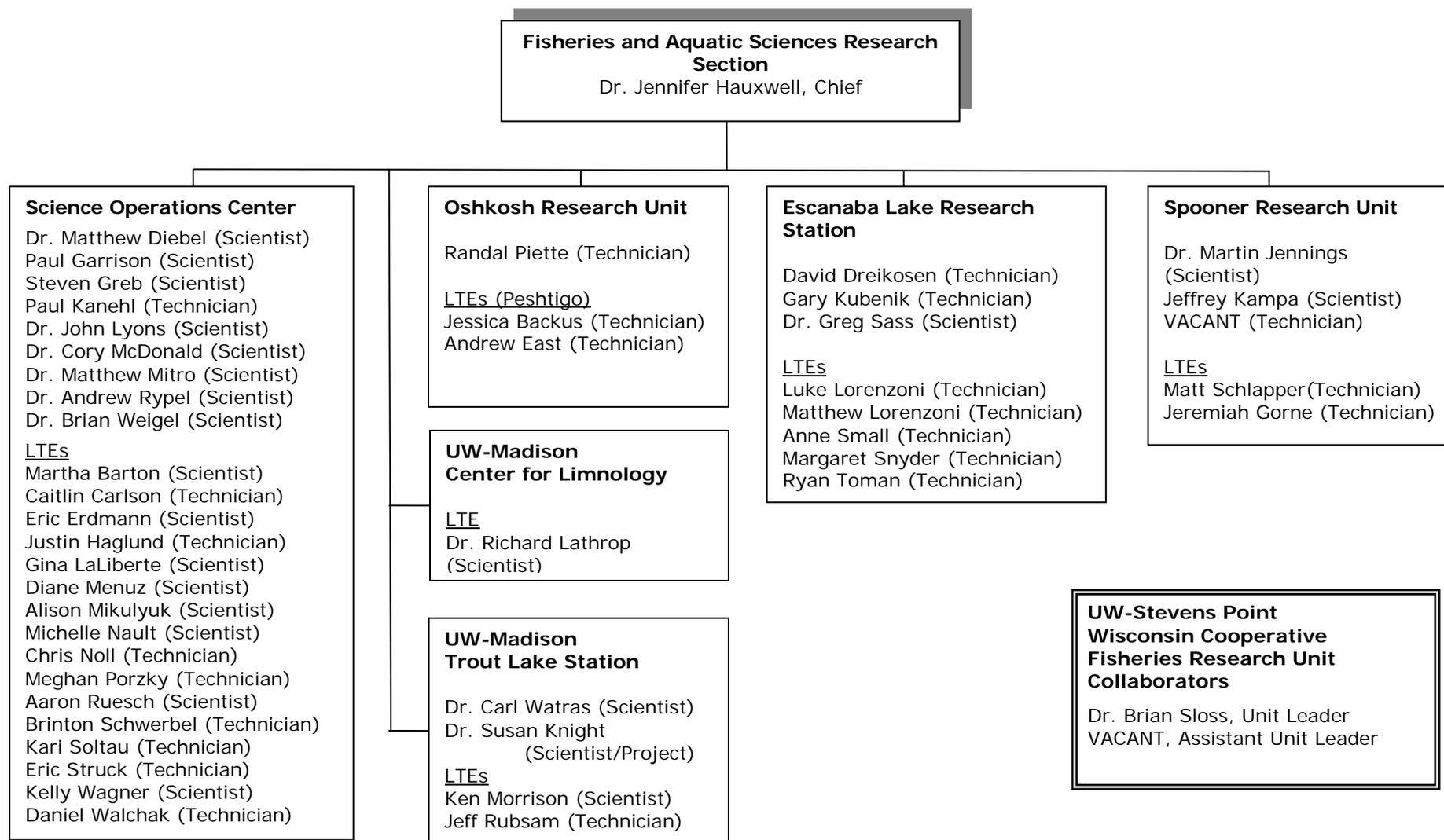


Section Organizational Chart

The following organizational chart identifies the Fisheries and Aquatic Sciences Research Section staff members located at six locations (July 2012): Science Operations Center (Madison), UW-Madison Center for Limnology campus and Trout Lake Station, Escanaba Lake Research Station (Northern Highland Fisheries Research Area Boulder Junction), Oshkosh research unit, and Spooner research unit. In addition, we work closely with collaborators at the Wisconsin Cooperative Fisheries Research Unit (UW-Stevens Point), which represents a formal partnership between WDNR, UW-Stevens Point, and the U.S. Geological Survey.



Fisheries and Aquatic Sciences Research Program

The Fisheries and Aquatic Sciences Research program provides technical expertise to advise science-based management of the state's aquatic resources. The section is staffed by professional scientists and research technicians possessing diverse individual expertise in fisheries, aquatic ecology, limnology, and quantitative ecology. The primary purpose of the section is to conduct, sponsor, and coordinate original research within areas of fisheries and aquatic ecology that support the program missions of the bureaus of Fisheries Management and Water Quality Management, as well as other department programs including the bureaus of Water Quality, Endangered Resources, Air Management, the Division of Forestry, and the Office of Great Lakes. In addition, staff routinely engage in technical consultation and policy development, serve on various DNR teams, and generally serve as "experts" within their disciplines. Science professionals within this program actively engage in technology transfer activities through the publication and presentation of research results ranging in format from peer-reviewed scholarly journal articles to informal talks. In addition, research staff members serve as leaders in identifying emerging issues and information gaps for aquatic resource protection and management. While agency scientists focus their efforts on applied and basic questions in Wisconsin, the management implications associated with their results inform national and even international audiences. In this document, we describe our scientific contributions via technical consultation and provide a summary of current research projects, recent publications and presentations, and biographies of our scientists and technicians. **This report covers activities from July 1, 2010 – May 2012.**

Fisheries and Aquatic Sciences Research Mission

- *To conduct, sponsor, and coordinate priority research in support of the agency's natural resource management programs to protect and enhance the aquatic resources of Wisconsin;*
- *To provide a balance of research ranging from the landscape-scale for ecosystem management to the species scale, including socially and economically important species as well as species that are rare, threatened, or endangered;*
- *To provide technical expertise to meet Department needs for science-based decision making;*
- *To transfer scientific findings to DNR and partners;*
- *To define and address emerging information needs.*

The economics of good science... take fishing, for example...

Wisconsin waters are home to 165 fish species. Wisconsin annually sells about 1.4 million fishing licenses to adult anglers, who spend about 20.8 million days fishing in the state annually. Nearly 41 percent of Wisconsin residents 16 and over participate in fishing, generating a \$2.75 billion economic impact. More than 30,000 Wisconsin jobs are supported by fishing, and fishing related activities and sales generate \$200 million in state tax revenues for local and state government (<1% is returned to DNR for traditional fisheries management). We help ensure angler's dollars are wisely spent. We do this by setting research agendas, and then conducting, sponsoring, and coordinating applied research within areas of fisheries and aquatic ecology that help the aquatic resource programs adaptively manage Wisconsin waters.

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Science Consultation Services

In addition to the project-based research identified in the next section, individual staff members in the Fisheries and Aquatic Sciences Research Section routinely provide consultation services to our natural resource management programs. These services support programmatic functions ranging from routine management decisions on a particular waterbody to setting statewide policy on a particular issue. This section highlights team participation, technical consultations, and policy development efforts by the section during the past biennium. Services provided are listed generally and by individual staff. This is only a partial listing of the types of services section staff members have contributed, but provides an overview of the wide range of technical consultations routinely provided, but difficult to quantify.

Overview

Aquatic Sciences management technical and policy consultation

Description: Section scientists serve as technical experts on a variety of water resources management issues and needs. They provide input, consultation, and support to DNR's lakes, streams, rivers, and monitoring programs through participation on Bureau of Water Quality Management statewide teams (Lakes, Streams, and Rivers Technical Teams, Water Division Monitoring Team, Water Quality Bureau Policy Management Teams, Wisconsin Lakes Partnership, cross-divisional Invasive Species Team), routine consultation regarding water resources management, and statewide policy development on issues related to aquatic invasive species, water quality/runoff and non-point related issues, and aquatic resource monitoring. They also provide scientific leadership on Great Lakes issues, working collaboratively with staff from the Office of Great Lakes.

Lead scientists: Matthew Diebel, Paul Garrison, Steve Greb, Jennifer Hauxwell, John Lyons, and Brian Weigel.

Collaborators: Water Division, Office of Great Lakes, U.S. Environmental Protection Agency, U.S. Geological Survey, Midwest state agencies, University of Wisconsin-Madison, University of Wisconsin-Stevens Point, University of Wisconsin-Milwaukee WATER Institute, and other universities.

Customer programs: Water Division, Office of Great Lakes, Forestry Division, Bureau of Endangered Resources, Land Division (NR 40 rule development), and Bureau of Air Management.

Fisheries management and technical policy consultation

Description: Serve as technical experts on a variety of Fisheries Management issues and needs. Provide input, consultation, and support to DNR Fisheries Management program through participation on FM statewide teams (species teams, monitoring teams, training team, FM Board, etc.), routine consultation regarding regulations, stocking, or habitat management actions, and as instructors for the FM new employee orientation training.

Lead scientists: Matt Diebel, Jennifer Hauxwell, Martin Jennings, Jeff Kampa, John Lyons, Steve Newman (retired), Matthew Mitro, Greg Sass, and Brian Weigel.

Technicians: Dave Dreikosen, Gene Hatzenbeler, Paul Kanehl, Gary Kubenik, and Randy Piette

Collaborators: Water Division, U.S. Fish and Wildlife Service (SFR), University of Wisconsin-Stevens Point Fisheries Cooperative Research Unit, Midwest state agencies, and other universities.

Customer programs: Water Division, Office of Great Lakes, Forestry Division, and Land Division (ER).

Individual Contributions

Martha Barton

- Analyzes aquatic macrophyte distributions in order to improve management of aquatic invasive macrophytes throughout WI
 - Creates lake reports to distribute to aquatic plant management coordinators, lake associations, or outside researchers upon request
 - Collaborates on original management research projects related to invasive species ecology and their management (US Army Corps of Engineers)
 - Represents the Department and presents scientific findings at scientific and academic conferences
 - Co-leads semi-annual training workshops on aquatic macrophyte data collection, data analysis and identification
-

Matthew Diebel

- Conducting water quality data analysis to support development of water quality criteria for streams and lakes for the Wisconsin Consolidated Assessment and Listing Methodology
 - Serves as technical advisor on Water Quality Bureau TMDL Modeling Team
 - Responds to frequent stakeholder inquiries about the Rock River TMDL
 - Serves on Water Quality Bureau's nitrogen criteria development team
 - Serves on the Stream Monitoring Technical Team
 - Serves as Department representative on Great Lakes-Upper Midwest Landscape Conservation Cooperative Aquatic Connectivity Initiative.
 - Serves as DNR liaison with UW Center for Limnology, Michigan State University on project for development of regional nutrient response models for lakes
 - Contributes to planning and analysis for Wisconsin Buffer Initiative pilot project in Pleasant Valley watershed
 - Peer reviews for scientific journals (~6/year)
 - Serves on Water Quality and Water Quality bureau interview panels
-

Paul Garrison

- Works with lake associations to develop management plans
-

- Works with lake associations and DNR lake managers to set water quality goals
 - Works with Water Quality Bureau to develop phosphorus standards
 - Works with Water Quality Bureau for Classification, Monitoring, & Assessment of Wisconsin's Lakes
 - Coordinated section grant with U.S. EPA for conducting and interpreting data from National Lake Assessment
 - Works with Tribes to understand limnological history of their lakes and the causes of any degradation
 - Works with DNR lake managers to understand zooplankton community for biomanipulation projects
 - Routinely serves as speaker for Wisconsin Lakes Partnership at the annual Wisconsin Lakes Convention
 - Served as a science lead for Water Quality Bureau's Assessment Methodology Team
 - Served on Steering Committee for U.S. EPA National Lake Assessment 2012
 - Served as national trainer for U.S. EPA National Lake Assessment 2012
 - Routinely serves as speaker for Wisconsin Lakes Partnership Lake Leaders course
-

Steve Greb

- Serves on DNR Climate Change Science Team, and WICCI's Water Resources, Hydrology, Central Sands, and Coldwater Fisheries working groups.
- Annually updates Citizen's Advisory Committee on Forestry BMPs; Forest buffer project; Field trip/presentation
- Serves on Turf Nutrient Standards Committee
- Serves on Water Quality Monitoring Team
- Serves on Great Lakes Monitoring Team
- Participates in peer review 4-6 scientific journal articles/year
- Serves as NASA colleague reviewer for current and future water quality related projects
- Chair- Water Quality Working Group for Group on Earth Observation
- Steering Committee Chair for NASA/NOAA Algorithm working group
- Consulted on Petenwell-Castle Rock nutrient management issue and provided satellite data to evaluate water clarity variations across lake basins



Steve Greb presenting stream gauge data as it relates to climate over the past 50 years to the Wisconsin Initiative on Climate Change Impacts (WICCI) Water Resources Working Group.

Gene Hatzenbeler

- Served on Fisheries Management Panfish team
-

- Provided field assistance to Treaty Assessment Unit
 - Provided field assistance to local fish managers and technicians
 - Provided technical support to fish hatchery staff on OTC marking and mark efficacy
 - Provided training and reading of OTC marked otoliths for Bureau of Fisheries Management and U.S. Fish and Wildlife Service staff
 - Provided technical support and chemical testing for egg disinfection for hatchery system
 - Provided field assistance to fish hatchery staff on egg collection of walleye, musky, and lake sturgeon
 - Provided equipment disinfection training to Bureau of Water Quality staff for exotic species
 - Provided peer-review for professional journals
 - Provided technical review of internal reports
-

Jennifer Hauxwell

- Serves on Fisheries Management Board
 - Serves on Water Quality Bureau's Water Resources Policy Management Team
 - Serves on Endangered Resources Bureau's Policy Team
 - Serves on Water Division Monitoring Team
 - Serves on Lakes Technical Team
 - Serves on Water Quality Bureau's Monitoring Work Group on ad hoc basis
 - Serves on Wisconsin Initiative on Climate Change Water Resources Working Group; served as reviewer for first report on adaptive assessment
 - Served on Fisheries Management interview panels
 - Co-chair, Program Committee, North American Lake Management Society 2012 Meeting
 - Member, Host Committee, North American Lake Management Society 2012 Meeting
 - Member of the planning committee and session moderator for 2nd Science in the Northwoods Conference, Boulder Junction, WI; September 29-October 1, 2010. Sponsors included UW Center for Limnology, US Forest Service, USGS, UW-Extension, and WDNR.
 - Represented the WDNR on the research subcommittee of the Governors Council on Invasive Species
 - Co-leader of the Aquatic Plants and Algae Species Assessment Group for the Governor's Council on Invasive Species, charged with reviewing potential species invasivity for WI and facilitating regulatory designations from a group of technical experts and stakeholders
 - Served as technical and policy advisor for invasive species rule development, conducting public hearings statewide and responding to stakeholder comments related to aquatic systems
 - Represented the WDNR research program at Lakes Partnerships meetings, university collaborators, internal program meetings, and other stakeholders
 - Coordinates the presentation of original research to the members of the Lakes Partnership, and works together to set future research priorities;
 - Serves as speaker for Wisconsin Lakes Partnership at the annual Wisconsin Lakes Convention, presents seminars for Lake Leaders Institute
 - Works with collaborators on original management research projects related to invasive species ecology and management and the effects of land use on aquatic communities (University of Wisconsin, US Army Corps of Engineers)
 - Presented annual training modules for Fish Management new employee orientation
-

Martin Jennings

- Serves on Fisheries Management Musky team
 - Serves on Fisheries Management Tournament Fishing team
 - Provides technical support to WDNR-funded projects under contract to UW-SP Cooperative Fisheries Research Unit and serves on graduate student committees, ensuring projects will address WDNR needs
 - Provides reports to lake/angler groups including spring muskie netting on individual lakes
 - Provides technical review of internal proposals and reports
 - Provides peer review for scientific journals and funding agencies
 - Contributes to outreach efforts such as Annual Fishing Report
 - Led development of state comment on ESA listing petition for coaster brook trout
 - Coordinated review process for international brook trout symposium published in 2008; this information critical to regional management issues in Lake Superior
 - Presents training modules for Fish Management new employee orientation
 - Assists with Endangered Resources fish species status assessments
 - Provides fish and aquatic organism identification for customers at Spooner Service Center
 - Participates in outreach for National Park Service
 - Serves on graduate committees on water resources research at U. Minnesota-Twin Cities
-

Jeff Kampa

- Serves on Fisheries Management Fish Propagation team
 - Serves on Fisheries Management Walleye team
 - Serves on Fisheries Management Training team
 - Served on Lake Sturgeon team
 - Presents annual training modules for Fish Management new employee orientation
 - Provides technical support to WDNR-funded projects under contract to UW-SP Cooperative Fisheries Research Unit
 - Serves on the Hatchery Facility Study Advisory Task Group
 - Provided technical review of consultants Comprehensive Study of Wisconsin's Fish Propagation System
 - Provides technical review of internal study proposals and reports
 - Provides peer review for professional journals
 - Provides technical review on projects for other agencies
-

Susan Knight

- Conducted plant identification workshops at the 2008-2012 Wisconsin Lake Conventions
- Conducted plant identification workshops at Kemp Biological Station in 2008-2012
- Conducts various plant identification and plant ecology workshops for citizens
- Conducts aquatic plant surveys
- Coordinated the hiring of AIS Scientist to the UW Center for Limnology and WDNR. Conducting research on air tolerance of aquatic invasive species
- Reviews articles and books for publication
- Conducting research on effectiveness of milfoil weevil to control Eurasian water-milfoil. Gave presentations throughout state on habitat changes due to declining water levels
- Served as Interim Director at UW-Madison Center for Limnology Trout Lake Station 2010-2012



Susan Knight teaching aquatic plant identification to a diverse audience including university students, state employees, private contractors and citizen lake groups.

Gina LaLiberte

- Provides data to Science Services staff for developing lake management plans with lake associations
- Provides data to Science Services staff for setting water quality goals with lake associations and DNR lake managers
- Provides data to Science Services staff for Classification, Monitoring, & Assessment of Wisconsin's Lakes with Water Quality
- Provide data to U.S. EPA for National Lake Assessment, National Stream and River Assessment, and National Wetland Condition Assessment
- Provided guidance to U.S. EPA in developing field and laboratory protocols for National Wetland Condition Assessment
- Educates citizens in understanding limnological history of their lakes and the causes of any degradation
- Identifies soft-bodied algae and aquatic invertebrates for citizens and various governmental entities in WI including DNR lake managers, municipal managers, tribal lake water managers, and lake educators, and provided information about ecology and management strategies
- Statewide Blue-Green Algae Coordinator: for CDC-funded Department of Health Services program to track human and animal illnesses. Coordinate sampling, distribute and interpret results for local health officials, provide ecological and public health information about blue-green algae to citizens, DNR staff, public health officials, media, and Natural Resources Board
- Science Operations Center chemical hygiene officer: revised safety plans for SOC programs, developed training programs and materials, coordinated building-wide laboratory chemical cleanup, brought programs into compliance with OSHA and EPA regulations

John Lyons

- Responds to multiple daily requests from WDNR managers, biologists and administrators; other governmental agencies, universities, environmental consultants, and non-profit organizations inside and outside the U.S.; and the general public for identification of unknown fish specimens, use of photos of specific fish species, and provision of diverse information on aquatic ecology and fish biology. Provides training, makes presentations and gives interviews, and writes popular and technical articles.
- Collects data and track the status of all rare fishes in the state, and provides information and guidance to appropriate WDNR programs as to how these species might be conserved.
- Collects data and tracks the status of all known and potential exotic fishes in the state and provides information and guidance to appropriate WDNR programs as to the threat these species may pose and how they might be controlled.
- Participates on WDNR technical teams and committees designated to develop and implement the state's Wildlife Action Plan, specifically to benefit fish Species of Greatest Conservation Need, for Endangered Resources, to provide guidance on designing and modifying road crossings to improve passage of fish and other aquatic organisms for Environmental Assessment and Fisheries Management; to help determine water levels that are sufficiently protective of fishes on the Rest Lake Chain and Manitowish River in Vilas County for Environmental Assessment, Water Quality, and Fisheries Management; to advise on the status and potential threat of invasive non-native fishes for Fisheries Management; to ensure that PCB remediation activities in the Pine Creek system in Calumet County do not harm fish populations for Endangered Resources and Water Quality; to help conserve the highly diverse fish fauna of the Mukwonago River in Waukesha County for Endangered Resources and Fisheries Management; to improve management of smallmouth bass and largemouth bass statewide for Fisheries Management; to design and implement a monitoring and assessment protocol for warm water streams and rivers for Fisheries Management; to develop a biological assessment strategy for streams and lakes for Water Quality; to establish a stream monitoring and assessment system for Water Quality; to implement an improved stream classification system for use by Fisheries Management and Water Quality; to design, implement, and evaluate fish passage facilities at the Prairie du Sac Dam on the Wisconsin River, an unprecedented undertaking in fish passage technology for the Midwestern United States, for Environmental Assessment, Endangered Resources, and Fisheries Management
- Provides annual information to Fisheries Management and Water Quality on the status and trends of fisheries and fish communities in 13 different streams, rivers and lakes throughout the state.
- Developed and helped implement new and powerful tools for monitoring and assessing stream and river ecosystems, including habitat assessment, fish surveys, and bioindicators such as the Index of Biotic Integrity
- Serves as the Wisconsin representative on the American Fisheries Society's endangered fishes committee, which documents and publicizes the status of all rare fishes in North America
- Serves on Fisheries Management Bass team
- Serves on Fisheries Management Baseline Monitoring Streams team
- Presents annual training modules for Fish Management new employee orientation
- Serves on Water Quality Streams Team
- Serves on WICCI Coldwater Fisheries Team

