinook from smolt traps for sampling.

On the Manistee—a major Lake Michigan tributary—relief came in 1989. Peak flow management was abandoned in favor of a less-disruptive practice known as run-of-river flow management. Water was allowed to flow naturally through the Tippy and Hodenpyl dams as a result of terms specified in new hydropower licenses. Today, the change is beginning to pay off. Researchers at the University of Michigan and Michigan State University, funded in part by Michigan Sea Grant, have found that survival of young chinook salmon in the Manistee has increased dramatically in response to the stable water flow.

"Natural reproduction is incredible now," said UM Fisheries Biologist Ed Rutherford. "It's gone from virtually nothing to approximately 700,000 smolts annually."

Still, the switch to run-of-river flows hasn't solved everything. The researchers found that although steelhead reproduction has also increased, the fish had a lower survival rate than that of young chinook. Rutherford suspects warm water temperatures may be the reason. Steelhead spawn and rear in the tailwater of dams, he explained, where summer water temperatures may be too warm. Many top-draw dams pull the warmer surface water from above the dam, which then flows downstream. Because steelhead remain in the stream longer than salmon, Rutherford suspects they may be affected to a greater degree by warm water temperatures.

Using electroshocking sampling techniques, Rutherford and colleagues measured the abundance and diversity of fish in the Manistee over a two-year period. They also used smolt traps to monitor the smolt run and examined the scales and vertebra of adult fish to distinguish wild salmon from those reared in hatcheries. (Salmon reared in hatcheries make up the majority of the salmon caught in Lake Michigan.) The researchers estimate that the greater numbers of chinook and steelhead surviving in the Manistee represent an 8.6 and 6.4 percent increase, respectively, in potential harvest available to recreational anglers, as compared to the harvest during peak flow regimes in the late 1980s.

continued on next page

WHAT'S INSIDE...

Tippy Dam

In the coming years, the economic approach may be relevant to more than just the Manistee River as numerous dams in the Great Lakes basin come up for relicensing.

THE BOTTOM LINE

The increase in chinook and steelhead is crucial information for the next phase of the project to be completed this year. MSU economists Frank Lupi and John Hoehn and UM economist Michael Moore will use a state-of-the-art economic model of recreational fishing in Michigan to translate the improved ecological changes into the dollars and cents of economic benefits.

They already know one thing: sportfishing is big business. Chinook and steelhead are two of five species of fish that make up the group called salmonids. Spending associated with recreational fishing for salmonids in the Great Lakes is estimated to contribute $1 billion per year to the economy. However, estimating the economic benefit of improvements to the sport fishery can be tricky.

For instance, in the process of relicensing hydropower dams, the Federal Energy Regulatory Commission (FERC) was required in 1986 to consider the benefits of fish and wildlife protection, recreational opportunities, and preservation of environmental quality. The problem, explained Moore, is that FERC's method of analysis has historically characterized costs and benefits only in terms of profits and losses to the companies that own the dams. As part of the research, Moore and colleagues reviewed FERC's analytical procedures. "One of the things we found," said Moore, "is that FERC collects very little information on benefits of improved ecosystem function and recreational opportunities. They do an unbalanced analysis."

Incorporating comprehensive data on costs and benefits can have tangible effects. For example, explained Moore, each hydropower license contains a series of operating conditions. Specific operational changes—such as adding fish ladders or changing to run-of-river flows—can be required if potential benefits are first recognized and quantified. On the Manistee, new data on steelhead raises the question of altering top-draw dam operations to bottom-draw to provide steelhead with cooler water. In essence, Moore said, a full accounting of the economic benefits may provide a basis for recommending operational changes.

The economic model will balance these benefits against the *costs* of run-of-river flows, which are measured in terms of lost hydropower revenues from the change in flow management.

In the coming years, the economic approach may be relevant to more than just the Manistee River as numerous dams in the Great Lakes basin come up for relicensing.

Over the next two years, the researchers will continue their work on the Au Sable and Muskegon rivers in order to create a scientific evaluation framework that is generally applicable to Great Lakes tributaries.

MICHIGAN RIVERS INVENTORY

One tool available to help improve estimates of the economic contribution of the Manistee to Michigan's recreational fishery is the Michigan Rivers Inventory—an ongoing project that classifies major river systems based on ecological characteristics.