- Provides peer review on an average of 10 internal and 10 external journal articles, technical publications, and project proposals per year
 - Serves as adjunct curator of fishes at the University of Wisconsin Zoological Museum, Madison
-

Alison Mikulyuk

- Works with Wisconsin Lakes Partnership to increase communication, collaboration and education about Wisconsin lakes and aquatic macrophytes
 - Represents the Department and present scientific findings at public meetings and comment sessions
 - Represents the Department and presents findings at scientific and academic conferences
 - Presents research and provides guidance to county AIS coordinators
 - Co-leads semi-annual training workshops on aquatic macrophyte data collection and identification
 - Establishes collaborative research relationships between WDNR and UW-Madison and between WDNR and UW-Stevens Point
 - Provides field assistance to DNR regional managers, citizens, and consultants
 - Provides aquatic plant taxonomic assistance to a variety of stakeholders
 - Serves on Wisconsin Lakes Technical Team
 - Serves on Wisconsin Lakes Monitoring Team
 - Develops technical documents and sampling schemes as requested by public and private audiences
 - Coordinates field data collection, sets research priorities and design ecological field studies
 - Conducts data analysis and provide technical assistance to lake managers and consultants in assessing aquatic plant distribution and abundance and response to management
-

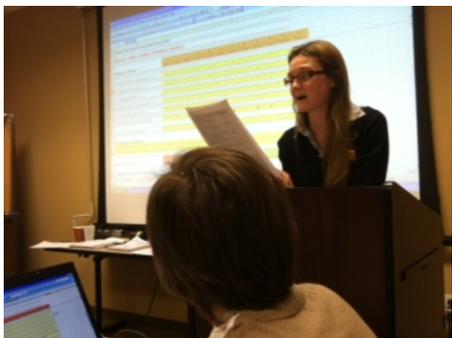
Matthew Mitro

- Chair of the Coldwater Fish and Fisheries Working Group for the Wisconsin Initiative on Climate Change Impacts, including collaboration on producing Wisconsin's first adaptive assessment to identify adaptation strategies to counter climate impacts on coldwater resources
 - Serves as fisheries/climate expert for DNR Adaptation Workshops for regional supervisors
 - Steering Committee and Science and Assessment Team member representing WDNR on the Fishers & Farmers Partnership for the Upper Mississippi River Basin, to foster collaboration between WDNR and the agricultural community on locally-directed projects that support both healthy farm land and healthy streams and fish populations
 - Works with Trout Unlimited Driftless Area Restoration Effort, including assistance to citizen monitoring of stream temperatures to evaluate how stream restoration projects can help lessen the impacts of a warming climate on stream temperatures
 - Provides technical support on viral hemorrhagic septicemia to VHS Response Team and conducted a comprehensive review of the State of the Science on VHS upon detection in WI
 - Provides educational outreach on fisheries issues to Wisconsin public schools
-

- Provides outreach to angler constituent groups such as Trout Unlimited by sharing research and management findings and collaborating on stream restoration projects
 - Serves on and provides technical and scientific support to the Fisheries Management Trout Team
 - Provides technical and scientific support to the Beaver Management Team on trout fisheries issues, including contributions on beaver/trout research and climate change issues to the new beaver management plan
 - Provides technical and scientific support to the Streams Baseline Monitoring Program
 - Serves on Fisheries Management Urban Fishing Team
 - Provides technical support to WDNR-funded projects under contract to UW-SP and the Fisheries Cooperative Research Unit and serves on graduate student committees, ensuring projects address WDNR needs
 - Provides field assistance in collecting trout for the WDNR wild trout stocking program
 - Provides technical assistance in developing trout angler surveys on fishing regulations, creel data, and DNR programs supporting trout fisheries
 - Provides technical reviews of Fisheries Management reports
 - Provides assistance in fish taxonomic identification to WDNR wardens
 - Presents research findings in WDNR seminar series to staff and public
 - Provides peer review for professional journals, including service as an associate editor for the North American Journal of Fisheries Management
-

Michelle Nault

- Provides leadership and training for implementing statewide standardized baseline monitoring of aquatic plant communities for grant-funded projects (provides standardized GIS-based lake sampling maps; conducts annual training for water resources staff, volunteers, and private consultants statewide to implement standardized protocol, specimen identification, sampling techniques, and data analysis procedures; assists with annual aquatic plant identification workshops)
 - Plans and coordinates aquatic plant sampling for Water Quality Bureau's Baseline Monitoring program on approximately 50-100 lakes distributed throughout the state of Wisconsin during each field season
 - Routinely provides lake reports to private individuals, lake associations, or outside researchers upon request
 - Works with collaborators on original management research projects related to invasive species ecology and management and the effects of land use on aquatic communities (University of Wisconsin, US Army Corps of Engineers)
 - Coordinates Eurasian watermilfoil research statewide and for case studies in various regions including Dane, Bayfield, Menominee, and Vilas Counties
 - Represents the Department and presents scientific findings at both public meetings and scientific and academic conferences
 - Co-leads the Aquatic Plant Species Assessment Group, part of the Wisconsin Governor's Council on Invasive Species
 - Co-leads semi-annual training workshops on aquatic macrophyte data collection and identification
 - Provides technical and taxonomic expertise to a variety of stakeholders on aquatic plant management and ecology
 - Serves on Wisconsin Lakes Technical Team
 - Serves on Wisconsin Lakes Monitoring Team
-



Michelle Nault leading the Aquatic Plant Assessment Group in order to determine which aquatic invasive plant species pose the greatest threats to Wisconsin's lakes and wetlands.

Steve Newman (Retired)

- Participated in reviewing /updating walleye management plan
- Advised UW grad students about fisheries projects
- Co-authored exploitation and population dynamics chapters in AFS "Biology, Management, and Culture of Walleye and Sauger"
- Served on graduate committees (UWGB and UWSP)
- Routinely reviewed Fisheries Management walleye regulation proposals
- Consulted Fisheries Management about inland lake trout management plan and provides information as needed for decision making
- Routinely worked/consulted with University staff and key cooperators (UWSP; UW; Bowling Green-OH; UWGB; U of Notre Dame; Dairymen's, Inc; GLIFWC; Max McGraw Wildlife Foundation)
- Routinely gave presentations/tours to private groups (Boy Scouts, etc) and schools
- Consulted with TWG and Tribal members as related to walleye harvest, exploitation, and coop projects
- Presented annual training modules for Fish Management new employee orientation
- Served on Fisheries Management Walleye team

Randy Piette

- Serves on Fisheries Management Catfish team
- Serves as agency freshwater mussel expert, assisting with dozens Water Regulation and Zoning, and DOT permit reviews for rip-rap, stream crossings, etc, impact to mussel habitat, as well as consultation and support to Endangered Resources for state and federally listed species
- Assists Water Management staff with electrofishing and support to Fisheries Management staff as requested

Greg Sass

- Participated in reviewing /updating walleye management plan
- Advised UW grad students about fisheries projects
- Adjunct professor at UWSP, University of Illinois, Western Illinois University, and Eastern Illinois University (advises five current graduate students and serves on 6 graduate committees)
- Honorary Fellow of UW-Madison Center for Limnology

- Routinely peer reviews fisheries and aquatic ecology manuscripts for various journals
 - Routinely gave presentations/tours to private groups (Boy Scouts, etc) and schools
 - Consulted with TWG and Tribal members as related to walleye harvest, exploitation, and coop projects
 - Presented annual training modules for Fish Management new employee orientation
 - Served on Fisheries Management Walleye team
 - Participant in the Wisconsin Fish Age Task Group
 - Serves as an advisor on invasive Asian carp management in Wisconsin
 - Presenter at Wisconsin Lakes Partnership annual Lakes Convention
-

Kelly Wagner

- Acted as liaison between Water Quality Bureau Lakes Team and Science Services aquatic plant research team
 - Co-leads semi-annual training workshops on aquatic macrophyte data collection and identification
 - Designs and coordinates macrophyte field data collection and ecological studies
 - Provides aquatic plant taxonomic assistance to a variety of stakeholders
 - Provides rare plant data and maps to Bureau of Endangered Resources for aquatic plant records encountered in Science Services work
 - Provides technical expertise of aquatic plant sampling methods as requested to US EPA and other state resource agencies
 - Represents the Department and presents findings at scientific and academic conferences
 - Works with GIS team and Lakes team staff to collaborate on efforts to digitize and identify small waterbodies in Wisconsin
 - Works with Wisconsin Lakes Partnership to communicate research findings and collaborate on work relevant to WI lakes and aquatic macrophytes
-

Carl Watras

- Consults with Air Management staff on issues related to mercury pollution and acid rain in Wisconsin
 - Contributes "Research Summary" annually for the NHAL Forestry Newsletter
 - Consults with Lac Du Flambeau band of the Lake Superior Chippewa via Brian Hoover (LDF Air Quality Program) and Gretchen Watkins (LDF Water Resources Program) on matters related to acid rain, mercury pollution and climate change.
 - Consults with Forest County Potawatomi Natural Resources Department on matters related to atmospheric contaminants
 - Consults with Bad River band of Lake Superior Chippewa on watershed/airshed issues
 - Provides guidance and support to the North Lakeland Discovery Center and to the Last Wilderness Conservation Association in Vilas County
 - Provides advice and guidance to local lake associations and the Town of Presque Isle, serving as chairman of the PI Board of Adjustment and the PI Municipal Ordinance Committee
 - Consults with Water Quality modelers and NOR managers on the St Louis estuary TMDL
 - Cooperates with NOR managers on the Tyler Forks project
 - Serves on the Center for Limnology outreach team
-

- Provides peer-review for several professional journals, including Limnology and Oceanography, Canadian Journal of Fisheries and aquatic Sciences, Environmental Science and Technology, Atmospheric Environment, Science of the Total Environment
 - Provides peer review for the National Science Foundation and the Environmental Protection Agency
 - Served as contributing editor for the journal Aquatic Ecology and the journal Science of the Total Environment
-

Brian Weigel

- Consults as a technical lead on various WDNR Water Division objectives including:
1) Deriving the optimal stream and river monitoring strategy and protocol (fish, macroinvertebrates, habitat, and water chemistry) for Water Quality Bureau Comprehensive Monitoring Strategy and Wisconsin Consolidated Assessment and Listing Methodology (WisCALM). Selected and identified stream and river monitoring sites for Regional WQ Biologists statewide. Analyzed, interpreted, and reported statewide assessment data. Used the information in an adaptive management context to evolve future monitoring and assessment. 2) Developing phosphorus and nitrogen standards for streams and rivers, and then determine monitoring and assessment guidance (WisCALM). Assist Upper Mississippi River Conservation Committee incorporate macroinvertebrate monitoring and assessment methods for biocriteria on the Upper Mississippi River. 3) Creates innovative monitoring tools, for example, macroinvertebrate-based indexes of biotic integrity (IBIs) for streams and rivers. Folds the tools into the monitoring programs. Provides guidance for Regional staff on IBI data acquisition and interpretation. Helps develop and test automated calculators in Program databases. 4) Ultimately, work as a technical consultant leads to fielding daily phone calls or e-mails from Central Office and Regional staff, regularly developing and presenting technical materials during team meetings, routinely authoring issue briefs to team co-members and WDNR Policy Management Teams, drafting large sections of the Water Quality Bureau Comprehensive Monitoring Strategy and WisCALM documents, reviewing other issue briefs or sections of monitoring programs, and meeting with US EPA staff and their consultants
- Served on rating panels for new hires (Fisheries Management and Water Quality Bureau)
- Serves on Fisheries Management work planning review teams
- Serves on Fisheries Management Sturgeon team in developing the comprehensive statewide sturgeon management plan, and defining research opportunities
- Contributes to Fisheries Management smallmouth bass management team by helping to derive standardized stream and river assessment protocol and interpretation guidance
- Served as a science lead for Water Quality Bureau's Assessment Methodology Team
- External review of >4 journal articles/year; review peers' work prior to submission ~4/yr
- Science lead for Water Quality Bureau's nutrient criteria working group
- Present training modules (~2/yr): Water Quality Bureau's Rivers and Streams groups, Water Quality Bureau's Phosphorus Criteria working group, Fish Management Bureau Statewide, Fish Management Bureau new employee orientation training

- Annually update Citizen's Advisory Committee on Forestry BMPs for the protection of water quality. Evaluate upland and instream forestry BMPs
- Continue to update Fisheries Management with survey statistics for Fishing Reports and press releases

Current Research Projects

This section of our report highlights current research efforts by staff members working in the Fisheries and Aquatic Sciences Research Section. Brief project summaries describe each project and identify the lead scientist(s), collaborating scientists and agencies, and Wisconsin DNR and external customer programs. Projects are funded through a variety of sources, including state funds, federal Sportfish Restoration funds (SFR), bureau-to-bureau contracts with partner programs, as well as external grants. Projects are listed in two categories: "Aquatic Sciences Research" and "Fisheries Research." Subheadings under Aquatic Sciences include Great Lakes, Aquatic Invasive Species, Nonpoint Source Pollutants, Monitoring, and Climate Change Research. Subheadings under Fisheries include Landscape/Land-use Investigations, Fish Passage Evaluations, Species Ecology/Population Dynamics, and Genetics. Many projects overlap, so each subsection does not necessarily reflect all pertinent research within that subdiscipline.

Aquatic Sciences Research

Great Lakes

***Cladophora* and water quality of Lake Michigan: a systematic survey of Wisconsin nearshore areas**

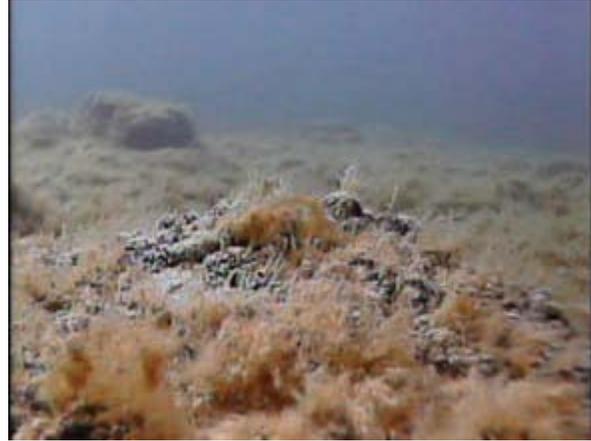
Project description: In recent years *Cladophora*, a filamentous macroalga, has increased along the Lake Michigan coast and has been deposited in large quantities on Lake Michigan beaches. In spring 2004, the Wisconsin DNR initiated a working group to develop a monitoring program to observe the density, distribution, and associated water quality of *Cladophora* along Wisconsin's Lake Michigan shoreline. This continuing investigation is intended to test sampling techniques and inform long-term monitoring plans and research needs, assist with developing long-term management plans, identify short-term beach clean-up and odor mitigation options, and address public information needs.

Lead Science Services scientists: Steven Greb, Paul Garrison, and Gina LaLiberte

Collaborators: Office of the Great Lakes; Harvey Bootsma, University of Wisconsin-Milwaukee WATER Institute; Northeast Region; Southeast Region; Bureau of Fisheries Management; University of Wisconsin-Extension; University of Wisconsin Sea Grant; county health departments

Customer programs: Office of Great Lakes, with applications to Bureau of Water Quality and Bureau of Fisheries Management

Project timeline: 2004 through present and continuing



Cladophora accumulation on a rocky substrate.

Cladophora washing up on a beach.

Evaluation in Wisconsin's Lake Michigan Areas of Concern

Project description: Benthos (benthic invertebrate) and plankton (phytoplankton/zooplankton) communities in Wisconsin's four Lake Michigan Areas of Concern (AOCs; Menominee River, Lower Green Bay and Fox River, Sheboygan River, and Milwaukee Estuary) and six non-AOCs will be quantified. The inclusion of non-AOC sites will allow comparison of AOC sites to relatively-unimpacted or less-impacted control sites with natural physical and chemical characteristics that are as close as possible to that of the AOCs.

Lead Science Services scientist: Paul Garrison

Collaborator: Office of Great Lakes, U.S. Geological Survey, U.S. Environmental Protection Agency

Customer programs: Office of Great Lakes

Project timeline: 2012 – 2013



Water quality sampling conducted by Eric Erdmann and Erin Oost.

St. Louis River Area of Concern Monitoring

Project Description

This study will facilitate study of the St. Louis River Area of Concern by collecting and analyzing samples within the AOC as well as sites outside the AOC. The sites outside

the AOC will be used for comparative purposes. Three sites are in the AOC 8 sites are outside the AOC. All of the sites, with the exception of the one near Outer Island, were sampled in 2010 as part of the EPA National Coastal Condition Assessment. The 3 sites in the AOC as well as 5 other sites have previously been sampled by DNR personnel.

Lead Science Services scientist: Paul Garrison

Collaborator: Office of Great Lakes

Customer programs: Office of Great Lakes

Project timeline: 2011

Aquatic Invasive Species

Evaluation of potentially invasive aquatic species, including macrophytes, algae, and cyanobacteria: a literature review for the Governor's Council on Invasive Species

Project description: Extensive literature reviews were conducted and information compiled on Wisconsin-specific threats posed by 36 aquatic invasive species in 2007 (NR 40 initial development and promulgation) and 42 species in 2012 (NR 40 update and revision). Environmental tolerances, reproductive potential, current distributions, and management options were studied. These reviews were used by stakeholder species assessment groups in developing recommendations for additional species to list under NR 40. Internal and external resource managers continue to use this resource as a source of information on aquatic invasive species and management.

Lead Science Services scientists: Michelle Nault, Alison Mikulyuk, Jennifer Hauxwell, Martha Barton, Kelly Wagner, Gina LaLiberte, and Susan Knight

Collaborators: Susan Graham, Laura Herman (University of Wisconsin-Stevens Point Lakes program), Governor's Council on Invasive Species Aquatic Plants and Algae Species Assessment Group, and various stakeholders

Customer programs: Water Division (Bureau of Water Quality, Bureau of Fisheries Management), with applications to Land Division (Bureau of Endangered Resources, Bureau of Wildlife Management), and Forestry Division

Project timeline: To be published in 2012

Managing lakes infested with Eurasian water-milfoil in Wisconsin: understanding the factors driving abundance

Project description: In conducting reconnaissance of 78 EWM-infested lakes in 2004, we became aware of a need for general information on basic EWM ecology. It became apparent that at the statewide level, we lacked even the most basic information (including EWM coverage and species lists of natives) on the state's

approximately 400 EWM-infested lakes. We conducted quantitative baseline surveys on 100 lakes with EWM to evaluate the abundance and distribution of EWM populations as well as link the status of these populations to lake physical factors and past management.

Lead Science Services scientists: Alison Mikulyuk, Jennifer Hauxwell, Susan Knight, and Kelly Wagner

Collaborators: Tim Asplund, Carroll Schaal, and Jeff Bode, Bureau of Water Quality Lakes Program; and regional lakes staff; and Wisconsin Lakes Partnership

Customer programs: Bureau of Water Quality, with applications to Bureau of Fisheries Management

Project timeline: 2005 – 2012



Eurasian watermilfoil in a northern Wisconsin lake. Photo by M. Nault.

Strategic long-term monitoring of lakes infested with Eurasian water-milfoil: effects of region and management

Project description: We are evaluating the long term abundance and distribution of Eurasian water-milfoil in a variety of lakes in Wisconsin. Lakes were selected to represent different ecoregions (north, central, south), Eurasian water-milfoil population levels (established or new), and management scenarios (best strategic management or no management). Results will allow us to understand the efficacy of management and how to best distribute the state's annual \$4 million Aquatic Invasive Species grant funds.

Lead Science Services scientists: Michelle Nault, Alison Mikulyuk, Martha Barton, Jennifer Hauxwell, Susan Knight

Collaborators: Tim Asplund, Carroll Schaal, and Jeff Bode, Bureau of Water Quality Lakes Program; and regional lakes staff; and Wisconsin Lakes Partnership

Customer programs: Bureau of Water Quality, with applications to Bureau of Fisheries Management

Project timeline: 2007 – ongoing



A pile of Eurasian watermilfoil collected after a harvester was operating in the area.

Desiccation resistance of invasive *Myriophyllum spicatum* and *Potamogeton crispus*.

Project description: Recreational boating is a vector for overland transport of aquatic plants due to their vegetative reproductive capabilities, and the tendency of plant fragments to become entangled on boats and trailers. The plants' susceptibility to drying out will diminish the effectiveness of boat transport. In this project, we are testing how long invasive plants Eurasian water-milfoil (*Myriophyllum spicatum*) and Curly-leaf pondweed (*Potamogeton crispus*) can survive out of water under conditions they would experience when entangled on boats and trailers.

Lead Science Services scientist: Susan Knight

Collaborators: John Havel, Missouri State University (co-Principal Investigator); University of Wisconsin-Madison Center for Limnology; Bureau of Water Quality

Customer program: WI Lake Partnership

Project timeline: 2011 – 2012

A field test on the effectiveness of milfoil weevil for controlling Eurasian water-milfoil in northern lakes

Project description: Eurasian water-milfoil (EWM) is a nuisance aquatic plant growing in an increasing number of Wisconsin lakes. While chemicals are often used to treat EWM, some situations preclude herbicide treatments. Prior research has shown that the water-milfoil weevil, *Euhrychiopsis lecontei*, often has a damaging effect on EWM and can significantly reduce densities. While much work has addressed weevil population numbers and habitat requirements, less is known about the effectiveness of weevils on populations of EWM, particularly in comparison to chemical treatments. We hope to determine whether there is reason for the Wisconsin DNR to adopt augmentation with native weevils as an alternative to chemical treatment to suppress EWM. In this study, we propose to introduce weevils into each of 7 lakes, with 1 EWM bed augmented with weevils and 1 bed serving as a control (no added weevils) in each lake. We will assess the biomass of EWM and native plants in the treated and untreated beds both pre-treatment (before augmentation) and post-treatment each year to assess the effectiveness of the weevil at controlling EWM.

Lead Science Services scientist: Susan Knight

Collaborators: John Havel, Missouri State University (co-Principal Investigator); University of Wisconsin-Madison Center for Limnology; Bureau of Water Quality

Customer program: WI Lake Partnership

Project timeline: 2012 – 2015

Efficacy of early spring 2-4-D treatment as a management tool for Eurasian water-milfoil in northern Wisconsin lakes

Project description: Two lakes separated by a sandbar in Bayfield County are used as control (Sandbar Lake) and experimental (Tomahawk Lake) basins to evaluate the effects of early-season 2,4-D treatment on Eurasian water-milfoil (EWM) and native plant populations. Annual point-intercept and biomass collection of aquatic plants will be used to assess early-season 2,4-D treatment as a tool for managing EWM.

Lead Science Services scientists: Michelle Nault, Alison Mikulyuk, Martha Barton, and Jennifer Hauxwell

Collaborators: John Skogerboe, U.S. Army Corps of Engineers; Town of Barnes; and Tim Asplund, Frank Koshere, and Pamela Toshner

Customer programs: Bureau of Water Quality, with applications to Bureau of Fisheries Management

Project timeline: 2006 – ongoing; peer-reviewed manuscript to be submitted fall 2012

Efficacy of early spring harvesting or 2,4-D treatment as a management tool for Eurasian water-milfoil in southern Wisconsin lakes

Project description: A repeated block design was employed in Turville Bay, Lake Monona, Dane County, in order to assess the impact of early season 2,4-D treatment and early season harvesting on the frequency and density of aquatic macrophytes. Each treatment was applied to two 5-acre plots; point-intercept and biomass data was collected bi-annually and compared to reference plots to allow us to assess the use of these approaches in managing Eurasian water-milfoil.

Lead Science Services scientists: Jennifer Hauxwell, Alison Mikulyuk, and Michelle Nault

Collaborators: John Skogerboe, U.S. Army Corps of Engineers; Jim Leverance and Susan Jones, Dane County Lakes and Watershed Commission; Tim Asplund, Kurt Welke, and Susan Graham

Customer programs: Bureau of Water Quality, with applications to Bureau of Fisheries Management

Project timeline: 2007 – 2013

Statewide evaluation of early season whole lake and spot 2,4-D herbicide concentrations to determine effective management protocols for Eurasian watermilfoil in lakes.

Project description: In 2009 the U.S. Army Corps of Engineers Engineer Research and Development Center (ERDC) and the Wisconsin Department of Natural Resources (WDNR) formed a Cooperative Research and Development Agreement (CRADA) to conduct herbicide concentration monitoring on herbicide applications in Wisconsin lakes and flowages. The objective was to provide information regarding actual herbicide concentration and exposure time data for herbicide applications under a variety of operational conditions and develop recommendations for improved control of invasive exotic aquatic plant species and reduced damage to native plant populations.

Lead Science Services scientists: Michelle Nault, Martha Barton, Jennifer Hauxwell

Collaborators: Tim Asplund and several staff, Water Quality Bureau; John Skogerboe and Michael Netherland, U.S. Army Corps of Engineers; Eddie Heath and Tim Hoyman, Onterra, LLC.

Customer programs: Bureau of Water Quality, with applications to Bureau of Fisheries Management

Project timeline: 2009 - 2012

Technical assistance provided to assess the status of recently-discovered Eurasian water-milfoil populations in Wisconsin lakes

Project description: Surveys are conducted to evaluate the density and distribution of newly-discovered Eurasian water-milfoil populations. Point-intercept data are collected lakewide, and then used to inform the development of an appropriate rapid response aquatic plant management plan and grant administration.

Lead Science Services scientists: Michelle Nault, Martha Barton, Alison Mikulyuk, and Jennifer Hauxwell

Collaborators: Tim Asplund, Carroll Schaal, and Jeff Bode, Bureau of Water Quality; regional DNR aquatic plant managers; lake associations, counties, tribes, towns, and lake consultants

Customer programs: Bureau of Water Quality, with applications to Bureau of Fisheries Management

Project timeline: 2005 – ongoing

Reducing carp densities for increasing water clarity and native aquatic plants in a shallow turbid lake: the Lake Wingra restoration project

Project description: This project began as an outgrowth of the carp exclosure demonstration study (2005-2008) that garnered local support to remove carp from Lake Wingra in March 2008. Since the carp removal, water clarity has increased dramatically due to a significant decline in blue-green algae in the lake (see photos). As a result, submersed aquatic macrophyte growth has increased substantially. While Eurasian water milfoil responded rapidly to the greater clarity, both in the exclosure experiment and the lake since the carp removal, native plants are slowly extending their area of coverage and depth range throughout the lake. The decrease in blue-green algae has also improved swimming conditions at Vilas Beach where beach closures due to algae are no longer a problem. The lake continues to be studied to determine the long-term response to the carp removal including an evaluation of water clarity and aquatic macrophyte growth.

Lead Science Services scientists: Dick Lathrop and Jen Hauxwell



Left: Lake Wingra in September 2007 with the 1-ha rectangular carp exclosure(photo: E. Sievers).

Right: Lake Wingra's Vilas Beach in July 2011 after the March 2008 carp removal (photo: R. Lathrop).

Collaborators: Kurt Welke, Bureau of Fish Management; Dave Liebl, UW-Madison; Dane County; Friends of Lake Wingra, UW Center for Limnology

Customer programs: Bureau of Water Quality, South Central Region, and Bureau of Fisheries Management

Project timeline: 2005 – 2015

Regulated aquatic plants in trade: assessing prevalence in trade and risk to Wisconsin waterbodies

Project description: The goal of this project is to reduce the availability of invasive aquatic plants via the trade industry by determining where regulated species are sold, educating vendors through outreach, and determining barriers to change through social survey of vendors. Biological surveys of vendor stock before and after education will determine efficacy of education campaign, and surveys of 150 small waterbodies near retail sources will determine risk of species introductions on the landscape.

Lead Science Services scientists: Kelly Wagner, Jennifer Hauxwell, and Alison Mikulyuk

Collaborators: Scott Van Egeren, Bureau of Water Quality; Mindy Wilkinson, Bureau of Science Information Services; Chrystal Schreck, Bureau of Science Information Services; University of Wisconsin Survey Center; WI Department of Agriculture and Consumer Protection; southeast region DNR aquatic plant managers; EPA GLRI funded.

Customer programs: WI DATCP, Bureau of Water Quality, with applications to Bureau of Fisheries Management

Project timeline: 2011 – ongoing

Nonpoint Source Pollutants

Long term trends water quality of Wisconsin rivers

Project description: The objective of this project is to evaluate trends over time in selected water quality parameters at 42 sites on Wisconsin rivers. Results will provide an overall picture of how water quality has changed in Wisconsin rivers over the last 30-50 years. The project report will explore reasons for changes, including agricultural and urban land management practices and wastewater discharges.

Lead Science Services scientist: Matt Diebel

Collaborators: U.S. Geological Survey

Customer programs: Bureau of Water Quality

Project timeline: 2011 – 2012

Evaluation of the effects of nitrogen on stream biological communities

Project description: The objective of this project is to evaluate relationships between nitrogen (N) concentrations in streams and biological community composition, including fish, macroinvertebrates, and diatoms. Sampling of streams with high N:P ratios will augment an existing dataset and allow the effects of N and P on biota to be distinguished from one another and from physical characteristics of streams. Results from this project will provide the scientific basis for determining N criteria for Wisconsin streams.

Lead Science Services scientist: Matt Diebel

Collaborators: Bureau of Water Quality, State Lab of Hygiene

Customer programs: Bureaus of Water Quality and Water Quality

Project timeline: 2011 – 2012

Yahara Lakes Phosphorus and Water Quality Assessment Project

Project description: The “Yahara CLEAN Project” was launched in 2008 as a joint partnership between DNR, Dane County and the City of Madison to improve water quality in the Yahara lakes. One key portion of Yahara CLEAN was a sub-project to analyze long-term P loading and lake response data that would allow specific P loading reduction targets to be recommended that if achieved would produce measureable water quality benefits for the four Yahara lakes. The analyses were completed and a final report written in December 2011. The results and

recommendations of that work have been foundational to new lake clean-up efforts by Yahara CLEAN partners and Clean Lakes Alliance, a local non-profit group.

Lead Science Services scientist: Dick Lathrop

Collaborator: Stephen Carpenter, UW Center for Limnology

Customer programs: Bureau of Water Quality, South Central Region

Project timeline: 2010 - 2012

Evaluation of agricultural and urban best management practices within Water Division's Priority Watershed Program

Project description: We are evaluating the performance of agricultural best management practices (BMPs) implemented in the Waumandee Creek watershed (Buffalo Co.) and urban BMPs implemented in the Lincoln Creek watershed (Milwaukee Co.). Practices that help restore ecological integrity will be promoted for use as part of TMDL and other restoration efforts.

Lead Science Services scientists: Brian Weigel and Paul Kanehl

Collaborators: Roger Bannerman, Bureau of Water Quality; U.S. Geological Survey; county land conservation departments; and City of Milwaukee

Customer programs: Bureau of Water Quality, with applications to Bureau of Fisheries Management

Project timeline: completion in 2012

Evaluation of forestry management practices for water quality protection and ecological integrity of fish communities in timber harvest units

Project description: Best management practices (BMPs), such as the establishment of riparian management zones, are practices chosen to reduce erosion and prevent or control pollution resulting from forestry operations. Riparian management zones have existed for many years in the areas of forestry, agriculture, and urban development, but no quantitative evaluation has been made by direct measurements of in-stream flow and water quality. This investigation will provide an understanding of the efficacy of current riparian management zones and serve as the basis for future evaluations of potential modifications to the recommended zone width and management activities allowed within the zones.

Lead Science Services scientists: Steven Greb, Brian Weigel, and Paul Kanehl

Collaborators: Carmen Wagner and Darrell Zastrow, Division of Forestry; private landowners; Minnesota DNR; and Ontario Forest Research Institute

Customer programs: Forestry Division, with applications to Bureau of Water Quality and Bureau of Fisheries Management

Project timeline: Fish, macroinvertebrate, and stream habitat analyses will occur in 2011 and followed with a peer-reviewed publication. Long-term monitoring will continue at 5-year intervals. Water quality evaluation monitoring was completed in fall 2010. Data analysis ongoing.



Fish community evaluation pre-harvest on a small, woodland stream.

The relative role of environmental, spatial and land-use patterns in explaining aquatic macrophyte community composition

Project description: We assessed the relative role of environmental, land-use and spatial patterns in explaining aquatic plant communities using a variation partitioning framework in conjunction with Moran Eigenvector Maps (MEM). We employed a tested and repeatable point-intercept sampling design to assess plant communities in 223 Wisconsin lakes. Across the landscape, environmental, land-use, and spatial patterns explained 29% of total adjusted variation in aquatic macrophyte communities. Environmental factors were the most important (explaining 40% of observed variation), but all sources of variation were significant. Community composition varied from north to south, along a gradient of alkalinity, and from disturbed to undisturbed lakes, diverging according to whether disturbance was urban or agricultural. The shared variation among predictor variables suggests causal relationships are complex and emphasizes the importance of considering space and land-use in addition to environmental factors when characterizing macrophyte assemblages in lakes. This work is the first to examine the joint and separate effects of environment, land-use and space on aquatic plant communities and so provides valuable information to guide management decisions.

Lead Science Services scientists: Alison Mikulyuk, Scott Van Egeren, Michelle Nault, Jennifer Hauxwell

Collaborators: Sapna Sharma, University of Wisconsin Center for Limnology

Customer programs: Water Division (Bureau of Water Quality, Bureau of Fisheries Management)

Project timeline: 2005 – 2011



Alison Mikulyuk collects plant samples from a northern Wisconsin lake.

Devil's Lake Restoration Project by Bottom Water Withdrawal

Project description: This project was originally initiated in the mid-1980's in response to concerns from regional DNR staff about deteriorating water quality at Devils' Lake, the centerpiece to Wisconsin's most popular state park. Extensive research was conducted in ensuing years that identified extensive internal recycling of phosphorus (P) from the bottom sediments was fueling different forms of algal problems in the lake: blooms of blue-green algae, mats of filamentous algae, and extensive growths of periphyton supporting a high density of snails linked to swimmer's itch. While external P loadings are no longer a problem as the original sources had been eliminated, the lake has no outlet for dilution flushing of the legacy of P seasonally stored in the deep-water sediments.

To remove this excess P from the lake, a bottom water withdrawal system was installed in the lake in 2002 and operated every year during late summer and early fall. This period of time is when P migrates out of the bottom sediments and builds up in the anoxic bottom waters of the lake prior to fall turnover when the P is mixed throughout the entire lake. The 5,500-foot long withdrawal pipe system (4,150 feet on the lake bed) has its intake positioned at the lake's deepest spot (~14 m water depth). DNR Science Services coordinated the pipe installation in 2002 and assists with the operation of the pipe as DNR-SS continues to evaluate the lake's water quality responses to the repeated withdrawals of P-rich water. The original project objective was to conduct withdrawals for 15 years to return the lake to a lower trophic state given the lake's pristine geologic setting in a quartzite outcropping. Much progress has been made on improving lake water quality as a significant amount of P has been removed from the lake.

In the fall of 2009, DNR-SS coordinated the reconstruction of the pipe, which operates as a siphon, by retrenching the pipe deeper on land so that the pipe would operate as a gravity feed system whenever flooding problems occurred in the park. This work increased the pipe's ability to more efficiently remove water from the lake as flooding problems have occurred regularly in recent years due to increased precipitation from a changing climate. Thus, it is highly likely the bottom

withdrawal pipe system will continue to be operated for decades to come for flood prevention and for additional lake water quality improvements.



*Left: Concrete weights being attached to the lake's bottom withdrawal pipe prior to sinking in summer 2002.
Right: Retrenching deeper the land portion of the withdrawal pipe in fall 2009.
(Photos: R. Lathrop)*

Lead Science Services scientist: Dick Lathrop

Collaborators: Devil's Lake State Park and South Central Region

Customer programs: South Central Region, Bureau of Water Quality, Devil's Lake State Park

Project timeline: 2002 (pipe installation), ongoing

Sentinel lakes – tracking long-term trends in acid rain and mercury pollution

Project description: As part of the Northern Wisconsin Long Term Ecological Research Program (LTER), a number of lakes are routinely monitored for a number of parameters. This project has yielded key information for use in establishing scientific information for mercury legislation and other air deposition challenges. The project is the foundation for other projects that lead to synergistic efforts such as climate change, fisheries changes, etc. The monitoring data are then woven into a larger network of monitoring sites and research studies.

Lead Science Services scientist: Carl Watras

Collaborators: Tim Kratz, University of Wisconsin

Customer programs: Water Division, Air and Waste Division, and Northern Region

Project timeline: 1984 – ongoing

Evaluation of Eagle Lake, Racine County, lake rehabilitation project

Project description: Eagle Lake long history of extensive Eurasian water-milfoil or large algal blooms. In an attempt to restore the lake, the fish population was removed by rotenone and the lake restocked with a more balanced fishery. We are examining the impact of this manipulation on the zooplankton community as well as evaluating responses of the native and exotic plant community to strategic use of herbicides.

Lead Science Services scientist: Paul Garrison

Collaborators: Craig Helker, Southeast Region, Bureau of Water Quality (lakes program) and Bureau of Fisheries Management

Customer programs: Bureau of Water Quality and Bureau of Fisheries Management

Project timeline: 2006 – present

Effectiveness of lake restoration of Silver Lake, Manitowoc County

Project description: Silver Lake has undergone various lake restoration measures including stream diversion, fish eradication, and alum treatment. The study assesses the effectiveness of these treatments.

Lead Science Services scientist: Paul Garrison

Collaborators: Mary Gansberg and Steve Hogler, Northeast Region, Bureau of Water Quality (lakes program); Bureau of Fisheries Management; and Tom Ward, Manitowoc Soil and Water Conservation Department; and Manitowoc County Lake Association

Customer programs: Bureau of Water Quality and Bureau of Fisheries Management

Project timeline: 2000 - ongoing



Gina LaLiberte and Paul Garrison sectioning a sediment core from Silver Lake.

Effectiveness of lake restoration of East Alaska Lake, Kewaunee County

Project description: East Alaska Lake has undergone various lake restoration measures including installing sedimentation basin and an alum treatment. The study assesses the effectiveness of these treatments.

Lead Science Services scientist: Paul Garrison

Collaborators: Mary Gansberg, Northeast Region, Bureau of Water Quality (lakes program); Tim Hoyman, Onterra, LLC, Tri-lakes Association

Customer programs: Bureau of Water Quality

Project timeline: 2009 – ongoing

Shell Lake paleolimnological study

Project description: This study is assessing the impact of shoreline and urban development on the lake's ecosystem in the context of climate change. This lake has undergone significant water level changes in the past years including high water levels that led to shoreline flooding which was alleviated by pumping water out of the lake. During periods of low rainfall the water levels have been very low. The possible impact of these changing water levels is affected by shoreline and urban development from the City of Shell Lake.

Lead Science Services scientist: Paul Garrison

Collaborator: City of Shell Lake

Customer programs: Bureau of Water Quality, City of Shell Lake

Project timeline: 2010 – 2012



Sectioning the Shell Lake core with Dave Voll of the City of Shell Lake.

Anvil Lake paleolimnological study

Project description: This study is assessing the impact of shoreline development on the lake's ecosystem in the context of climate change. This lake has undergone

significant water level changes in the past years during periods of low rainfall the water levels have been very low. The possible impact of these changing water levels is affected by shoreline development.

Lead Science Services scientist: Paul Garrison

Collaborator: Anvil Lake Association

Customer programs: Bureau of Water Quality, Anvil Lake Association

Project timeline: 2012 – 2014

Dunes Lake paleolimnological study

Project description: This shallow lake at the present time has a large amount of filamentous algae over much of the lake surface area. Also the surrounding marsh seems to be encroaching on the lake. The stream that enters the lake drains a highly agricultural watershed which also contains sewage treatment ponds which are located near the water course. This project documented the sensitive nature of the lake to early agricultural activity as well as the adverse impact of the nutrients from the treatment ponds.

Lead Science Services scientists: Paul Garrison and Gina LaLiberte

Collaborator: Door County Land and Water Conservation Dept., The Nature Conservancy

Customer programs: Bureau of Water Quality, Door County, The Nature Conservancy

Project timeline: 2011 – 2012

Max Lake paleolimnological study

Project description: A sediment core was analyzed from this softwater seepage lake covering the entire lifespan of the lake, circa 14,000 years. The diatom community was used to reconstruct phosphorus and pH to estimate the impact of the warmer and effectively drier period during the mid-Holocene. Charcoal fragments preserved in the sediments were used to assess the relative frequency of fires which are a surrogate for drought conditions. These conditions may be similar to that predicted by GCL models for the next century. This study gives us a preview of what to expect in softwater seepage lakes if the climate becomes warmer and effectively drier.



Part of the sediment core from Max Lake

Lead Science Services scientists: Paul Garrison and Gina LaLiberte

Collaborator: Dr. Samantha Kaplan; Focus on Energy

Customer programs: Focus on Energy, WICCI, Bureau of Water Quality

Project timeline: 2009 – 2012

Lake Chetac paleolimnological study

Project description: This lake experiences frequent blooms of blue-green algae. This study assessed whether this was a natural occurrence and it is natural whether conditions had worsened in recent decades.

Lead Science Services scientists: Paul Garrison and Gina LaLiberte

Collaborator: Big Chetac Lake Association

Customer programs: Bureau of Water Quality, Big Chetac Lake Association

Project timeline: 2008 – 2010

Top/Bottom paleolimnological studies

Project description: Sediment cores are being used to assess the current nutrient levels with presettlement concentrations using the diatom community. In some cases change in the general coverage of macrophytes is also assessed. Lakes included in this series of studies are Amnicon and Dowling, Douglas Co.; Sand, Barron Co.; Sissabagama, Sawyer Co.; Spirit and North Spirit, Taylor and Price Co.; Ash and North White Ash, Polk Co.; Red, Douglas Co.; Potato, Sawyer Co.

Lead Science Services scientists: Paul Garrison and Gina LaLiberte

Collaborator: Lake Associations of above lakes and Bureau of Water Quality

Customer programs: Lake Associations of above lakes and Bureau of Water Quality

Project timeline: 2009 – ongoing

Honest John Lake and Bear Trap Slough paleolimnological studies

Project description: These water bodies are thought to be experiencing declining water quality in recent years. These studies used fossils deposited in the sediments to reconstruct changes in the water quality over the last 200 years

Lead Science Services scientist: Paul Garrison

Collaborator: Bad River Band of the Lake Superior Tribe of Chippewa Indians

Customer programs: River Band of the Lake Superior Tribe of Chippewa Indians

Project timeline: 2002 – 2011

Evaluation of the Bad River Wetlands and Streams

Project description: This project is a continuation of assessments of streams and wetlands located in the Bad River Indian Reservation. Samples have been collected in 2006 and 2011. The diatom community is used to assess the nutrient status of these water bodies. Wetland sites have previously been assessed in 2004 and 2005.