The main components of the project are Geographical Information System (GIS) databases that provide such data as watershed descriptions, hydrology, habitats, chemistry, temperature, and fish communities. In Michigan's lower peninsula, rivers are classified into 49 types of river valley segments, which also include estimates of fishing activity at each location. By using such data on river characteristics, researchers hope to produce more accurate estimates of the economic benefits of recreational fishing in Michigan.

The Michigan Rivers Inventory project is an ongoing partnership between the Michigan Department of Natural Resources Institute for Fisheries Research and the University of Michigan School of Natural Resources and Environment.

by Joyce Jakubiak

Promoting Sustainability

NEW STRATEGIC PLAN ADDRESSES CRITICAL GREAT LAKES ISSUES

Every few years, wise organizations schedule time to assess the effectiveness of current programs and identify future priorities. For Michigan Sea Grant, 1998 was such a year. Staff from around the state convened in April to discuss the direction of the program and how best to use Michigan Sea Grant's resources to promote the sustainability of the Great Lakes. Ideas surfaced throughout the year from those within Sea Grant and from current and potential stakeholders and clients. Researchers and decision-makers from around the state provided insight at four focus groups. By October, Michigan Sea Grant had identified five priority Great Lakes issues that are also consistent with organizational capabilities and national Sea Grant goals. These issues provide the basis for a five-year strategic plan and require a coordinated research and outreach approach. The five issues and Michigan Sea Grant's role are summarized below.

COASTAL SUSTAINABLE DEVELOPMENT

A steady growth of permanent and temporary residents near Great Lakes coastlines puts pressures on coastal shoreline areas that lead to potential chronic problems, including increased beach erosion, water quality degradation, and coastal habitat loss. To make sound land use decisions, individual communities will need to better understand the value and complexity of Michigan's coastline. Michigan Sea Grant will endeavor to provide information across jurisdictional boundaries and create partnerships and collaborations to assist coastal communities in creating sustainable development plans.

TROPHIC CHANGE

Trends in lower nutrient loading and the effects of exotic species are just two conditions that have fundamentally altered the biology of the Great Lakes. These trophic changes to the natural food web have been linked to critical issues now facing Great Lakes fisheries, including fluctuations in key zooplankton and benthic invertebrate populations, declines in chinook populations, and blue green algal blooms. It is critical that decision-makers have the necessary science available to anticipate these changes and to implement the difficult decisions to make these transitions less disruptive. Through research and education, Michigan Sea Grant will contribute to the understanding of trophic change and its impacts.

AQUATIC NUISANCE SPECIES

More than 140 exotic species have colonized the Great Lakes, and new species continue to arrive. In partnership with state and regional ANS management agencies, Michigan Sea Grant will continue to support research on the effects of aquatic nuisance species as well as viable ways to limit future introductions. Through public presentations, conferences, teacher workshops, and educational materials, Michigan Sea Grant will continue to educate citizens and engage them in preventing the further spread of exotic nuisance species.

GREAT LAKES EDUCATION

Two recent studies show that Michigan residents are not well informed about Great Lakes issues. Often it is not a lack of information that can hinder knowledge but the ability and time to locate relevant, usable data. To better educate Michigan citizens and support effective decision-making, Sea Grant will adopt a highly targeted strategy that disseminates concise, up-to-date, research-based information on specific Great Lakes issues. Michigan Sea Grant will also continue its successful youth camp and vessel-based education programs and strengthen outreach efforts through focused research.

COASTAL WETLANDS

Coastal wetlands offer hydrological and habitat values that are critically important to sustaining Great Lakes ecosystems and human communities. Yet permits are approved that result in the conversion of significant wetland areas to other land uses. The productivity of the Great Lakes now depends heavily on scattered wetlands acreage. Michigan Sea Grant stands in a unique position, with its capacity to deliver research and community education, to champion coastal wetland education in Michigan. Sea Grant will bring together all aspects of coastal wetland issues in an objective, non-regulatory, statewide educational perspective.

Goals 2000-2004

- Contribute to the overall understanding of the impact of coastal development and provide information and technical assistance to promote and facilitate sustainable coastal communities.
- Assist Great Lakes resource managers in understanding and incorporating ecological, social, and economic aspects of trophic change into management decisions.
- Lead efforts to limit the introduction of new aquatic nuisance species in the Great Lakes and work to reduce the spread and density of existing aquatic nuisance species.
- Provide Michigan citizens with the knowledge and skills necessary to fulfill their roles as stewards of the Great Lakes, leading to an environmentally and economically sustainable future.
- Promote coastal wetland health through education, monitoring, and resource protection programs.

Michigan Sea Grant's complete Strategic Plan is on the Web at ***www.engin.umich.edu/seagrant/sp*** *or call 734/764-1118 for print copies.*

Research 1999

In addition to six continuing research projects, Michigan Sea Grant will support four new projects in 1999. Topics explore the effects of partial river restoration, incorporating biological uncertainties into fisheries management decisions, reducing noise aboard fishing vessels, and trace metals in freshwater ecosystems.

River Revival

Ecological and Economic Consequences of Hydropower-Related Watershed Restoration on Salmonid Productivity in Great Lakes Tributaries

Please see article on pages 1 and 2.

Edward Rutherford, University of Michigan;
Michael R. Moore, University of Michigan;
Kevin Wehrly, Institute for Fisheries Research;
John Hoehn, Michigan State University;
Frank Lupi, Michigan State University

Estimating the Unknown

Application of Decision Analysis to Great Lakes Fishery Management

During the past half century, populations of salmon and trout in the Great Lakes have collapsed and substantially recovered. Two management actions have spurred the recovery—stocking juvenile salmon and controlling the parasitic sea lamprey. These management activities continue today but pose new challenges. What level of salmon stocking is appropriate to maintain a sustainable predator/prey balance? What combination of sea lamprey control measures will be safe and cost-effective in the future? These management decisions will be critical in the next few years, and inappropriate decisions can be costly—both economically and ecologically.

Inherent biological uncertainties can play a substantial role in the outcome of events. Survival rates of stocked salmon, natural reproduction rates, dynamics of prey species, and sportfishery harvest all complicate stocking decisions. For sea lamprey, the effectiveness of control can depend partly on reproductive rates, larval population dynamics and spatial distribution. In recent years, significant progress has been made in the development of sophisticated statistical tools to help managers objectively describe and thus consider these types of uncertainties in fishery systems. This research project will apply formal decision analysis techniques to the issues of salmonine stocking and sea lamprey control in the Great Lakes.

The project will use a workshop approach to solicit views of stakeholders regarding management objectives and decision options. Researchers will identify the biological uncertainties that prevent managers from accurately forecasting the outcome of events and modify existing computer models to forecast potential outcomes and rank management options. They will test the ranking based on interaction with participants at a final workshop.

The results of the research will be immediately relevant to the issues of salmon stocking and sea lamprey control. In addition, the implications of the study will extend beyond these two issues to demonstrate the importance of a decision analysis framework. The project will help facilitate a shift in Great Lakes fishery management toward increased attention to the role of uncertainty in decision-making. This attention, in turn, will lead to more effective management decisions.

Michael Jones, Michigan State University;
James Bence, Michigan State University;
Randall Peterman, Simon Fraser University

Noise Aboard Ship

Modeling of Noise from the Propulsion System of a Fishing Boat/Ship and Development of Noise Reduction Techniques

Aboard fishing boats, crew members often endure harsh conditions, which are sometimes due to the mechanical nature of a ship. Studies have shown that high noise levels in the engine room and crew quarters have physical, psychological and financial impacts. Noise can cause crew members to become fatigued and lead to poor performance and negative work attitudes, all of which can compromise safety aboard ship. This harsh acoustic environment is also associated with difficulty in attracting and retaining skilled workers.

Shipboard noise has drawn increasing attention in recent years partly due to national and international rules but also to a growing interest in reducing annoyance and discomfort to the crew and passengers. Noise regulations are fairly stringent for passenger and research vessels. However, Great Lakes fishing boats are generally older and built without any form of vibration and noise control provisions. A diesel engine is frequently mounted directly on the hull of a vessel. The noise generated on a boat 15 to 30 meters long can be compared to that of heavy construction equipment.

Work has been done in military naval applications to numerically compute the noise level of ships and submarines using a technique called Statistical Energy Analysis (SEA). This research project will use the SEA technique in combination with another theory (Energy Finite Element Analysis) to simulate the noise and vibration transmitted aboard a Great Lakes fishing vessel and evaluate the effects of retrofitting the ship to improve conditions. The project will build on past Sea Grant research that demonstrated the applicability of the methodology to small vessels.

The goal of the research is to develop a complete modeling capability for fishing boats, which can become an integral part of the design process of any vessel. For older ships, the model will identify a range of practical modifications that can reduce noise and vibration, such as re-mounting a propulsion system, using engine covers, and treating areas of the ship with special materials to reduce noise and vibration.