Lead Science Services scientists: Paul Garrison and Gina LaLiberte

Collaborator: Bad River Band of the Lake Superior Tribe of Chippewa Indians

Customer programs: River Band of the Lake Superior Tribe of Chippewa Indians

Project timeline: 2006 – 2012

Monitoring

The use of satellite remote sensing for monitoring Wisconsin lakes

Project description: Satellite remote sensing offers an unbiased sampling approach to simultaneously monitor water clarity in a large number of lakes, essentially sampling the entire population (lakes >10 ha statewide). This technique provides spatial coverage ranging in scale from within lake variation to statewide coverage. Water quality parameters quantified from space platforms include suspended solids, chlorophyll-a, temperature, and water color. Remote sensing provides a cost-effective alternative to traditional in-situ monitoring methods.

Lead Science Services scientists: Steven Greb and Eric Erdmann

Collaborators: Jonathon Chipman, Dartmouth College; Colleen Mouw, University of Wisconsin-Madison Environmental Remote Sensing Center; and NASA Group on Earth Observations

Customer programs: Bureau of Water Quality, with applications to Bureau of Fisheries Management

Project timeline: Ongoing



Satellite imagery is linked with volunteer secchi readings to ultimately generate water clarity values for more than 8000 lakes statewide.

Using Satellite Remote Sensing to Develop Predictive Models of Lake Water Clarity: Investigating Driver Interactions and Impacts of Climate Change

Project description: Predicting how inland lakes in the Upper Midwest will respond to climate change requires an in depth understanding of the complex interactions between the drivers of water clarity and the inherent variability in individual lake responses. Previous work has focused on developing predictive landscape-based models using in situ data collected from either a few well-studied lakes with long term datasets or from a large number of lakes with relatively little data. Results have shown drivers are organized in a hierarchy ranging from local (individual lake) to regional (e.g. ecoregion) scales. The important drivers vary depending upon the scale and what response variable is being investigated. The WDNR has been monitoring lake water clarity on an annual basis through remote sensing since 2003. Through this effort and previous research, the database of water clarity estimates dates back to the early 1980s and includes lakes from all regions of the state. This project aims to use this long-term dataset to identify landscape and climate drivers of water clarity and develop predictive models. These models will incorporate future land use and climate scenarios to predict lake water clarity in all regions of the state.

Lead Science Services scientist: Eric Erdmann

Collaborators: Monica Turner, University of Wisconsin-Madison Dept. of Zoology; Emily Stanley, University of Wisconsin-Madison Center for Limnology.

Customer Programs: Bureau of Water Quality, with applications to Bureau of Fisheries Management.

Project Timeline: 2011 – 2016



True color Landsat 5 satellite image of Lake Petenwell on 11 June 2010. Adjacent agriculture and other anthropogenic land uses are known drivers of water clarity.

Southern Wisconsin long-term ecological research (LTER)

Project description: This project is a multi-year collaboration with the University of Wisconsin to monitor long term trends in aquatic ecosystems and other environmental media. The project forms the foundation for other projects that lead to synergistic efforts such as climate change, fisheries changes, etc. There are a small number of lakes that are routinely monitored every year for certain parameters that are then woven into a larger network of monitoring sites and research studies.

Lead Science Services scientist: Richard Lathrop

Collaborator: Steve Carpenter, University of Wisconsin

Customer programs: Water Division and Air and Waste Division

Project timeline: Ongoing

U.S. Environmental Protection Agency National Lake Assessment

Project description: This is part of a national program to assess the condition of the Nation's lakes. Various indicators and stressors are being evaluated including nutrients, algal toxin, water chemistry, sediment mercury and diatoms, phytoplankton, zooplankton, shoreland habitat, benthic macroinvertebrate community, and macrophytes.

Lead Science Services scientists: Paul Garrison

Collaborators: Tim Asplund, Bureau of Water Quality and U.S. Environmental Protection Agency

Customer programs: Bureau of Water Quality, with applications to Bureau of Fisheries Management

Project timeline: 2012 – 2014

U.S. Environmental Protection Agency National Lakes Assessment Design Support - Developing a rapid assessment protocol for macrophytes

Project description: We developed and tested a macrophyte sampling method to be used by individuals with no aquatic plant taxonomic background. The method is designed to detect large-scale impacts to aquatic plant communities and was adopted by US EPA as a research indicator for the 2012 National Lakes Survey. The method can be used to quickly screen macrophyte communities and will be tested against the current baseline protocol in 2012 to determine its suitability as a Tier I monitoring protocol for macrophytes.

Lead Science Services scientists: Alison Mikulyuk, Kelly Wagner, Michelle Nault, Martha Barton, Jennifer Hauxwell

Collaborator: Tim Asplund, Bureau of Water Quality

Customer programs: Bureau of Water Quality, US EPA

Project timeline: 2011 – present

U.S. Environmental Protection Agency National Wetlands Condition Assessment project

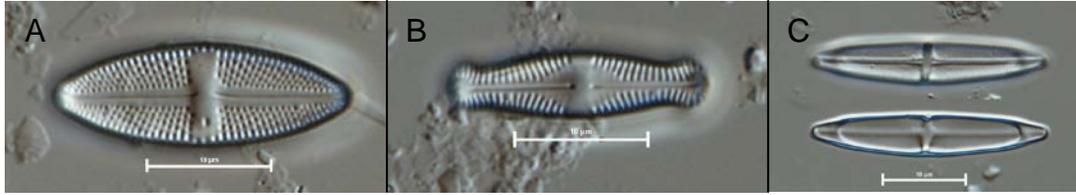
Project description: Wetland periphyton soft algae and diatoms will be used to assess wetland nutrients and biological integrity, which will inform nutrient and runoff management decisions, as well as listing/delisting of impaired waters.

Lead Science Services scientists: Paul Garrison and Gina LaLiberte

Collaborators: National algae experts; Bureau of Water Quality, and U.S. Environmental Protection Agency

Customer programs: Bureau of Water Quality, with applications to Bureau of Fisheries Management

Project timeline: 2008 – 2010



Luticola goeppertiana (A), *Pinnularia ignobilis* (B), *Stauroneis smithii* (C): diatoms (Bacillariophyta) from the National Wetland Condition Assessment.

Citizen based monitoring – developing a user-friendly protocol to track lake levels and water tables across Vilas County

Project description: In collaboration with local citizen scientists, this project has developed standardized protocols that citizens may use to monitor lake levels across Vilas County. Because lake levels have changed dramatically over the past two decades, citizens have become increasingly interested and willing to monitor the lake that they live on. Volunteers currently monitor water level fluctuations in 26 Vilas County lakes, and the number of volunteers is growing steadily. Each volunteer keeps a weekly record of the water level of their lake, and these data are compiled by the project coordinator at the North Lakeland Discovery Center in Manitowish Waters. The data collection season runs from ice-out to ice-on, and the compiled data are being incorporated into the SWIMS database by Lake Management staff.



Fastening Gauge to Fencepost

Citizen scientists set a staff gauge in a Vilas County lake to monitor water level changes over time.

Lead Science Services scientist: Carl Watras

Collaborators: Bureau of Endangered Resources and North Lakeland Discovery Center

Customer programs: Bureau of Endangered Resources and Northern Region

Project timeline: 2008 – ongoing

Evaluating impacts of permitted projects on freshwater mussel populations

Project description: This investigator serves as a regional expert on issues related to freshwater mussel identification, distribution, and habitat use. He provides advice and assistance to Fisheries Management and Water Quality staff and DNR's DOT liaisons in determining impacts of project permits on mussel communities.

Lead Science Services scientist: Randal Piette

Collaborators: Regional water resources and fish management staff and Wisconsin Department of Transportation

Customer programs: Bureau of Endangered Resources, Bureau of Water Quality, Office of Energy and Environmental Analysis, with applications to Bureau of Fisheries Management

Project timeline: Ongoing

Phenological study of inter- and intra-annual variation in aquatic plant frequency of occurrence and density in a northern and a southern Wisconsin lake

Project description: Point-intercept and biomass data were collected on one northern and one southern aquatic plant population every other week from ice on to ice off. We will assess the variation in plant metrics over multiple years as well as across one growing season in order to more accurately define an appropriate sampling window for baseline aquatic plant surveys.



Susan Knight sampling aquatic vegetation

Lead Science Services scientists: Susan Knight, Jennifer Hauxwell, Kelly Wagner, Alison Mikulyuk, and Michelle Nault

Collaborators: University of Wisconsin and Wisconsin Association of Lakes

Customer programs: Bureau of Water Quality, with applications to Bureau of Fisheries Management

Project timeline: 2007 – present

Developing an aquatic macrophyte-based index of anthropogenic perturbation

Project description: From a database of aquatic plant survey information collected using a standardized and repeatable sampling methodology on 266 Wisconsin lakes, we have extracted several aquatic plant metrics that predict the presence of anthropogenically-altered land-use categories at local and watershed scales. We intend to further test these metrics for sensitivity to a variety of stressors in order to develop an index of disturbance that can be used as a bioassessment tool and indicator of environmental quality.

Lead Science Services scientists: Kelly Wagner, Scott Van Egeren, Alison Mikulyuk, Michelle Nault, Jennifer Hauxwell

Collaborators: Tim Asplund, Bureau of Water Quality

Customer programs: Bureau of Water Quality

Project timeline: 2008 – present

Climate Change Research

Wisconsin Initiative on Climate Change Impacts (WICCI) Project

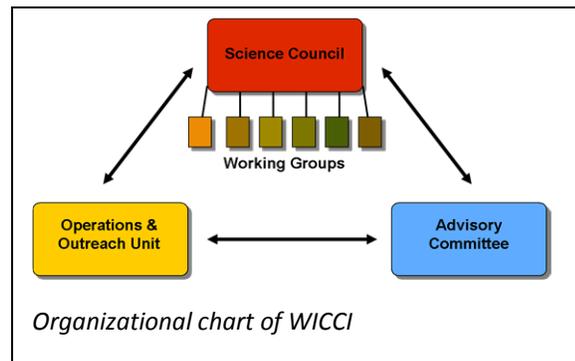
Project description: This large collaborative project called the Wisconsin Initiative on Climate Change Impacts (WICCI) was comprised of well over 200 members from different state and federal agencies, institutions and organizations located throughout Wisconsin. The effort was directed by a Science Council of approximately 22 members with co-chairs from the DNR and UW-Madison, the two entities that launched and sustained the joint project. Fifteen separate working groups were formed to assess the impacts of climate change on various topic areas or specific geographic regions and to recommend adaptation strategies to address the identified impacts. WICCI's first adaptive assessment report entitled: "Wisconsin's Changing Climate: Impacts and Adaptation" was completed in early 2011, which summarized individual assessment reports of the 15 working groups. The information generated by WICCI's first adaptive assessment is being disseminated by a very active outreach effort. At the same time, new scientific studies are being conducted to augment project results.

Lead DNR scientists: Dick Lathrop (DNR's designated Co-Chair WICCI Science Council); Jack Sullivan, Tim Asplund, Bill Walker, Erin Crain, and Darrell Zastrow (WICCI Science Council); other DNR scientists have leading roles in many of the working groups – Jennifer Hauxwell, Matt Mitro, John Lyons, Steve Greb, Paul Garrison.

Collaborators: DNR, UW System, state and federal agencies, others

Customer programs: DNR Divisions: Land, Water, Forestry, Enforcement and Science

Project timeline: 2007 (initiated), ongoing



Potential effects of climate change on inland glacial lakes and implications for lake-dependent biota in the Great Lakes Region

Project description: Loons and other sensitive aquatic species may be particularly sensitive to climate change, especially if changes in climate result in changes in the trophic status of waters. Through hydrologic modeling and paleolimnological investigations, this study assesses potential impacts of climate change on loons and other sensitive species. This study will also test a groundwater model that indicates seepage lakes in northern WI will become more alkaline if climate change results in warmer and drier conditions. This model will

be tested by using the historical diatom community to reconstruct the alkalinity levels during the mid-Holocene when the climate was warmer and drier than it is today.

Lead Science Services scientist: Paul Garrison

Collaborators: Mike Meyer, Kevin Kenow, Dale Robertson, John Walker, Randy Hunt, and Paul Hansen, DNR, and U.S. Geological Survey and University of Wisconsin Center for Limnology

Customer programs: Bureau of Water Quality and Bureau of Wildlife Management, with applications to Bureau of Fisheries Management

Project timeline: 2008 – ongoing

Historic Trends in Flows of Wisconsin Rivers

Project Description: This project examined recent trends in stream flows of Wisconsin rivers in the context of climatic drivers. Trends in flow over the past 57 years were determined for 48 USGS stations across the state of Wisconsin. Four annual metrics (mean flow, base flow, one-day maximum flow, and Julian day of center of spring flow) were tested for trends using the non-parametric Kendall test as well as linear regression, incorporating an autoregressive parameter. Stations having significant trends in mean and base flow were not randomly distributed throughout the state but were generally correlated with precipitation patterns.

Lead Science Services scientist: Steven Greb

Collaborators: Randy Hunt and Warren Gebert, USGS

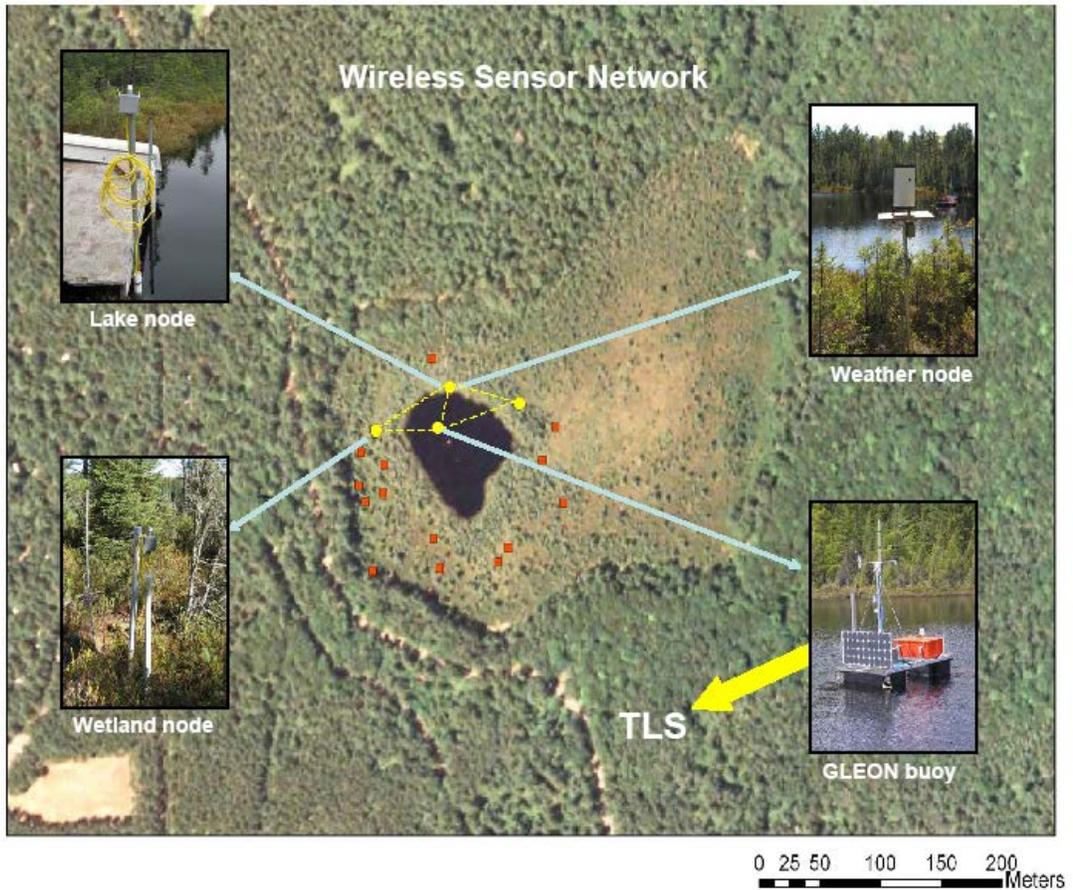
Customer programs: Water Division

Project timeline: 2009 – ongoing

Developing wireless radio-sensor networks to monitor climate change impacts on lakes and wetlands

Project description: Using mote technology (a mote is a very small radio-sensor computing device), wireless monitoring networks have been designed and deployed to detect changes in water and solute fluxes in northern Wisconsin wetlands. Each network of sensors can monitor water table fluctuations, precipitation, evaporation, dissolved organic carbon and bulk ionic solutes at 30 minute intervals throughout the ice-free season. The data are transmitted via low-power radio to a remote base station that is affiliated with UW-Madison GLEON project. Two prototype networks using alternative technologies have been operating in tandem since 2009 in Vilas County wetlands. The networks are able to function unattended for several months on a few AA batteries. The high frequency data are essential in assessing the impact of extreme events, such as intense rainfall or extremely hot, dry weather. Regional climate models indicate that the frequency of such extreme events will increase during future decades. Specifics on network configuration,

technology, collaborators data, and reports are available on the project website: www.wetlands.gleon.org.



Lead Science Services scientists: Carl Watras and Ken Morrison

Collaborators: Mike Morrow and Yu Hen Hu, Department of Electrical and Computer Engineering, UW-Madison; Paul Hanson and Tim Kratz, Center for Limnology, UW-Madison

Customer programs: Water Quality, Endangered Resources

Project timeline: 2008 – ongoing

Lake level fluctuations in the Northern Highland Lake District of Wisconsin: historical and current patterns

Project description: Water levels in our northern lakes have declined dramatically during the past decade, reaching record low levels in 2010. The purpose of this project is to put these observations in a historical and regional perspective and to evaluate the potential influence of climatic change on the regional water cycle. Records of lake stage, water table elevation, precipitation and evaporation are being investigated; and the impact of climatically-sensitive environmental factors is

being assessed with statistical models, mass balance models and Bowen ratio energy balance models. Results will be compared to findings for the Laurentian Great Lakes, where the historical record is more extensive but the uncertainties are greater.



Lead Science Services scientist: Carl Watras

Collaborators: Zhengyu Liu, Department of Atmospheric and Ocean Sciences, UW-Madison; Jordan Read, Department of Civil and Environmental Engineering, UW-Madison; Tim Kratz, Trout Lake Research Station, UW-Madison; Sam Morgan, Vice President, Wisconsin Valley Improvement Corporation

Customer programs: Bureau of Lake Management, Bureau of Water Quality, Bureau of Endangered Resources

Project timeline: 2008 – ongoing

Fisheries Research

Landscape/Land Use Investigations

Development and evaluation of watershed models for predicting stream fishery potential

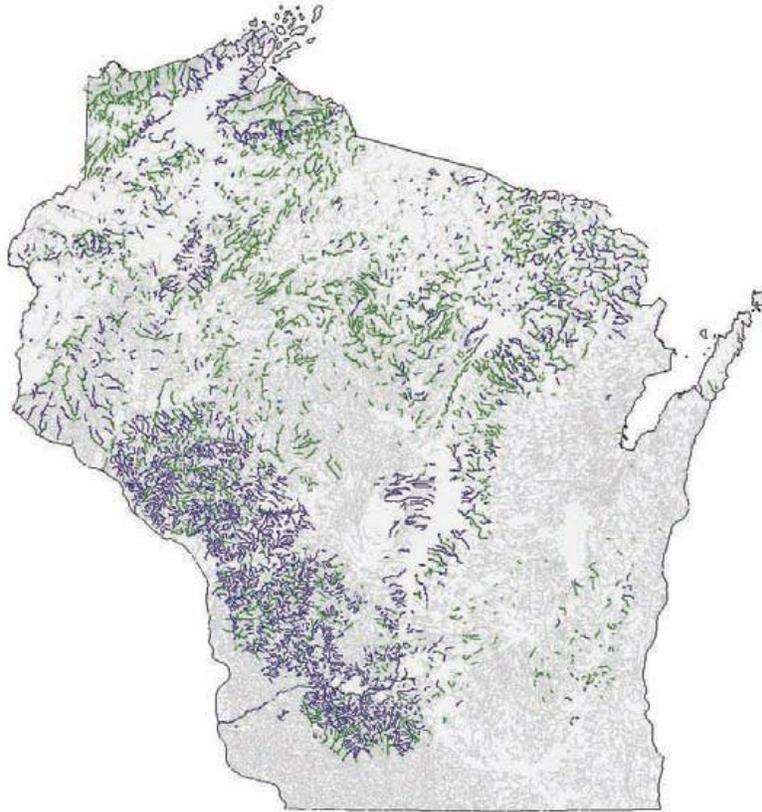
Project description: This project will develop computer models that use readily available, watershed-scale, GIS-based information to predict flows, water temperatures, and suitability for 50 fish species in all 55,000+ miles of streams and rivers in Wisconsin. The project will use these models to assess, map, and classify the current status of stream fisheries in the state and will provide tools for managers to determine stream potential and to forecast future effects of land-use and climate change on stream fisheries.