Nickolas Vlahopoulos, University of Michigan

Trace Metals

Bioregulation of Trace Metals in the Great Lakes

Toxic metals from countless sources are continually released into the Great Lakes. While some bays near industrial cities are known to be heavily polluted, dissolved concentrations of many metals have remained low in the lakes as a whole. What happens to these metals once they enter the water?

Part of the answer lies in the realm of biological processes. Just as humans need small amounts of metals (iron and zinc, for example) to survive, aquatic organisms, such as algae, also need them. Studies have shown that aquatic organisms compete for essential microelements. While trace metals are essential for biological activity in lakes, they become contaminants if human activities lead to higher than normal concentrations. The quantity of metals currently being absorbed by algae in the Great Lakes is uncertain. This complex chemical/biological interaction has been studied in the ocean, but little work has been done in freshwater ecosystems. In this study, the researchers hypothesize that biological processes affect the concentrations of toxic metals in the Great Lakes.

To discover the extent of this process, the researchers will take chemical and biological measurements in the Saginaw Bay region. Chemical sampling will focus on four metals: zinc, copper, manganese and cadmium. Researchers will measure the form of the metals (such as dissolved or particulate) to discover the quantity available to be taken up by algae and the total concentrations. They'll conduct laboratory tests on water samples to measure the reaction of aquatic organisms to varying amounts of metals.

The outcome of this exploratory research will contribute to the knowledge of fundamental processes that are likely to control long-term changes in water quality. The results may also help refine mitigation strategies aimed at reducing toxic metals in the Great Lakes.

Jerome Nriagu, University of Michigan;
John Lehman, University of Michigan

announcements

Great Lakes Conference

Leading scientists and environmental/fishery managers will present current research findings and provide practical approaches to addressing key Great Lakes issues Thursday, March 11 at the tenth annual Great Lakes Conference at Michigan State University. The event, titled *Great Lakes, Great Challenges*, is scheduled from 9 am to 4 pm in the Lincoln Room of the Kellogg Center. Topics will include fisheries, contaminants, recreational opportunities and tribal issues.

Held in conjunction with MSU's Agricultural and Natural Resources (ANR) Week, the conference is sponsored by MSU's Department of Fisheries and Wildlife and Institute of Water Research and Michigan Sea Grant. For more information or to register, please contact the Institute of Water Research at (517) 353-3826.

A Year in Washington

KNAUSS FELLOWSHIP TERM IS 'BEYOND EXPECTATIONS'

Before arriving in Washington D.C. one year ago, Michigan State University graduate student Mike Oetker had no experience in politics. As a Knauss Marine Policy Fellow, Oetker soon found himself organizing policy hearings, writing speeches for committee chairmen and, on one occasion, playing an advisory role on the House floor.

"I've had a great year," says Oetker, who finished his term on January 31. "It was beyond my expectations. The experience has opened the door for a policy-based career, which I've never considered before."

Oetker has led hearings on the Sportfishing and Boating Improvement Act, the impact of snow geese in the Arctic, and the Great Lakes Fish and Wildlife Restoration Act, later signed by President Clinton.

Oetker, who recently earned his Master's degree in fisheries, was one of 27 graduate students from around the country to receive Knauss Marine Policy Fellowships in 1998, a program sponsored by the National Sea Grant College Program. Following interviews in Washington, Oetker chose to work within the House Committee on Resources, chaired by Don Young (R-AK), participating in the Subcommittee on Fisheries Conservation, Wildlife and Oceans, chaired by Jim Saxton (R-NJ).

"There's a sharp learning curve before you understand the process and start contributing," he remembers. "But committee staffers realize it's an educational experience, and they take the time to help you start out."

His initiation came after just three months when Oetker found himself delivering a pointed address to a conferees meeting, urging policy changes to a bill reauthorizing the Aquatic Resources Trust Fund Program. The event, which led to modifications of the bill, was intimidating, says Oetker: "I felt like I had jumped off the deep end with a bunch of bricks in my hands. There was no looking back after that."

Since then, Oetker has written speeches for committee chairmen and led several policy hearings. Leading a hearing requires conducting research to become well versed in a given topic

Congressman Don Young (R-AK) and Mike Oetker.

and serving as advisor to the chairman while an expert panel of witnesses presents information to members of Congress. Oetker has led hearings on the Sportfishing and Boating Improvement Act, the impact of snow geese in the Arctic, and the Great Lakes Fish and Wildlife Restoration Act, which was later signed by President Clinton.