Lead Science Services scientists: John Lyons and Matthew Mitro

Collaborators: Regional Bureau of Fisheries Management and Water Quality staff, U.S. Fish and Wildlife Service (SFR), U.S. Environmental Protection Agency, and U.S. Geological Survey

Customer programs: Bureau of Fisheries Management and Water Quality, with applications to Bureau of Drinking Water and Groundwater

Project timeline: 2000 – 2014



Map of the predicted current actual distribution and abundance of brook trout based on the stream model (blue = common, green = uncommon)

Predicted effects of climate change on Wisconsin stream fishes

Project description: This project is working to increase the sensitivity of existing computer models that predict stream suitability for 50 fish species to variation in climate and groundwater inputs. The researchers will predict the response of stream fishes to Wisconsin-specific climate change scenarios over the next 25-50 years and identify streams particularly vulnerable to climate fluctuations. The results will provide tools for managers and policy makers to plan for and to adapt to future climate changes more efficiently.

Lead Science Services scientists: John Lyons, and Matthew Mitro

Collaborators: U.S. Fish and Wildlife Service (SFR), U.S. Geological Survey, Michigan State University, Michigan DNR, and Wisconsin Initiative on Climate Change Impacts

Customer programs: Bureau of Fisheries Management, with applications to Bureau of Water Quality and Bureau of Endangered Resources

Project timeline: 2008 – 2014

Fish response to hydrologic modification

Project description: This study will evaluate relationships between stream fish species distributions and hydrologic metrics, including low and storm flows. These relationships will then be used to predict changes in fish assemblages that would result from hydrologic modification from groundwater withdrawals and increases in impervious surfaces. This research could support the development of stream flow standards.

Lead Science Services scientist: Matt Diebel

Collaborators: Capitol Area Regional Planning Commission, Michigan DNRE, US Geological Survey

Customer programs: Bureaus of Fisheries and Water Quality

Project timeline: 2010 – 2011

Fish Passage Evaluations

Effects of flow regulation and restriction of passage due to hydroelectric project operation on the structure of fish and invertebrate communities in Wisconsin's large river systems

Project description: This study will evaluate how changes in flow regulation at hydroelectric dams on the Menominee River affect fish communities. This is the final phase of a long-term, before-after-control-impact study to evaluate fish community responses to river flow changes implemented in an agreement between the department, Wisconsin Electric Power Company, Michigan DNR, and U.S. Fish and Wildlife Service.

Lead Science Services scientist: Randal Piette

Collaborators: Regional Bureau of Fisheries Management staff and U.S. Fish and Wildlife Service (SFR)

Customer program: Bureau of Fisheries Management

Project timeline: Ongoing

Evaluation of Prairie du Sac Dam fish passage project

Project description: The Prairie du Sac Dam on the Lower Wisconsin River is one of the most significant barriers to fish movements in Wisconsin, and the planned installation of upstream and downstream fish passage through the dam in 2015 is the largest project of its kind in the Midwest, with an unprecedented opportunity to learn how to better reconnect fragmented river systems and restore their fisheries. The objective of this study is to help design, operate, and evaluate the upstream passage facility and to determine if it is successful in re-establishing extirpated species above the dam and improving fisheries.

Lead Science Services scientist: John Lyons

Collaborators: Regional Bureau of Fisheries Management staff, U.S. Fish and Wildlife Service (SFR and Fisheries Assistance offices in Green Bay and LaCrosse), Alliant Energy, River Alliance of Wisconsin, University of Wisconsin-Madison

Customer programs: Bureau of Fisheries Management, with applications to Water Quality, Environmental Assessment, and Bureau of Endangered Resources.

Project timeline: 2008 – 2020



Prairie du Sac dam

Long-term monitoring of Baraboo River fish and habitat post dam removal

Project description: The Baraboo River is the longest free-flowing river in the Midwest now that the dams have been removed. We have a unique opportunity to document the sport fish rejuvenation, and the whole fish assemblage in general, after removing 4 dams that have impeded fish migration for decades. This is an important example of restoring water quality, fisheries, and ecological integrity by removing unsafe, abandoned, or obsolete dams.

Lead Science Services scientists: Brian Weigel and Paul Kanehl

Collaborators: Bureau of Fisheries Management; and U.S. Fish and Wildlife Service (SFR)

Customer programs: Bureau of Fisheries Management and Bureau of Water Quality

Project timeline: Continue sampling at 5-year intervals

Northern pike spawning habitat connectivity

Project description: The objective of this project is to guide the restoration of stream connectivity by identifying the most significant fish migration barriers in the Green Bay watershed. The project will use a GIS-based analytical approach that bases the value of barrier removal on both the amount and quality of reconnected habitat. The results of this project will include a detailed map of habitat suitability and accessibility for northern pike and stream-resident species and a list of barriers ranked on connectivity effect. These products will provide a quantitative basis for prioritizing barrier removal and tracking the progress of connectivity restoration.

Lead Science Services scientist: Matt Diebel

Collaborators: The Nature Conservancy, UW-Madison Center for Limnology, The Cadmus Group, Inc.

Customer programs: Bureaus of Fisheries and Water Quality

Project timeline: 2011 – 2012

Great Lakes Basin Aquatic Connectivity Assessment

Project description: Ecological connectivity between the Great Lakes and their tributaries is widely impaired, and many agencies and organizations are currently investing in restoring these connections to enhance target fish and wildlife populations. To assist in targeting these investments, we will use spatial data on the location and attributes of barriers (dams and road-stream crossings) and fish breeding habitat throughout the Great Lakes basin to analyze the optimum strategy for enhancing connectivity and restoring fish migrations. The project will provide specific guidance for restoration at scales from individual watersheds to the entire basin, refine methodologies for spatial analysis of barriers, and provide a

systematic framework for comparing costs (direct economic costs, species invasions) and benefits (connectivity, focal fish species) of barrier removal.

Lead Science Services scientist: Matt Diebel

Collaborators: The Nature Conservancy, UW-Madison Center for Limnology

Customer programs: Bureaus of Fisheries and Water Quality

Project timeline: 2011 – 2013

Species Ecology/Population Dynamics

Rewrite the book Fishes of Wisconsin

Project description: This scientist will summarize the extensive and rapidly increasing new information on all 165 species of fishes in Wisconsin that has become available since the standard reference work Fishes of Wisconsin was published in 1983. The project will make both the new and older information accessible through innovative online applications, including a photo-based fish identification system (<http://wiscfish.org>), a customizable distribution-mapping tool (<http://infotrek.er.usgs.gov/fishmap>), a comprehensive searchable bibliography, and an updatable “e-book” of species accounts (http://infotrek.er.usgs.gov/wdnr_fishes/index.jsp). The project will provide improved interpretation and access to information essential to the conservation and management of fisheries and aquatic resources in Wisconsin.

Lead Science Services scientist: John Lyons

Collaborators: Numerous authors from within Wisconsin DNR, other government agencies, and universities; U.S. Geological Survey; University of Wisconsin and U.S. Fish and Wildlife Service (SFR)

Customer programs: Bureau of Fisheries Management, with application to Bureaus of Water Quality, Environmental Assessment, and Endangered Resources

Project timeline: 2000 – 2020

Status and trends in the fish community of the lower Wisconsin River

Project description: This project will monitor long-term fish community and fisheries dynamics over the entire length of the lower Wisconsin River. It will document trends in fish populations and assess responses to changes in environmental conditions. The project also will provide data and interpretation to improve conservation and management of one of the most important fisheries in the state.

Lead Science Services scientist: John Lyons

Collaborators: Regional Bureau of Fisheries Management staff, U.S. Fish and Wildlife Service (SFR), Alliant Energy, and River Alliance of Wisconsin

Customer programs: Bureau of Fisheries Management, with applications to Water Quality and Bureau of Endangered Resources

Project timeline: 1987 – present (ongoing monitoring with no end date)

Status and trends in sportfish populations of southwestern Wisconsin warmwater streams

Project description: This project will monitor the long-term dynamics and trends of sportfish populations, primarily smallmouth bass, in seven southwestern Wisconsin streams that support (or once supported) high-quality fisheries. It will document the responses of smallmouth bass to agricultural runoff, which has decimated many stream fisheries in this region of the state, and to floods and droughts. The project also will provide data and interpretation to improve the conservation and management of a unique and valuable type of stream fishery.

Lead Science Services scientists: John Lyons and Paul Kanehl

Collaborators: Regional Bureau of Fisheries Management staff and U.S. Fish and Wildlife Service (SFR)

Customer programs: Bureau of Fisheries Management, with applications to Bureau of Water Quality

Project timeline: 1989 – ongoing



John Lyons backpack shocking streams.

Developing expectations for smallmouth bass populations in rivers

Project description: Smallmouth bass provide one of the most important river fisheries statewide. This project will quantify expectations for smallmouth bass

populations, and devise a monitoring framework to evaluate if rivers are meeting their expectations. The Bureau of Fisheries Management will use this information to make local or statewide management decisions regarding stocking, habitat manipulations, harvest regulations, and the Bureau of Water Quality can use the framework for regulatory purposes.

Lead Science Services scientists: Brian Weigel and John Lyons

Collaborators: Tim Simonson and regional Bureau of Fisheries Management staff and U.S. Fish and Wildlife Service (SFR)

Customer programs: Bureau of Fisheries Management and Bureau of Water Quality, with applications to the Office of the Great Lakes.

Project timeline: Ongoing

Characterizing thermal regimes of coolwater walleye in the warm Lower Wisconsin River

Project description: This project will: 1) characterize the thermal regime of the lower Wisconsin River, particularly the summer maximum water temperature, 2) determine the water temperatures inhabited by walleye through out the summer, with special emphasis during peak summer temperatures, and 3) identify thermal refugia used by walleye and determine necessity for adapting to climate warming. Depending upon the scope and scale of these refugia, management may be necessary for the protection or enhancement of critical, at-risk habitats in response to climate warming.

Lead Science Services scientist: Brian Weigel

Collaborators: Bureau of Fisheries Management staff, Water Quality staff, and U.S. Fish and Wildlife Service (SFR)

Customer programs: Bureau of Fisheries Management and Bureau of Water Quality.

Project timeline: Collect telemetry and water temperature data 2011 - 2013

Movement and habitat use of flathead catfish in the upper Fox and Wolf Rivers

Project description: Project goals include: determining movement patterns and habitat use by adult and juvenile flathead catfish in the upper Fox and Wolf Rivers by using radio telemetry; cooperating with and advise regional Fisheries Management staff in determining population dynamics and exploitation of the flathead catfish fishery within the Winnebago System; and developing innovative management principals to improve a heavily exploited regional fishery that may be implemented on a statewide basis.

Lead Science Services scientist: Randal Piette

Collaborators: Al Niebur, regional Bureau of Fisheries Management staff and U.S. Fish and Wildlife Service (SFR)

Customer program: Bureau of Fisheries Management

Project timeline: Ongoing



Surgically implanting radio transmitter in male flathead catfish (L). Randy Piette conducting field research on overwintering site selection of flatheads (R).

Muskellunge growth characteristics

Project description: Trophy fisheries are an important component of the statewide muskellunge management plan. We will develop better documentation of age and growth characteristics in premier muskellunge fisheries, with an objective of setting realistic goals based on limnology, fish community, and angling pressure. Improved understanding of relations between angling pressure, capture probability, hooking mortality, and growth are essential to optimizing use of high-demand fisheries. This project also is evaluating new approaches to user group participation in research, with local guides and anglers reporting data from tagged muskellunge.

Lead Science Services scientist: Martin Jennings

Collaborators: Regional Bureau of Fisheries Management staff and U.S. Fish and Wildlife Service (SFR)

Customer program: Bureau of Fisheries Management

Project timeline: Ongoing



A muskellunge is released after measurement during a spring fyke netting survey.

Muskellunge broodstock management

Project description: Science Services scientists worked with regional fisheries and propagation staff to implement recommendations for broodstock management developed by Dr. Brian Sloss at University of Wisconsin-Stevens Point. This work included developing a workable framework for identifying potential brood sources, test netting potential brook lakes, and testing new field procedures associated with PIT tagging broodstock. Additional field work addressed issues related to spawning frequency and site fidelity, which are relevant to developing numerical targets for broodstock sampling. Ongoing work is evaluating genetic composition of hatchery produced fish in relation to targets for retaining genetic variability in source populations.

Lead Science Services scientist: Martin Jennings

Collaborators: Brian Sloss, University of Wisconsin-Stevens Point Cooperative Fishery Research Unit; Regional Bureau of Fisheries Management staff, U.S. Fish and Wildlife Service (SFR), and University of Wisconsin-Stevens Point Fisheries Coop Unit

Customer program: Bureau of Fisheries Management

Project timeline: 2006 – present



Muskellunge fingerlings in a hatchery raceway await stocking into Wisconsin lakes.

Threatened fishes of the upper St. Croix River

Project description: The upper St. Croix River contains a diverse fish fauna, including some state threatened species. No thorough surveys documenting distribution and abundance of several nongame species are available. This project will provide a current assessment and recommendations for future monitoring of the gilt darter, greater redhorse, and river redhorse.

Lead Science Services scientists: Martin Jennings, Gene Hatzenbeler, and Jeff Kampa

Customer programs: Bureau of Endangered Resources, Bureau of Fish Management, National Park Service

Project timeline: 2009 – 2011



A gilt darter in a riffle on the Namekagon River in Burnett County, Wisconsin.

Lake sturgeon distribution, movement, and stocking success in the Upper St. Croix River and Namekagon River

Project description: The Bureau of Fisheries Management and the Bureau of Endangered Resources have identified lake sturgeon information needs to better inform and focus management and conservation efforts for lake sturgeon. Science Services is conducting population assessments to estimate lake sturgeon population size and movement in the St. Croix and Namekagon rivers, and to evaluate performance of rehabilitation stocking above dams.



Lake sturgeon scanned for passive integrated transponder (PIT) tag.

Lead Science Services scientist: Jeff Kampa

Collaborators: U.S. Fish and Wildlife Service (SFR), National Park Service.

Customer programs: Bureau of Fisheries Management and Bureau of Endangered Resources

Project timeline: 2008 – 2013

The effects of exploitation on northern walleye populations

Project description: The overall objective of this project is to describe the population dynamics of lightly (0-5%), moderately (10-25%), and heavily (35%-50%) exploited adult walleye populations, and to develop walleye population models to help in predicting sustainable harvest.

Lead Science Services scientists: Greg Sass, Dave Dreikosen, and Gary Kubenik

Collaborators: Hundreds of individual collaborators over the past 60 years; Mike Hansen, University of Wisconsin-Stevens Point; U.S. Fish and Wildlife Service (SFR); U.S.D.A. Forest Service; Dairymen's Incorporated; University of Notre Dame; Max McGraw Wildlife Foundation; and Great Lakes Indian Fish and Wildlife Commission

Customer program: Bureau of Fisheries Management

Project timeline: Ongoing

Northern Highland Fishery Research Area (NHFRA) population and harvest monitoring

Project description: This project takes place on five lakes in the NHFRA which have been continuously managed as experimental research waters since 1946. The lakes are located in the Northern Highland State Forest in Vilas County and include Escanaba, Nebish, Palette, Spruce, and Mystery. The overall objective of the project is to maintain the long-term NHFRA database and to continually monitor fishing pressure, angler characteristics, and fish populations through a compulsory creel census and fish population sampling. The project will continually add to the valuable and extensive NHFRA database and provide information that will address a number of high priority issues that were identified by the Joint federal-state-tribal Assessment Steering Committee.

Lead Science Services scientists: Greg Sass, Dave Dreikosen, and Gary Kubenik

Collaborators: 100s of collaborators over the past 60 years, Mike Hanson and Mike Bozek, University of Wisconsin-Stevens Point; Fisheries Management regional staff; and U.S. Fish and Wildlife Service (SFR), Ben Beardmore, UW-Madison Center for Limnology; Robert Arlinghaus, Humboldt University at Berlin, Germany.

Customer program: Bureau of Fisheries Management

Project timeline: Ongoing



Dave Dreikosen and Matt Lorenzoni tagging a walleye.

Reexamination of Wisconsin's Ceded Territory walleye management policies

Project Description: This project will reexamine stock-recruitment relationships for walleye in the Ceded Territory of Wisconsin using: A) all available lakes with population estimates and fall YOY surveys (assumes survival to age 1 is set by abundance of fall age 0's, no overwinter mortality, e.g. Beard et al. (2003a) plus thirteen years of data); and B) all available lakes with continuous, long-term adult and age-0 population estimates and/or age 1 estimates (does not assume fall age-0's survive to age-1, accounts for overwinter mortality, Escanaba, Big Crooked, GLIFWC lakes (8)). Alpha and beta parameter distributions based upon the aggregate stock-recruitment relationships will be used to inform the statistical catch at age model to represent weak, mean, and strong compensatory dynamics and to inform initial adult stock densities used in the model. We will build a statistical catch-at-age model to test for exploitation rates in a mixed fishery (including tribal pulse fishing) (35%, 50%, 75%, 90%) that lead to long-term walleye sustainability by varying compensatory recruitment responses (informed by the alpha distribution) and initial adult walleye densities (informed by the beta distribution). Independent of the first model, we will test various recreational harvest regulations, tribal exploitation rates, and various angler effort and behaviors (density-dependent and -independent catchability); an emergent property of this model will be sustainable exploitation rates under the various scenarios.

Lead Science Services scientist: Greg Sass

Collaborators: Brian Roth, Matt Catalano, Iyob Tsehaye, Quantitative Fisheries Center, Michigan State University; Mike Staggs, DNR Fish Management; Neil Kmiecek, Great Lakes Indian Fish and Wildlife Commission

Customer programs: Bureau of Fisheries Management

Project timeline: 2011 – 2012

Feeding habits of bowfin, gar, and largemouth bass: a comparative study between The Nature Conservancy's Emiquon Preserve, Illinois, Reelfoot Lake, Tennessee, and four Southeastern Wisconsin lakes

Project description: This study will continue previous research testing for the ability of gar, bowfin, and largemouth bass to suppress invasive common carp populations. Previous assessments of the Emiquon Preserve in Illinois and Reelfoot Lake, Tennessee suggest that relative abundances of gar and bowfin equal to or exceeding those of common carp may be sufficient to suppress this invasive from having negative ecosystem consequences. Analysis of diet contents from bowfin, gar, and largemouth bass are being used to test whether predation of YOY common carp is a plausible mechanism. This project will examine four southeastern Wisconsin lakes that vary in common carp, bowfin, and largemouth bass abundances to test for similar patterns across a latitudinal gradient.

Lead Science Services scientists: Greg Sass and John Lyons

Collaborators: Todd Van Middlesworth and Tim Spier, Western Illinois University; Brad Ray and Jack Grubaugh, University of Tennessee at Martin

Customer programs: Bureau of Fisheries Management

Project timeline: 2012 - 2013

Restoration of a brook trout fishery in Tenny Spring Creek using an artificial barrier

Project description: This study evaluates the utility of installing an artificial waterfall-type barrier to restore a brook trout population. Distribution of the native brook trout in Wisconsin streams has declined in part due to competition from non-native brown trout. Specific objectives of this study include evaluating changes in the trout population and stream fish community following restoration, evaluating movement across the stream barrier (upstream and downstream), and determining if brook trout restoration upstream of the barrier improves the brook trout population downstream of the barrier. We are also using the stocking of Tenny Spring Creek to evaluate the survival and growth of first generation (F1) versus second generation (F2) brook trout derived from a wild source population in Ash Creek.

Lead Science Services scientist: Matthew Mitro

Collaborators: Regional Bureau of Fisheries Management staff and U.S. Fish and Wildlife Service (SFR)

Customer programs: Bureau of Fisheries Management

Project timeline: 2008 – present

Brook and brown trout population response to in-stream habitat restoration

Project description: This study investigates the effect of stream habitat restoration on brook trout and brown trout populations. Research in Wisconsin has shown that where brook and brown trout populations coexist, brown trout have had a greater positive response than did brook trout to habitat improvement that added overhead cover for trout. This study tests if habitat improvement without overhead cover can improve brook trout populations in two streams where both species coexist. This study also evaluates how trout age structure and abundance varies among restoration sites, the role that environmental conditions and recruitment play in restoration success, and the implications for future monitoring of stream habitat development projects and the setting of recovery expectations. Results will help guide future trout stream restorations.

Lead Science Services scientist: Matthew Mitro

Collaborators: Gene Van Dyck and Jordan Weeks, regional Bureau of Fisheries Management staff; U.S. Fish and Wildlife Service (SFR), and Trout Unlimited

Customer program: Bureau of Fisheries Management

Project timeline: 2004 – present

Monitoring temporal trends in trout populations and base flow in streams

Project description: This study addresses two critical needs for trout stream management in Wisconsin: determining the utility of temporal trend reference sites as a component of baseline monitoring of coldwater, wadeable streams and understanding the role of stream flow (base flow and extreme flow events) and stream temperature in trout population dynamics. Trout population data from fixed sites sampled over time will be used to separate temporal and spatial variability in baseline monitoring data, which will facilitate the formulation of hypotheses to explain annual variability in trout recruitment and population dynamics. Trout population response to stream flow will assist in determining appropriate minimum flows for stream trout populations and in identifying risks to base flow and trout populations from changing land and groundwater use and from changing precipitation and climate regimes.