"That was by far my biggest accomplishment," Oetker remembers. He was recognized on the House floor for his work in getting the bill passed.

During his term, Oetker has also participated in hearings on West Coast groundfish, factory trawlers in the Bering Sea and management of the dungeness crab. He has met personally with such notables as the director of the National Oceanic and Atmospheric Administration and the director of the National Marine Fisheries Service.

"You're dealing with a lot of the people who make the policy and management decisions," says Oetker, "and they recognize your name if you do quality work."

Oetker has recently accepted a legislative staff position, working on fisheries policy for the House Committee on Resources.

Zebra Mussels Invade 36 New Inland Lakes

Lake monitoring conducted last year has confirmed that zebra mussels have spread to another 36 of Michigan's inland lakes. The number of confirmed lake infestations now totals 100.

Oakland County had the most infestations in 1998 with eight new lakes, according to Michigan Sea Grant Extension Associate Mike Klepinger. Other infested lakes are dispersed throughout the lower peninsula.

Nine of the new infestations reported last year were found by citizen volunteers participating in the Sea Grant Zebra Mussel Monitoring Program. Begun in 1993, the program is a joint effort of the Michigan Department of Natural Resources, the Michigan Lake and Stream Associations, Inc., and the Michigan Sea Grant College Program. Volunteer monitoring was designed to verify predictions of the dispersal mechanisms, direction, and rate of spread of zebra mussels to Michigan's inland waters. Over the last five years, Michigan Sea Grant has received 360 reports on 186 lakes.

Twenty-six infestation reports came from various sources including biologists and property owners who discovered adult zebra mussels attached to boats, docks, water pumps and equipment. Resource managers consider some of the state's lakes to be at greater risk of infestation than others. Inland lakes with a high level of transient recreational boating activity due to their large size and public access and those in close proximity to infested waters are particularly vulnerable. Zebra mussels can contaminate lakes when boaters and anglers unknowingly transport the clinging veligers from infested waters via boats, trailers, and fishing equipment.

For a map and list of infested lakes, visit: **www.msue.msu.edu/seagrant/sgezmans.html** on the Web.

On the Agenda

DETROIT TO HOST NATIONAL MEETING ON SUSTAINABILITY

Across America, communities, businesses and organizations are finding new ways to balance economic, environmental and social goals. Ideas and best practices for achieving this balance are the focus of the first National Town Meeting for a Sustainable America to be held May 2-5 at the Cobo Convention Center in Detroit (with satellite links to points across America).

The four-day conference will showcase successful sustainability initiatives by businesses, communities and other organizations that promote economic prosperity, environmental protection and equitable opportunity. Michigan Sea Grant Extension Agent Steve Stewart will present *The Role of Schoolship Education in Great Lakes Sustainability*.

Sponsored by the President's Council on Sustainable Development and the Global Environment & Technology Foundation, the conference is designed to catalyze a national movement toward sustainable development. For more information, visit: **www.sustainableamerica.org** on the Web.

IAGLR CONFERENCE PLANNED FOR CLEVELAND

The International Association for Great Lakes Research conference (IAGLR '99) will be hosted by Case Western Reserve University in Cleveland May 25-28. The theme of the conference is "Great Lakes, Great Science, Great Cities." For more information, email Frank Lichtkoppler at lichtkoppler@agvax2.ag.ohio-state.edu

PURPLE LOOSESTRIFE PROJECT KICK-OFF

Spring workshops for people interested in the Purple Loosestrife Project will be held at Michigan State University on March 11 and 12. For more information, visit **www.msue.msu.edu/seagrant/pp** on the Web or contact Sea Grant Extension Associate Mike Klepinger.

publications

Slow the Spread of Zebra Mussels and Protect Your Boat Too
MSG-94-713
Find out how to slow the spread of zebra mussels and protect boats and motors. Free.

Eating Great Lakes Fish
MSG-94-502
Most Great Lakes fish, if prepared properly, are safe and beneficial to eat. Detailed instructions and illustrations help you trim, fillet and cook your catch of the day. Recipes included. 16 pp. $.50

Freshwater Fish Preservation
MSG-94-501
Provides instructions on how to safely handle, clean, freeze, can and smoke your catch of the day. Recipes included. 16 pp. $1.00

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