Lead Science Services scientists: Matthew Mitro

Collaborators: Jordan Weeks, regional Bureau of Fisheries Management staff; and U.S. Fish and Wildlife Service (SFR)

Customer program: Bureau of Fisheries Management

Project timeline: 2007 – present

Effects of known exploitation rates on trout population dynamics

Project description: This study will investigate the effects of a known exploitation rate on a brown trout population in Trout Creek. This study will document how

known changes in trout density attributable to exploitation and consistent with a maximum size limit regulation will affect population characteristics including abundance, size structure, recruitment, growth, and mortality. This type of information is critical to setting science-based angling regulations. This study will also document movement (or lack thereof) through the flood control structure on Trout Creek, which may be modified in the near future to specifically prevent upstream movement.

Lead Science Services scientist: Matthew Mitro

Collaborators: Gene Van Dyck, regional Bureau of Fisheries Management staff; and U.S. Fish and Wildlife Service (SFR)

Customer program: Bureau of Fisheries Management

Project timeline: 2011 - present

Development of inland trout population models

Project description: Project goals include developing population models to evaluate how different stressors, such as habitat degradation or loss and angler catch and release or harvest, may affect trout reproduction or growth or survival of trout in different size and age classes. Population models will incorporate trout ageing data from ongoing tagging studies to validate methods for determining trout age. Trout models will help in better understanding processes that regulate and factors that limit trout populations, and will provide a framework to rigorously evaluate trout fishing regulations and habitat management activities.

Lead Science Services scientist: Matthew Mitro

Collaborators: U.S. Fish and Wildlife Service (SFR)

Customer program: Bureau of Fisheries Management

Project timeline: 2008 – present



Trout survey in Elk Creek 2010.

Center for the Study of Fish Age and Growth

Project description: This project provides research support toward implementing the Wisconsin Fisheries Analysis Center—a cooperative effort between UW-Stevens Point faculty and WDNR research scientists and managers—which will provide three broad services of value to fisheries management in Wisconsin:

- 1) Analysis of fish population dynamics and quantitative fishery science metrics used by WDNR fisheries biologists and technicians in response to natural variation, management intervention, or human induced environmental change within Wisconsin and the region;
- 2) Quality assurance and quality control systems for fish age estimation; and
- 3) Technical training (seminars and short courses) for state fisheries professionals and technical staff (provided on a cost per trainee basis), and graduate students, including the development of distance education and certification programs that would increase accessibility for agency professional staff.

This project involves setting up and managing a fish ageing lab at the Science Operations Center as one of a network of labs statewide participating in the Fisheries Analysis Center partnership and providing guidance on annual fish ageing and analysis priorities. We are currently validating the use of otoliths to determine the age of brook trout and brown trout in Wisconsin streams by tagging known-age trout in multiple streams. We are also evaluating the use of scales, rays, and otoliths for determining the age of lake whitefish in Lakes Superior and Michigan.

Lead Science Services scientist: Matthew Mitro

Collaborators: Ron Bruch, Jon Hansen, Scott Hansen, and Michael Seider, Bureau of Fisheries Management staff; and Michael Hansen and Daniel Isermann, University of Wisconsin-Stevens Point; U.S. Fish and Wildlife Service (SFR)

Customer program: Bureau of Fisheries Management

Project timeline: 2009 – present

Hatchery and Fisheries Management support services

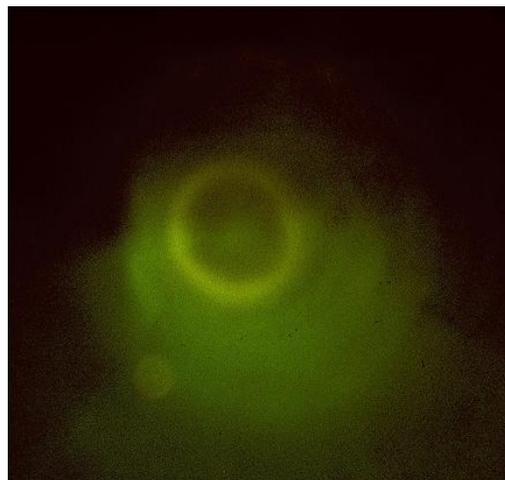
Project description: Standard hatchery practices are usually adequate to fulfill stocking needs defined in the annual Fish Production Plan. However, refinement of some practices is periodically required to reduce stress and improve condition of stocked fish. New protocols need to be developed to meet unforeseen challenges (e.g. new diseases) in the statewide production program. We will provide input on experimental design to evaluate production, harvesting and transportation alternatives to meet new challenges. We will support Fish Management stocking evaluations by documenting oxytetracycline (OTC) mark efficacy in hatcheries and examining field collection samples for OTC marks.

Lead Science Services scientist: Jeff Kampa

Collaborators: Regional Bureau of Fisheries Management staff and U.S. Fish and Wildlife Service (SFR)

Customer program: Bureau of Fisheries Management

Project timeline: 2009 – 2013



Oxytetracycline fluorescent mark on walleye fingerling otolith.

Cisco assessment and cisco-gamefish interactions in Wisconsin lakes

Project description: The cisco (*Coregonus artedii*) is a keystone species in lake food webs, providing important prey for several gamefish species. Cisco are also targeted by anglers, primarily during the winter. Cisco are not routinely monitored in WDNR surveys, and the status and trends of most Wisconsin populations is unknown. Threats to cisco include the invasive rainbow smelt, landuse trends that lead to depleted hypolimnetic oxygen, and warming temperatures. This project will survey lakes with historical records of cisco to assess current distribution. A subset of lakes will be monitored, and relations between cisco and gamefish will be modeled. Sampling will consist of variable mesh size vertical gillnets and hydroacoustics.



Martin Jennings and Jeff Kampa conducting field work.

Lead Science Services scientists: Martin Jennings, Jeff Kampa, John Lyons

Collaborators: Greg Sass, Gene Hatzenbeler

Customer program: Bureau of Fisheries Management

Project timeline: 2011 - 2017

Modeling bass-walleye interactions in northern Wisconsin lakes

Project Description: This study will develop ecological-simulation computer models that allow managers to examine how bass and walleye interact, particularly in terms of how they may prey on each other, compete for food and space, and respond differently to changes such as warmer temperatures, lower lake levels, different plant communities, and changes in shoreline land use. These models will then be used to explore how various fisheries management actions (e.g., regulation changes, stocking, habitat enhancement) might be used to favor one species or the other.

Lead Science Services scientists: Greg Sass and John Lyons

Collaborators: Bureau of Fisheries Management and regional Fisheries Management Staff; UW-Madison, Center for Limnology; UW-Stevens Point, College of Natural Resources, U.S. Geological Survey, Climate Change Research Program, U.S. Fish and Wildlife Service (SFR)

Customer Program: Bureau of Fisheries Management

Project Timeline: 2011 - 2016

Distribution and status of silver chub in the Lower Wisconsin and adjacent Mississippi rivers

Project Description: This project will determine the conservation status of the silver chub, a poorly-known and potentially rare fish, in Wisconsin. The study will document the distribution and abundance of the silver chub in the Lower Wisconsin River and adjacent areas (Pools 10 and 11) of the Mississippi River, the heart of the range of this species in the state. Surveys will involve refining a new trawling method to sample the silver chub, which is difficult to collect with conventional fisheries techniques.

Lead Science Services scientists: John Lyons

Collaborators: Bureau of Endangered Resources and regional Fisheries Management and Water Quality staff; UW-Madison, Center for Limnology; Friends of the Lower Wisconsin River; U.S. Fish and Wildlife Service (SWG)

Customer Program: Bureau of Endangered Resources

Project Timeline: 2011 - 2013



Silver chub from the Mississippi River.

Using otolith microchemistry to identify habitat use and seasonal movements by blue sucker in the Lower Wisconsin and Mississippi rivers in order to improve upstream passage operation and evaluation at the Prairie du Sac Dam

Project Description: This project will apply the powerful new technique of otolith microchemistry analysis to infer migration patterns and habitat use of the blue sucker throughout its life cycle in the Lower Wisconsin and Mississippi rivers. Inferences from the otolith analysis will be tested with targeted sampling of different life stages of the blue sucker in specific macrohabitats in the Lower Wisconsin and Mississippi rivers. Results of analyses and sampling will be used to develop and refine operating and evaluation guidelines for the Prairie du Sac Dam fish passage facility that will become operational in 2015.

Lead Science Services scientist: John Lyons

Collaborators: Bureau of Endangered Resources and regional Fisheries Management and Water Quality staff; UW-Madison, Center for Limnology; Friends of the Lower Wisconsin River; U.S. Fish and Wildlife Service (SWG)

Customer Program: Bureau of Endangered Resources, Fisheries Management, and Environmental Assessment

Project Timeline: 2011 - 2013

Genetics

Long-term viability of source populations of wild brook trout and brown trout for Wisconsin's wild trout stocking program

Project description: This study will develop a quantitative understanding of the long-term viability of wild brook trout and brown trout populations as source populations for Wisconsin's wild trout stocking program. The wild trout stocking program has become a highly successful and integral part of trout management in Wisconsin, but high and poorly understood utilization of the source populations and new challenges to fisheries management such as viral hemorrhagic septicemia threaten the viability of the program and our ability to meet annual wild trout stocking management objectives. This study will enable science-based management decisions that will work to ensure the long-term viability of a successful program. A captive brood stock of F1 brook trout was recently developed to produce F2 brook trout to supplement the stocking of F1 brook trout derived from wild Ash Creek brook trout. We are now evaluating the utility of stocking F2 brook trout in place of F1 brook trout to determine if this new source of eggs achieves the goals of the wild trout stocking program.

Lead Science Services scientist: Matthew Mitro

Collaborators: Gene Van Dyck, Jordan Weeks, Heath Benike, Sue Marcquenski, Bob Fahey, Mike Aquino, Kurt Welke, and John Komassa, regional Bureau of Fisheries Management staff; Brian Sloss, University of Wisconsin-Stevens Point Fisheries Coop Unit; U.S. Fish and Wildlife Service (SFR)

Customer program: Bureau of Fisheries Management

Project timeline: 2004 – present



Paul Kanehl and Stephanie Warnement surveying brook trout in Ash Creek, WI.

Muskellunge genetic characterization

Project description: This project characterized the population genetic structure of Wisconsin muskellunge. Science Service involvement includes coordination of field sampling, providing input for recommendations, and participation on M.S. committees of University of Wisconsin-Stevens Point students conducting genetic analyses in the lab.

Lead Science Services scientist: Martin Jennings

Collaborators: Brian Sloss (Principal Investigator); Regional Bureau of Fisheries Management staff, U.S. Fish and Wildlife Service (SFR), and University of Wisconsin-Stevens Point Fisheries Coop Unit

Customer program: Bureau of Fisheries Management

Project timeline: 2008 - 2010

Population genetic structure of nongame fishes

Project description: Genetic surveys of muskellunge and walleye demonstrated patterns of diversity inconsistent with watershed boundaries. These inconsistencies may be the result of natural zoogeographic processes or past management practices. Surrogate species that are not actively managed or widely used as bait should reflect the diversity patterns expected from natural zoogeographic processes. Johnny darters and rock bass genetic structure are being evaluated to infer natural genetic diversity patterns of fishes in the region of interest, the headwaters of the Chippewa and Wisconsin River drainages in northern Wisconsin.

Lead Science Services scientist: Martin Jennings.

Customer program: Brian Sloss and Laci Westbrook (UW-Stevens Point and WCFRU); Bureau of Fisheries Management

Project timeline: 2010 - 2012

Brook trout genetic characterization

Project description: We developed DNA microsatellite profiles for brook trout from tributary stream and hatchery populations used in the Lake Superior basin. These genetic markers can distinguish fish from different populations, which is useful for identifying source populations of migratory or "coaster" brook trout encountered in Lake Superior. We are ready to evaluate samples of any brook trout sampled in Wisconsin waters of the lake at the University of Wisconsin-Stevens Point fisheries genetics lab.

Lead Science Services scientist: Martin Jennings

Collaborators: Brian Sloss (University of Wisconsin-Stevens Point Cooperative Fishery Research Unit) and Regional Fisheries Management staff, University of

Wisconsin-Stevens Point Fisheries Coop Research Unit, and U.S. Fish and Wildlife Service (SFR)

Customer program: Bureau of Fisheries Management

Project timeline: 2006 – present

Research Publications

The professionals employed by the Fisheries and Aquatic Sciences Research Section routinely publish the results of their work in technical reports and peer-reviewed journals, serials, monographs, and books produced by scientific societies and other publishers. They also make their findings available to people who make and influence decisions about natural resources and environmental management through internal reports, impact assessment and guidance documents, brochures, fact sheets, and informational leaflets. A subset of staff publications appearing in print during 2010 through 2012 are listed below. We list customer programs benefiting directly from the work and briefly overview the significance/management implications of each effort.

2012

U.S. Fish and Wildlife Service. 2012. National Fish, Wildlife and Plants Climate Adaptation Strategy. (R. Lathrop was a contributing author to the report based on his membership of the "Inland Waters" Technical Team.)

Customer programs: Bureau of Water Quality, Bureau of Fisheries Management, Bureau of Wildlife Management, Bureau of Air Management, Bureau of Forestry.

Significance/management implications: This national assessment on the impacts of climate change on fish, wildlife and plants has implications for Wisconsin through various federal programs. In turn, work that had been completed as part of WICCI's first adaptive assessment was useful for developing the national strategy that highlighted regional impacts including examples from Wisconsin.

Watras, C.J., Morrow, M., Morrison, K., Scannell, S., Yazicioglu, S., Hanson, P., Read, J.S., Hu, Y-H. 2012. Wetland Observatories: monitoring the impact of weather and climate on hydrochemical dynamics with wireless sensor networks (WSNs). (in review)

Garrison, P.J. and G. LaLiberte. 2012. Paleoecological Study of Shell Lake, Washburn County. Wisconsin Department of Natural Resources. PUB-SS-1088 2011. 19 pp.

Garrison, P.J. 2012. Paleoecological Study Dunes Lake, Door County and Water Quality Assessment of 3 Nearby Streams. Wisconsin Department of Natural Resources. PUB-SS-1093 2012. 16 pp.

O'Donnell, D. M., S. W. Effler, M. G. Perkins, C. M. Strait, Z. Lee and S. Greb. 2012. Resolution of optical gradients and pursuit of optical closure for Green Bay, Lake Michigan. Journal of Great Lakes Research (in review).

Customer Program: Bureau of Watershed Management

Significance/Management Applications: Compares methodology for optical methods. Important for model building of satellite algorithms used to measure water quality from space.

Weigel, B.M. 2012. Water Quality Bureau Stream Monitoring Framework 2012 and Beyond. Wisconsin Department of Natural Resources, Madison, Wisconsin.

Lyons, J. 2012. Development and validation of two fish-based indices of biotic integrity for assessing perennial coolwater streams in Wisconsin, USA. Ecological Indicators 23:402-412.

Customer programs: Bureaus of Watershed and Fisheries Management

Significance/management implications: Provides tools to use to assess the ecological health of coolwater streams, which are the most common and widespread stream type in the state. These IBI's will be incorporated into the standard stream monitoring and evaluation program for Water Quality.

Sass, G.G., S.R. Carpenter, J.E. Gaeta, J.F. Kitchell, and T.D. Ahrenstorff. 2012. Whole-lake addition of coarse woody habitat: response of fish populations. Aquatic Sciences-Research Across Boundaries 74:255-266.

Customer programs: Bureau of Fisheries Management

Significance/management implications: Lakeshore residential development (LRD) reduces coarse woody habitat (CWH) in lakes resulting in negative effects on fishes. We tested whether the addition of CWH could reverse those effects. We added CWH to Camp Lake, a lake with CWH abundances similar to developed lakes, following 2 years of study of the fish populations in the reference and treatment basins. Both basins were monitored for 4 years following the manipulation. Specifically, we tested for changes in the population dynamics (densities, size-structure, growth), diet, and behavior (habitat use) of bluegill (*Lepomis macrochirus*) and largemouth bass (*Micropterus salmoides*). CWH addition had no discernible effect on fish population dynamics. Diet and behavioral responses were more pronounced in the treatment basin. Prey diversity and availability increased. Piscivory increased, with decreased reliance upon terrestrial prey, for largemouth bass. Habitat use was positively correlated with CWH branching complexity and abundance. Our study suggests that negative effects observed in fish populations through CWH reductions cannot be reversed in the short-term by adding CWH. We recommend that regulations governing the LRD process be protective of CWH.

Lyons, J., editor. 2012. Fishes of Wisconsin E Book. Author of chapters of smallmouth bass and pugnose shiner. Wisconsin Department of Natural

**Resources, Madison, and U. S. Geological Survey, Middleton, WI ,
<http://www.fow-ebook.us>**

Customer programs: Bureaus of Fisheries Management, Endangered Resources, and Water Quality

Significance/management implications: Provides a complete and up-to-date reference on all that is known about each species of Wisconsin fish, including nomenclature, taxonomy and systematics, identification, morphology and variation, status and abundance, distribution, habitat, ecology, development, diet, and importance and management. The web format allows easy access and accommodates regular updates of information.

Jennings, M.J. 2012. Longear sunfish *Lepomis megalotis*. Fishes of Wisconsin website, in press.

Mitro, M. G. In Press. Statistical methods for determining significant change. Chapter 5 in C. Jones, editor. Fishers and Farmers Monitoring Protocol.

Spacapan, M., C.A. Miller, and G.G. Sass. 2012. An evaluation of river usage in the Mississippi River basin following the invasion of Asian carp. Northeast Recreation Research Symposium, Cooperstown, New York, USA.

Sass, G.G., J.H. Chick, and B.S. Ickes. 2012. Setting quantitative fish management targets for the Upper Mississippi River System. LTRMP technical report (in press).

Sass, G.G., T.R. Cook, K.S. Irons, M.A. McClelland, N.N. Michaels, and T.M. O'Hara 2012. Experimental and comparative approaches to determine factors supporting or limiting submersed aquatic vegetation in the Illinois River and its backwaters. LTRMP technical report (in press).

McClelland, M.A. and G.G. Sass. 2012. Assessing fish collections from random and fixed site sampling methods on the Illinois River. Journal of Freshwater Ecology, 1-9, iFirst.

Customer programs: Bureau of Fisheries Management

Significance/management implications: The fish assemblage of the Illinois River is monitored annually through a long-term electrofishing (LTEF) program. Through the LTEF program, fish species composition and abundances are examined in six navigation reaches using a fixed site sampling design. We added a series of random sites to the LTEF sampling program in 2005 and 2007 to supplement current monitoring efforts. We used random and fixed site samples to assess fish species richness, relative abundance, and species-specific contributions to catches. We collected 17,537 fish from both sampling designs. Total fish and mean catch

per hour was greater for fixed sampling (10,221 and 379.1, respectively) compared to random sampling (7316 and 259.6, respectively). Total fish species richness was 70, with 63 and 62 species collected through fixed and random samplings, respectively. Fish species diversity and evenness was greater for fixed site sampling. Eight fish species were unique to the fixed site design with seven fish species unique to random sampling. Fish assemblage analyses showed that catches for each sampling design contained a similar base set of species. Our results suggest that the goals of specific long-term monitoring programs may dictate the sampling method to be used. Whereas fixed site sampling may be biased toward potentially more and a greater diversity of fishes, random site selection will be unbiased and may provide greater spatial coverage.

Garvey, J.E., G.G. Sass, J. Trushenski, D. Glover, P.M. Charlebois, J. Leavengood, B.M. Roth, G. Whitledge, B.C. Small, S.J. Tripp, and S. Secchi. 2012. Fishing down the bighead and silver carps: reducing the risk of invasion to the Great Lakes. Final report to the Illinois Department of Natural Resources.

Van Middlesworth, T.D., N.N. Michaels, and G.G. Sass. 2012. Fish and aquatic vegetation monitoring of The Nature Conservancy's Emiquon Preserve. Illinois Natural History Survey Technical Report 2012 (01). Ruebush, B.C., G.G. Sass, J.H. Chick, and J.D. Stafford. 2012. *In situ* tests of sound-bubble-strobe light barrier technologies to prevent range expansions of Asian carp. *Aquatic Invasions* 7:37-48.

Customer programs: Bureau of Fisheries Management

Significance/management implications: In 2009-2010, we tested the effectiveness of a SBSLB at repelling Asian and non-Asian carp species (all other fishes tested) within Quiver Creek, a tributary to the Illinois River. To test barrier effectiveness, Asian carp and non-Asian carp species were removed from upstream of the barrier, marked, and released downstream of the SBSLB. Asian carp were also collected from the mainstem Illinois River and transplanted downstream of the barrier. Trials were conducted with the SBSLB ON and OFF to determine upstream passage rates. Short-term and extended trials were also conducted to test for differences in upstream passage rates using sound, bubbles, and strobe lights (flashing and not flashing) versus sound and bubbles only. Barrier effectiveness was evaluated by upstream recaptures. Two of 575 marked silver carp and 85 of 2,937 marked individuals of other fish species breached the barrier and were recaptured. No marked bighead carp (n=101) made upstream passage. Our results suggest that SBSLB technologies could be used as a deterrent system to repel Asian carp, but should not be used as an absolute barrier to prevent range expansions. Potential negative influences of this technology on non-target fishes must also be evaluated prior to implementation as a management tool.

Piette, R., A. Niebur. 2012. Red River Freshwater Mussel and Fisheries Assessment for Relicensing the Gresham Municipal Utilities Upper Red lake (FERC No. 2484) and Weed Dam (FERC No. 2464) Hydroelectric Projects. Wisconsin Department of Natural Resources Report.

Piette, R. 2012. Freshwater Mussel Survey Report: Mill Creek. Wisconsin Department of Natural Resources Survey Report.

Piette, R. 2012. Freshwater Mussel Report: Highway 49 Bridge crossing of Little Wolf River. Wisconsin Department of Natural Resources Report.

Piette, R. 2012. Freshwater Mussel Survey Report: Iola, Wisconsin. Wisconsin Department of Natural Resources Report.

Piette, R. 2012. Freshwater Mussel Survey Report: Milwaukee River, Campbellsport, Wisconsin. Wisconsin Department of Natural Resources Report.

Piette, R. 2012. Fox River Mussel Survey – Grand River Locks. Wisconsin Department of Natural Resources Report.

Piette, R. 2012. Freshwater Mussel Survey report: Wolf River. Wisconsin Department of Natural Resources Report.

Moerke, A., J. Mistak, R. Piette, and A. Selle. 2012. Final Report: Little Quinnesec Fisheries Settlement Project. Wisconsin Department of Natural Resources Project Final Report.

Nault, M. 2012. Governor's Council on Invasive Species and Wisconsin DNR - Technical Reviews of 42 Potentially Invasive Aquatic Plants and Algae in Wisconsin. Wisconsin Department of Natural Resources Bureau of Science Services, PUB-SS-XXXX 2012. Madison, Wisconsin, USA.

Customer program: Bureau of Water Quality and Bureau of Fisheries Management

Significance/management implications: Extensive literature reviews were conducted and information compiled on Wisconsin-specific threats posed by 42 aquatic invasive species. Environmental tolerances, reproductive potential, current distributions, and management options were studied. These reviews were used by stakeholder species assessment groups in developing recommendations for additional species to list under NR 40. Internal and external resource managers continue to use this resource as a source of information on aquatic invasive species and management.

Nault, M., A. Mikulyuk, J. Hauxwell, J. Skogerboe, T. Asplund, M. Barton, K. Wagner, T. Hoyman, and E. Heath. 2012. Herbicide Treatments in Wisconsin Lakes. NALMS LakeLine 32:21-26.

Customer program: Bureau of Water Quality and Bureau of Fisheries Management

Significance/management implications: For the past several years, the U.S. Army Corps of Engineers and Wisconsin Department of Natural Resources have worked in collaboration with various stakeholders, as well as academic and agency scientists and resource managers to develop and implement plans for strategic and efficient control of Eurasian watermilfoil (*Myriophyllum spicatum*) utilizing whole-lake, early season 2,4-D herbicide treatments. We have conducted preliminary analysis of aquatic plant community responses following herbicide applications on a diverse subset of lakes and flowages throughout Wisconsin, and are in the process of developing best management practices and recommendations for improving control of invasive aquatic plants while minimizing non-target damage to native species.

Wagner, K. and A. Mikulyuk. 2012. Rapid Macrophyte Habitat Assessment Methodology. Wisconsin Department of Natural Resources Bureau of Science Services, PUB-SS-XXXX 2012. Madison, Wisconsin, USA.

Customer program: Bureau of Water Quality

Significance/management implications: The document outlines a protocol for sampling aquatic macrophytes that is fast (~ 2 hrs per lake) and doesn't require taxonomic knowledge of aquatic plants. After additional work that Science Services will be conducting in 2012, the protocol may be incorporated as a Tier I Monitoring protocol for plants.

2011

Lathrop, R., J. Magnuson, E. Katt-Reinders, S. Pomplun, A. Coulson, S. Dunwoody, D. Liebl, T. Sinclair, J. Sullivan, D. Watermolen, D. Webb, C. Anderson, T. Asplund, C. Betz, W. Bland, G. Clark, A. Dorland, S. Gayan, H.J. Harris, D. Hart, J. Hurley, G. Kraft, C. Kucharik, J. LaGro, O. LeDee, J. Lyons, K. Martin, S. McLellan, M. Meyer, M. Mitro, P. Moy, P. Nowak, J. Patz, K. Potter, D. Vimont, and W. Walker. 2011. Wisconsin Initiative on Climate Change Impacts. Wisconsin's changing climate: impacts and adaptation. UW Nelson Institute for Environmental Studies and Wisconsin Dept. Natural Resources. (R. Lathrop was a contributing author, an Editorial Team member, and Co-Chair of the Science Council for WICCI that produced the report.)

Customer programs: Bureau of Water Quality, Bureau of Fisheries Management, Bureau of Wildlife Management, Bureau of Air Management, Bureau of Forestry, DNR Regions.

Significance/management implications: This publication is the first adaptive assessment report released in 2011 by the Wisconsin Initiative on Climate Change Impacts (WICCI). The report identifies vulnerabilities and impacts due to climate change in Wisconsin including sectors of management responsibility for the DNR.

McClelland, M.A., K.S. Irons, G.G. Sass, T.M. O'Hara, and T.R. Cook. 2011. A comparison of two electrofishing programmes used to monitor fish on the Illinois River, Illinois, USA. River Research and Applications DOI:10.1002/rra.1590

Customer programs: Bureau of Fisheries Management

Significance/management implications: The Illinois River Biological Station monitors fish communities in the Illinois River using two different electrofishing programs, one using three-phase AC (The Long-term Illinois Fish Population Monitoring Program, LTEF) and the other pulsed-DC (The Long-term Resource Monitoring Program, LTRMP). In 2001, we replicated three-phase AC sampling sites with pulsed-DC electrofishing gear to test for differences between the two collection methods and programs. Electrofishing runs at each site were standardized by length and time, with 48 samples collected for each gear. Our objective was to test for differences in fish catch rates using total catch, species richness, fish size ranges, and sample composition and structure. Total catch was significantly greater for LTRMP electrofishing (4,368 total fish, mean = 91.0 fish per sample) compared to LTEF electrofishing (1,423 total fish, mean = 29.6 fish per sample). Species richness was also significantly greater for LTRMP electrofishing (50 total species, mean = 12.9 species per site) compared to LTEF electrofishing (38 total species, mean = 7.9 species per site). Size ranges of fishes, comprised of 100 mm length groups, showed higher total catches for the LTRMP within all length groups. Although our analyses suggest that collections from the LTRMP were significantly greater in most instances, a consistent pattern of species composition between the two programs was not evident. Our results suggest that caution must be taken when attempting to compare fish community composition and structure information between these programs.

Mitro, Matthew G., John Lyons, and Sapna Sharma. 2011. Executive summary: coldwater fish and fisheries. Pages 170-173 in E. Katt-Reinders, editor. Wisconsin's changing climate: impacts and adaptations. Wisconsin Initiative on Climate Change Impacts. Nelson Institute for Environmental Studies, University of Wisconsin-Madison and the Wisconsin Department of Natural Resources, Madison, Wisconsin.

Mitro, Matthew G., John Lyons, and Sapna Sharma. 2011. Wisconsin Initiative on Climate Change Impacts: Coldwater Fish and Fisheries Working Group Report. 31 pages.

Customer programs: Bureaus of Fisheries Management and Water Quality

Significance/management implications: Our working group report details our assessment of the potential impacts of climate change on coldwater fish and fisheries in Wisconsin. Modeling results based on changes in air and stream temperatures suggest climate warming will cause significant declines in inland trout populations in streams, with the possibility of brook trout becoming extirpated under a worst-case climate change scenario. Modeling results also suggest significant declines in cisco in Wisconsin's coldwater lakes. We also present adaptation strategies, many of which are supported by research conducted by Science Services staff, which can be used to lessen the impacts of climate change on coldwater fishes.

Pomplun, S., R. Lathrop, A. Coulson, and E. Katt-Reinders. 2011. Managing our future: Getting ahead of a changing climate. Wisconsin Natural Resources. February 2011:20-25.

Customer programs: Bureau of Water Quality, Bureau of Fisheries Management, Bureau of Wildlife Management, Bureau of Air Management, Bureau of Forestry, DNR Regions.

Significance/management implications: This publication gives an overview of the first adaptive assessment report released in 2011 by the Wisconsin Initiative on Climate Change Impacts (WICCI). The report identifies vulnerabilities and impacts due to climate change in Wisconsin including sectors of management responsibility for the DNR.

Jennings, M.J., G.R. Hatzenbeler, and J.M. Kampa. 2011. Spring capture site fidelity of adult muskellunge in inland lakes. North American Journal of Fisheries Management 31:461-467.

Customer program: Fisheries Management

Significance/management implications: Sampling for muskellunge is usually conducted with fyke nets during the spring, when adult fish are found in or near suitable spawning habitat. Population estimation for muskellunge is done with a mark-recapture estimate conducted over two years of netting. The method assumes that marked and unmarked fish are equally vulnerable to the recapture effort. The results demonstrated that most fish are found in the same areas in which they were marked, indicating that recapture effort needs to be randomly distributed. In addition, the results suggest that netting effort to capture broodstock will be less likely to resample the same individuals if effort is distributed to different areas of the lake. This is an important sampling consideration to meet genetic diversity goals in the propagation program.

Weigel, B.M. 2011. Introduction to standardized collection and assessment of macroinvertebrates in nonwadeable rivers of Wisconsin. Wisconsin Department of Natural Resources, Madison, Wisconsin.

Weigel, B.M. 2011. Optimization of the Water Quality Bureau stream monitoring design for resource assessment and cost efficiency. Leadership Academy, Wisconsin Department of Natural Resources, Madison, Wisconsin.

Weigel, B.M., and J.J. Dimick. 2011. Development, validation, and application of a macroinvertebrate-based index of biotic integrity for nonwadeable rivers of Wisconsin. Journal of the North American Benthological Society 30:665-679.

Customer program: Water Quality Bureau, Upper Mississippi River Conservation Committee, US EPA.

Significance/management implications: The macroinvertebrate IBI is intended to provide an efficient and effective tool for quantifying the impairment of rivers in Wisconsin. It is proposed for use in Water Quality Bureau Comprehensive Monitoring Strategy and Wisconsin Consolidated Assessment and Listing Methodology (WisCALM) for US Clean Water Act Reporting, and biocriteria for the Upper Mississippi River.

Jennings, M.J., G.R. Hatzenbeler, and J.M. Kampa. 2011. Threatened fishes of the upper St. Croix River drainage. Final report, State Wildlife Grants Program.

Customer program: Endangered Resources

Significance/management implications: This project provided updated survey information on two species of greatest conservation need (SGCN) in northwestern WI. The results were used in species status assessments for three state-threatened species. Recommendations based on the project were to maintain state threatened status for the gilt darter and river redhorse, and change the listing status of the greater redhorse from threatened to special concern.

Van Middlesworth, T.D., N.N. Michaels, and G.G. Sass. 2011. Fish and aquatic vegetation monitoring of The Nature Conservancy's Emiquon Preserve. Illinois Natural History Survey Technical Report 2011 (06).

Nate, N., M.J. Hansen, L.G. Rudstam, R.L. Knight, and S.P. Newman. 2011. Population and community dynamics of walleye. In: B.A. Barton (editor-in-chief), *Biology, Management, and Culture of Walleye and Sauger*. American Fisheries Society. Bethesda, Maryland.

Schmaltz, P.J., A.H. Fayram, D.A. Isermann, S.P. Newman, and C.J. Edwards. 2011. Harvest and exploitation. In: B.A. Barton (editor-in-chief), *Biology, Management, and Culture of Walleye and Sauger*. American Fisheries Society. Bethesda, Maryland.

Mitro, M., J. Lyons, and S. Sharma. 2011. Wisconsin Initiative on Climate Change Impacts: Coldwater Fish and Fisheries Working Group Report. 31 pages.

Lyons, J. 2011. Pugnose shiner, *Notropis anogenus*. Online account in: Lyons, J., editor. 2012. *Fishes of Wisconsin E Book*. Wisconsin Department of Natural Resources, Madison, and U. S. Geological Survey, Middleton, WI, <http://www.fow-ebook.us>

Lyons, J. 2011. Smallmouth bass, *Micropterus dolomieu*. Online account in: Lyons, J., editor. 2012. *Fishes of Wisconsin E Book*. Wisconsin Department

of Natural Resources, Madison, and U. S. Geological Survey, Middleton, WI, <http://www.fow-ebook.us>

Roth, B.M., T.R. Hrabik, G.G. Sass, J. Peters, and N.E. Mandrak. 2011. Fish and decapods crustaceans of the Great Lakes basin. In: Great Lakes Fisheries Science and Policy, 2nd Edition. W.W. Taylor, N.J. Leonard, and A. Lynch (eds). Michigan State University Press, East Lansing, Michigan

Irons, K.S., G.G. Sass, M.A. McClelland, and T.M. O'Hara. 2011. The long-term resource monitoring program: insights into the Asian carp invasion of the Illinois River, Illinois, USA. In: Invasive Asian Carps in North America. D.C. Chapman and M.H. Hoff (eds.). American Fisheries Society Symposium 74. Bethesda, Maryland. pp. 31-50.

Wang, L., D. Infante, J. Lyons, J. Stewart, and A. Cooper. 2011. Effects of dams in river networks on fish assemblages in non-impoundment sections of rivers in Michigan and Wisconsin, USA. *River Research and Application* 27:473-487.

Customer programs: Bureaus of Fisheries Management and Water Quality

Significance/management implications: Documents how river fragmentation by dams has affected and modified fish communities in non-impounded portions of rivers and describes a methodological framework for assessing dam effects in river systems. After taking into account natural variation, dams had small to moderate effects on fish communities even in rivers reaches far from dams, illustrating the ecological impacts of river fragmentation.

Gaeta, J.W., M.J. Guarascio, G.G. Sass, and S.R. Carpenter. 2011. Lakeshore residential development and growth of largemouth bass (*Micropterus salmoides*): a cross-lakes comparison. *Ecology of Freshwater Fish* 20:92-101.

Customer program: Bureau of Fisheries Management

Significance/management implications: Lakeshore residential development tends to decrease the amount of littoral habitat in lakes. In this study, growth rates of small largemouth bass were positively correlated with lakeshore residential development. This relationship was opposite for largemouth bass greater than 210 mm. Our results, relative to undeveloped lakes, indicated that largemouth bass in highly developed lakes would take 1.5 growing seasons longer to enter the fishery (356 mm).

Ahrenstorff, T.D., T.R. Hrabik, J.D. Stockwell, D.L. Yule, and G.G. Sass. 2011. Seasonally dynamic diel vertical migrations of *Mysis diluviana*, coregonine fishes, and siscowet lake trout in the pelagia of western Lake Superior. *Transactions of the American Fisheries Society* 140:1504-1520.

Customer program: Bureau of Fisheries Management

Significance/management implications: This study assessed seasonal and interannual changes in vertical migration patterns of three trophic levels in the Lake Superior pelagic food web and examined the mechanisms underlying the observed variability by using models of foraging, growth, and μ . Our results suggest that the opossum shrimp *Mysis diluviana*, kiyi *Coregonus kiyi*, and siscowet lake trout *Salvelinus namaycush* migrate concurrently during each season, but spring migrations are less extensive than summer and fall migrations. In comparison with *M. diluviana*, kiyis, and siscowets, the migrations by ciscoes *C. artedi* were not as deep in the water column during the day, regardless of season. Foraging potential and μ probably drive the movement patterns of *M. diluviana*, while our modeling results indicate that movements by kiyis and ciscoes are related to foraging opportunity and growth potential and receive a lesser influence from μ . The siscowet is an abundant apex predator in the pelagia of Lake Superior and probably undertakes vertical migrations in the water column to optimize foraging efficiency and growth. The concurrent vertical movement patterns of most species are likely to facilitate nutrient transport in this exceedingly oligotrophic ecosystem, and they demonstrate strong linkages between predators and prey. Fishery management strategies should use an ecosystem approach and should consider how altering the densities of long-lived top predators produces cascading effects on the nutrient cycling and energy flow in lower trophic levels.

Weis, J.J. and G.G. Sass. 2011. Largemouth bass nest site selection in small, north temperate lakes varying in littoral coarse woody habitat abundances. North American Journal of Fisheries Management 31:943-951.

Customer program: Bureau of Fisheries Management

Significance/management implications: To test for a relationship between nest site selection or nest density and the abundance of littoral CWH, we monitored largemouth bass nest site selection in the littoral zones of two small, northern Wisconsin lakes (comprising a total of three separated basins) for three consecutive spawning seasons. Our study sites varied in natural and manipulated abundances of CWH; spawning seasons before and after a whole-basin CWH reduction or a whole-basin CWH addition were examined. Within basin analysis provided some evidence that local variation in CWH abundance influenced local nest density; however, this relationship was only significant for one basin in a single season. Among basins and across seasons, we observed a positive but nonsignificant effect of littoral CWH density on nest density and inconsistent responses to the CWH manipulations. Although littoral CWH is an important habitat feature influencing fish populations, communities, and life histories, our results suggest that CWH did not directly limit largemouth bass nest densities and was not a strong driver of nest site selection in these lakes. Nevertheless, policies allowing human mediated removals of CWH from freshwater systems may still be detrimental to fish communities and other taxa that are dependent upon CWH.

Sharma, S., M.J. Vander Zanden, J.J. Magnuson, and J. Lyons. 2011. Comparing climate change and species invasions as drivers of coldwater fish population extirpations. PLoS ONE 6(8):e22906. 9 pages.

Customer programs: Bureau of Water Quality and Bureau of Fisheries Management

Significance/management implications: Describes the expected decline in distribution of cisco in response to a warming climate. Cisco are a keystone species in many deep lakes, where they serve as important prey for gamefish such as muskies and walleyes, and can modify zooplankton communities, and indirectly phytoplankton and water quality, so their possible loss has major implications for lake management. Threats to cisco from climate change are contrasted with threats from invasive rainbow smelt, which is predicted to have a much smaller impact on cisco populations statewide.

Piette, R., and A. Niebur. 2011. Movement of adult male flathead catfish in the Upper Fox River and Wolf River systems determined by radiotelemetry. American Fisheries Society Symposium 77:455-471.

Customer programs: Fisheries Management

Significance/management implications: Forty four male flathead catfish were tracked over a 3-year period, yielding important information on annual ranges and seasonal locations, timing and habitat preferences. Fish showed strong river and site fidelity returning to the same river reach and often the same woody structure in successive years during spawning and summer period. This study provides important management implications for protecting and maintaining sustainable populations of this species.

Piette, R. 2011. Lower Menominee River Freshwater Mussel Survey, Summary of 2011 Results. Wisconsin Department of Natural Resources Report.

Watras, C. J., P.C. Hanson, T.L. Stacy, K.M. Morrison, J. Mather, Y-H Hu and P. Milewski. 2011. A temperature compensation method for CDOM sensors in freshwater. Limnology and Oceanography, Methods 9:296-301.

Customer programs: Bureau of Water Quality, Bureau of Air Management

Significance/management implications: One consequence of climate change in Wisconsin will likely be an acceleration of the aquatic carbon cycle. Optical sensors can be used to monitor high-frequency changes in this cycle, provided the effect of extraneous environmental variables on sensor output can be constrained. This paper presents an algorithm that can be used to compensate for the effects of temperature on commonly used CDOM sensors; and it shows how temperature compensation affects the interpretation of field data from Wisconsin lakes.

Meyer, M.W., P.W. Rasmussen, C.J. Watras, B.M. Fevold and K.P. Kenow. 2011. Bi-phasic trends in mercury loon concentrations in blood of Wisconsin loons during 1992-2010. Ecotoxicology 20(7):1659-1668.

Customer programs. Bureau of Air Management, Bureau of Fisheries Management, Bureau of Water Quality, Bureau of Wildlife Management

Significance/management implications This paper reports a trend reversal in time series data on loon mercury concentrations, and it builds on a previously reported link between the aquatic cycle of methyl mercury and the water cycle in northern Wisconsin (Watras and Morrison, 2008. CJFAS 65: 100-116). In the earlier paper, it was reported that rates of methylmercury production had increased in Little Rock Lake during a period of extreme drought due to sulfate mobilization from exposed littoral sediments. In the present paper, this result is generalized to bioaccumulation by loons across the northern lake region.

Greb, S. 2011. Measuring Water Clarity: Volunteers Clearly Make a Difference. Lake Tides, Vol. 36, No. 1

Customer programs: Lake Home Owners, Lake Associations, extension staff

Significance/management implications: Educational materials for citizen-based monitoring.

Lathrop, R.C., and S.R. Carpenter. 2011. Phosphorus loading and lake response analyses for the Yahara lakes. Yahara CLEAN project.

Garrison, P.J. 2011. Evaluation of the Bad River Wetlands—2006. Wisconsin Department of Natural Resources. PUB SS-1084 2011. 23 pp.

Customer programs: Bad River Band of the Lake Superior Tribe of Chippewa Indians

Significance/management implications: This is a continuance of previous assessment of these wetlands.

Garrison, P.J. 2011. Paleoecological Study of Honest John Lake, Ashland County. Wisconsin Department of Natural Resources. PUB-SS-1085 2011. 12 pp.

Customer programs: Bad River Band of the Lake Superior Tribe of Chippewa Indians

Significance/management implications: Prior to 1970, this lake was classified as oligotrophic with phosphorus concentrations of less than 15 µg L⁻¹. With increased development in the lake's watershed, nutrient levels increased and at the present time are 3-4 times greater.

Garrison, P.J. 2011. Paleoecological Study of Bear Trap Slough, Ashland County. Wisconsin Department of Natural Resources. PUB-SS-1087 2011. 10 pp.

Customer programs: Bad River Band of the Lake Superior Tribe of Chippewa Indians,

Significance/management implications: The core indicated that phosphorus levels have not changed significantly in this core during the last 100 years. Nitrogen levels may have increased and it is likely that sediment deposition has increased.

Garrison, P., S. Kaplan, and G. LaLiberte. 2011. Max Lake Sediment Core Report to the Wisconsin Focus on Energy. Wisconsin Department of Natural Resources. 11 pp.

Customer programs: Bureau of Water Quality, Focus on Energy, WICCI,

Significance/management implications: The time period of this core is the entire life of the lake which is about 13,000. Prior to the mid-Holocene warm period, the lake was likely part of a much larger lake. As a consequence, the lake had higher pH values and greater phosphorus concentrations. During the warming period, the lake level dropped and the lake became isolated from the larger lake. This resulted in the lake becoming a seepage lake with little contact with the groundwater. The level of the pH declined to where the lake became an acidic lake. This study implies that if the regional climate becomes warmer as most GCMs indicate, headwater drainage lakes may become seepage lakes which could result in profound changes in the lake's biota.

Nault, M., A. Mikulyuk. 2011. Aquatic Invasive Species: Technical Reviews of Distribution, Ecology, Impacts, and Management. Australian Swamp Stonecrop (*Crassula helmsii*). Wisconsin Department of Natural Resources - [PUB-SS-1078 2011].

Mikulyuk, A., S. Sharma, S. Van Egeren, E. Erdmann, M.E. Nault, J. Hauxwell. 2011. The relative role of environmental, spatial, and land-use patterns in explaining aquatic macrophyte community composition. Canadian Journal of Fisheries and Aquatic Sciences 68:1778-1789.

Customer program: Bureau of Water Quality and Bureau of Fisheries Management

Significance/management implications: This study is the first to quantify and compare the relative strengths of anthropogenic landuse disturbances, environmental, and spatial variation in determining aquatic plant community composition. This work describes complex and collinear relationships between predictor variables and community response. Multi-scale patterns in alkalinity, water clarity, and soil erodibility drive aquatic plant communities and place constraints on management, which recommends a regional nesting of management approaches.

2010

Betz, C.R., T. Asplund, J. Hurley, T. Bernthal, A. Coulson, E. Erdmann, P. Garrison, S. Greb, B. Hansis, D. Higgins, R. Hunt, P. Juckem, E. O'Brian, D. Robertson, C. Wolbers. 2010. Water Resources Working Group. Wisconsin Initiative on Climate Change Impacts. (Working group reviewers: J. Hauxwell and D. Higgins; WICCI Science Council Reviewers: S. Dunwoody, B. Johnson, and J. Kutzbach). UW Nelson Institute for Environmental Studies and Wisconsin Dept. Natural Resources.

Lyons, J., J. Stewart, and M. Mitro. 2010. Predicted effects of climate warming on the distribution of 50 stream fishes in Wisconsin, USA. Journal of Fish Biology 77:1867-1898.

Customer programs: Bureaus of Fisheries Management and Water Quality

Significance/management implications: Describes a detailed quantitative ecological model that allows prediction of effects of climate and land-use change on all streams and rivers in Wisconsin and then uses this model to projects impacts of climate warming on the occurrence and distribution of the 50 most-common stream fishes in the states. Results suggest that climate warming will cause great declines in cold water and cool water species and moderate gains for warm water species. Overall losses will be much greater than overall gains, and many small streams will see losses of diversity and fisheries.

Jennings, M., B. Sloss, G. Hatzenbeler, J. Kampa, T. Simonson, S. Avelallemant, G. Lindenberger, and B. Underwood. 2010. Implementation of genetic conservation practices in a muskellunge propagation and stocking program. Fisheries 35:388-395.

Customer program: Bureau of Fisheries Management

Significance/management implications: Genetic conservation is an important management issue, but implementation of recommendations to conserve genetic diversity often faces obstacles. This paper details many of the practical issues dealing with implementation, and demonstrates workable approaches to improving genetic conservation.

Weigel, B.M. 2010. Wadeable streams monitoring program: Site selection 2010-2015 using a GRTS and Natural Communities framework. Wisconsin Department of Natural Resources, Madison, Wisconsin.

Watershed Bureau Monitoring Technical Team. 2010. Wisconsin Consolidated Assessment and Listing Methodology (WisCALM): Stream and river protocol modifications for phosphorus impairment assessment. Watershed Bureau, Wisconsin Department of Natural Resources, Madison, Pp. 1-8.

Michaels, N.N. and G.G. Sass. 2010. Fish and aquatic vegetation monitoring of The Nature Conservancy's Emiquon Preserve. Illinois Natural History Survey Technical Report 2010 (14).

Newman, S. D. Dreikosen, G. Matzke, G. Kubenik, M. Lorenzoni, and M, Snyder. 2010. Northern Highland Fisheries Research Area population and harvest monitoring. Annual Report, Northern Highland Fishery Research Area, Woodruff, Wisconsin.

Cochran, P. A., and J. Lyons. 2010. Attachments by parasitic lampreys within the branchial cavities of their hosts. Environmental Biology of Fishes 88:343-349.

Mitro, M. G., J. Lyons, and J. S. Stewart. 2010. Predicted effects of climate change on the distribution of wild brook trout and brown trout in Wisconsin streams. Proceedings of Wild Trout X, West Yellowstone, MT, September 28-30, 2010.

Mitro, M. G. 2010. Groundwater key for trout as our climate warms. Wisconsin Trout 22(1):6.

Westenbroek, S., J. Stewart, C. Buchwild, M. Mitro, J. Lyons, and S. Greb. 2010. A model for evaluating stream temperature response to climate change scenarios in Wisconsin. Proceedings of the 2010 Watershed Management Conference, American Society of Civil Engineers, Madison, WI, August 23-27, 2010.

Lyons, J.. 2010. Indices of ecological integrity: a state agency perspective. Pages 357-358. In W. Hubert and M. Quist (editors), Inland Fisheries Management in North America. American Fisheries Society. Bethesda, MD.

Customer programs: Bureaus of Fisheries Management and Water Quality

Significance/management implications: Provides a case-history of uses of multi-metric biotic indices in Wisconsin, discussing historical development and application, strengths and weaknesses of indices, and likely future directions. This report gives guidelines on how an agency could best incorporate these indices in their aquatic management programs.

Kampa, J. M. 2010. Science in the spotlight: Wisconsin has stock in walleye. Wisconsin Fishing Report. Wisconsin Department of Natural Resources Fisheries Management Publication # PUB-FH-506-rev2010.

Mitro, M.G., J. Lyons, and J. Stewart. 2010. Predicted effects of climate change on the distribution of wild brook trout and brown trout in Wisconsin streams. Pages 69-76 in R. F. Carline and C. LoSapio, editors. Conserving wild trout: Proceedings of Wild Trout X. Bozeman, Montana.

Customer programs: Bureaus of Fisheries Management and Water Quality

Significance/management implications: This proceedings paper details our assessment of the potential impacts of climate change on wild brook trout and brown trout fisheries in Wisconsin. Modeling predicting the distribution of trout in Wisconsin streams under three projected climate change scenarios obtained from downscaled global circulation models suggest greater losses for brook trout versus brown trout. Models also provide indices of the relative magnitude and spatial pattern of trout distribution changes in response to climate warming. Our models may be used to triage or better allocate resources to streams when employing adaptation strategies to lessen the impacts of climate change.

Kampa, J. M. 2010. Biosecurity Workshop Summary. WDNR Biosecurity Workshop, June 9-10, Madison.

Rach, J.J., G.G. Sass, J.A. Luoma, and M.P. Graikowski. 2010. Effects of water hardness on size and hatching success of silver carp eggs. North American Journal of Fisheries Management 30:230-237.

Customer programs: Bureau of Fisheries Management

Significance/management implications: This study determined that water hardness was not a limiting factor for silver carp egg hatching success. Previous studies had suggested that water hardness may limit invasive silver carp distributions, but that is not the case.

Sass, G.G., T.R. Cook, K.S. Irons, M.A. McClelland, N.N. Michaels, T.M. O'Hara, and M.R. Stroub. 2010. A mark-recapture population estimate for invasive silver carp (*Hypophthalmichthys molitrix*) in the La Grange Reach, Illinois River. Biological Invasions 12:433-436.

Customer programs: Bureau of Fisheries Management

Significance/management implications: This study provided the first-mark recapture population estimate for invasive silver carp in the United States. Determining the abundance and biomass of Asian carp populations is essential for informing management policies to reduce their numbers. Asian carp population growth was also shown to be considerable higher than many other invasive species in Wisconsin.

Sass, L.L., M.A. Bozek, J.A. Hauxwell, K. Wagner and S. Knight. 2010. Response of aquatic macrophytes to human land use perturbations in the watersheds of Wisconsin lakes, U.S.A. Aquatic Botany 93: 1-8.

Customer programs: Bureau of Water Quality and Bureau of Fisheries Management

Significance/management implications: This article describes the effects of land use and ecoregion on lake macrophyte communities, and found that overall, species richness was negatively related to watershed development. Effects of land use in the perimeters on macrophytes did not provide higher correlations compared to land use at the watershed scale. In lakes with higher total watershed development levels, introduced species, particularly Eurasian watermilfoil, increased in abundance while native species, especially potamids, isoetids, and floating-leaved plants, declined in abundance.

Diebel, M., J.T. Maxted, O.P. Jensen, and M.J. Vander Zanden. 2010. A spatial autocorrelative model for targeting stream restoration to benefit sensitive non-game fishes. Canadian Journal of Fisheries and Aquatic Sciences 67:165-176.

Customer programs: Bureau of Water Quality, Bureau of Fisheries Management

Significance/management implications: Stream restoration projects often aim to benefit aquatic biota and frequently use the reappearance of sensitive nongame fish species as a measure of restoration success. This study developed statistical fish distribution models that indicate where restoration is likely to be effective for individual species and where static habitat characteristics or spatial context may limit biological response even if habitat is improved.

Watras, C.J. 2010. Mercury Pollution in Remote Freshwaters. Pp. 648-657. In G.E. Likens (ed). Biogeochemistry of Inland waters. Elsevier.

Customer programs: Bureau of Air Management, Bureau of Fisheries Management, Bureau of Water Quality, General Public

Significance/management implications: This is a derivative publication of a manuscript that originally appeared in the Encyclopedia of Inland Waters, Oxford, United Kingdom.

Garrison, P., and G. LaLiberte. 2010. The importance of water level changes and shoreline development in the eutrophication of a shallow, seepage lake. Proceedings of the Academy of Natural Sciences of Philadelphia 160:113-126.

Customer programs: Bureau of Fisheries Management and Bureau of Water Quality, Berry Lake Association, and Oconto County

Significance/management implications: Berry Lake is a small seepage lake that has dense shoreline development. This lake experience climatically driven large water fluctuations. This study documented that increased shoreline development had a greater impact on the lake's water quality than lake level changes.

Greb, S.R., A. Martin, and J.W. Chipman. 2010. Water Clarity Monitoring of Wisconsin Lakes (USA) using Landsat Satellites. Proceedings from the International Society of Remote Sensing of the Environment. (Peer Reviewed)

Customer Program: Bureau of Water Quality

Significance/Management Applications: The State of Wisconsin has over 15,000 lakes. They are important in supporting the state's recreation economy as well as a diverse aquatic ecological community. Increased costs for lake monitoring along with staff shortages have forced the state to seek alternative methods to monitor these numerous water bodies. The state has successfully developed a "Lakes from Space" program, using Landsat 5 and 7 images to generate water clarity measurements for approximately 8000 lakes.

Garrison, P.J., G.D. LaLiberte, and B.P. Ewart. 2010. The importance of water level changes and shoreline development in the eutrophication of a shallow, seepage lake. Proceedings of the Academy of Natural Sciences, Philadelphia. 160:113-126.

Garrison, P. and G. LaLiberte. 2010. Paleoecological Study of Lake Chetac, Sawyer County. Bureau of Science Services miscellaneous publication [PUB-SS-1069 2010].

Customer programs: Bureau of Fisheries Management and Bureau of Water Quality, Lake Chetac Lake Association

Significance/management implications: Lake Chetac is a large shallow lake that experiences frequent harmful algal blooms. This study showed that the lake was eutrophic prior to European settlement but that nutrient levels have increased in the last few decades.

Garrison, P.J. 2010. Paleoecological Study of Tainter Lake, Dunn County. Wisconsin Department of Natural Resources. PUB SS-1075 2010. 18pp.

Customer programs: Bureau of Water Quality

Significance/management implications: Tainter Lake is a large shallow lake that experiences frequent harmful algal blooms. This study showed that the lake has been eutrophic since it was formed and that in recent years phosphorus levels may have declined but that they remain in the hypereutrophic range.

Hauxwell, J., S. Knight, K. Wagner, A. Mikulyuk, M. Nault, M. Porzky, and S. Chase. 2010. Recommended Baseline Monitoring of aquatic plants in Wisconsin: Sampling design, field and laboratory procedures, data entry and analysis and applications. Wisconsin Department of Natural Resources Bureau of Science Services, PUB-SS-1068 2010.

Customer programs: Bureau of Water Quality and Bureau of Fisheries Management

Significance/management implications: This publication describes how to conduct the statewide standardized protocol for sampling and analyzing aquatic plants in lakes. This baseline approach is useful for both in-lake management as well as statewide assessments of patterns and drivers of plant community structure.

Knight, S., and J. Hauxwell. 2010. Distribution and abundance of aquatic plants- human impacts. In: G. Likens (editor-in-chief), Biogeochemistry of Inland Waters. Elsevier, Oxford, United Kingdom.

Mikulyuk, A., J. Hauxwell, P. Rasmussen, S. Knight, K.I. Wagner, M E. Nault and D. Ridgely. 2010. Testing a methodology for assessing plant communities in temperate inland lakes. Journal of Lake and Reservoir Management 26: 54-62.

Nominated for James LaBounty Paper of the Year Award in 2010 by the North American Lake Management Society

Customer program: Bureau of Water Quality and Bureau of Fisheries Management

Significance/management implications: We developed a standardized baseline aquatic macrophyte monitoring methodology for statewide use in Wisconsin. Adopting a consistent approach to monitoring will allow us to take full advantage of all the work being done across the state by allowing for comparative studies which will lead to more accurate assessments of the ecological condition of lakes, the effect of management actions, and allow us to better track environmental change over time. We rigorously tested the method after development and published an account of the accuracy, precision, and power of the sampling approach as employed over several years.

CABI. 2010. *Salvinia auriculata* [original text by A. Mikulyuk]. In: Invasive Species Compendium. Wallingford, UK: CABI. Available online at <http://www.cabi.org.ISC/>.

CABI. 2010. *Potamogeton crispus*. [original text by A. Mikulyuk and M. E. Nault]. In: Invasive Species Compendium. Wallingford, UK: CABI. Available online at <http://www.cabi.org.ISC/>.

CABI. 2010. *Cabomba caroliniana*. [original text by A. Mikulyuk and M. E. Nault]. In: Invasive Species Compendium. Wallingford, UK: CABI. Available online at <http://www.cabi.org.ISC/>.

CABI. 2010. *Salvinia minima*. [original text by A. Mikulyuk and M. E. Nault]. In: Invasive Species Compendium. Wallingford, UK: CABI. Available online at <http://www.cabi.org.ISC/>.

CABI. 2010. *Trapa natans*. [original text by A. Mikulyuk and M. E. Nault]. In: Invasive Species Compendium. Wallingford, UK: CABI. Available online at <http://www.cabi.org.ISC/>.

CABI. 2010. *Hygrophila polysperma*. [original text by M. E. Nault and A. Mikulyuk]. In: Invasive Species Compendium. Wallingford, UK: CABI. Available online at <http://www.cabi.org.ISC/>.

CABI. 2010. *Lagarosiphon major*. [original text by M. E. Nault and A. Mikulyuk]. In: Invasive Species Compendium. Wallingford, UK: CABI. Available online at <http://www.cabi.org.ISC/>.

CABI. 2010. *Hydrocharis morsus-ranae*. [original text by M. E. Nault and A. Mikulyuk]. In: Invasive Species Compendium. Wallingford, UK: CABI. Available online at <http://www.cabi.org.ISC/>.

CABI. 2010. *Nymphoides peltata*. [original text by M. E. Nault and A. Mikulyuk]. In: Invasive Species Compendium. Wallingford, UK: CABI. Available online at <http://www.cabi.org.ISC/>.

CABI. 2010. *Ludwigia grandiflora*. [original text by A. Mikulyuk and M. E. Nault]. In: Invasive Species Compendium. Wallingford, UK: CABI. Available online at <http://www.cabi.org.ISC/>.

CABI. 2010. *Ludwigia peploides*. [original text by A. Mikulyuk and M. E. Nault]. In: Invasive Species Compendium. Wallingford, UK: CABI. Available online at <http://www.cabi.org.ISC/>.

CABI. 2010. *Crassula helmsii*. [original text by M. Nault and A. Mikulyuk]. In: Invasive Species Compendium. Wallingford, UK: CABI. Available online at <http://www.cabi.org.ISC/>.

Significance/management implications: The Invasive Species Compendium is an encyclopedic resource comprised of detailed peer-reviewed articles on invasive species contributed by experts around the world. The compendium contains science-based information that can be used to inform management decisions and prepare rapid response plans. The resource is available online through <http://www.cabi.org/isc/>

Research Presentations

In addition to publishing research results, the professionals employed by the Fisheries and Aquatic Sciences Research Section routinely present the results of their work in the form of presentations. Presentations range from hour-long academic seminars to short scientific talks and are given to a variety of audiences. A subset of staff presentations conducted during 2010 – 2012 is listed below.

Martha Barton

Barton, M., S. Knight, M. Nault, K. Wagner, P. Skawinski, S. Van Egeren. (June 2012). Aquatic Plant Identification Workshop. Kemp Natural Resources Station, Woodruff, WI.

Barton, M., S. Knight, M. Nault, and K. Wagner. (April 2012). Name that Plant! Aquatic Plant Identification. Wisconsin Lakes Convention, Green Bay, WI.

Balfour (Barton), M., J. Hauxwell, A. Mikulyuk, M. Nault and S. van Egeren. (9 November 2010). Invasive aquatic species on our door step: The need for vigilant neighbors. Minnesota-Wisconsin Invasive Species Conference, St. Paul, MN.

Matt Diebel

Diebel, M., T. Paoli, P. McIntyre, D. Oele, E. Childress, J. Maxted, A. Somor, A. Shaw, and N. Van Helden. (27 March 2012). Prioritizing barrier removal for northern pike spawning migration in Green Bay tributaries, Road Crossing Design Workshop.

Diebel, M. and C. Hardin. (27 March 2012). How streams work, Road Crossing Design Workshop.

Diebel, M. and M. Miller. (27 March 2012). Biological considerations for design of road crossings, Road Crossing Design Workshop.

Diebel, M. (20 March 2012). Developing goals and strategies to improve water quality, at Wisconsin Agricultural Water Quality Meeting. Invited talk.

Diebel, M., T. Paoli, P. McIntyre, D. Oele, E. Childress, J. Maxted, A. Somor, A. Shaw, and N. Van Helden. (2 March 2012). Prioritizing barrier removal for northern pike spawning migration in Green Bay tributaries, at WDNR Seminar Series.

Diebel, M. (22 March 2012). Total maximum daily loads for total phosphorus and total suspended solids in the Rock River basin, at Rock River public meeting.

Diebel, M. (8 February 2012). New phosphorus-chlorophyll relationships for Wisconsin lakes, at WDNR Water Quality Bureau statewide meeting.

Diebel, M. (14 December 2011). Overview of Great Lakes Basin connectivity assessments and prioritization methods, at Great Lakes Aquatic Connectivity Project meeting.

Diebel, M., S. Cogswell, and C. Freiburger. (8 September 2011). Building the infrastructure for large-scale connectivity restoration in the Great Lakes Basin, at American Fisheries Society annual meeting.

Diebel, M., T. Paoli, P. McIntyre, D. Oele, E. Childress, J. Maxted, A. Somor, A. Shaw, and N. Van Helden. (8 September 2011). Limiting factors for northern pike recruitment from Great Lakes tributary networks, at American Fisheries Society annual meeting. Invited talk.

Diebel, M. (13 August 2011). Nutrients in Wisconsin Streams and Lakes, at Eagle Lake Property Owners and Improvement Association annual meeting. Invited talk.

Diebel, M. (4 August 2011). Connectivity research updates, at The Nature Conservancy's Great Lakes Migratory Fish Data and Information Gaps Workshop.

Diebel, M., S. Cogswell, and C. Freiburger. (27 June 2011). Building the infrastructure for large-scale connectivity restoration in the Great Lakes Basin, at National Conference on Fish Passage Engineering and Ecohydrology. Invited talk.

Diebel, M. (2 June 2011). How to reconnect your watershed, at DNR Endangered Resources Statewide Meeting. Invited talk.

Diebel, M. (10 May 2011). How to reconnect your watershed, at Fox-Wolf Watershed Alliance Conference. Invited talk.

Diebel, M. (13 April 2011). Does public perception of lake condition correspond with water quality measurements?, at Wisconsin Lakes Convention.

Diebel, M. (25 March 2011). Nutrients in Wisconsin Streams, at Volunteer Stream Monitoring Symposium. Invited talk.

Diebel, M. (1 March 2011). Balancing Invasion-Isolation Trade-offs in River Networks, at Upper Midwest Stream Restoration Symposium.

Diebel, M. (18 February 2011). Balancing Invasion-Isolation Trade-offs in River Networks, at Science Services statewide meeting.

Diebel, M. (10 February 2011). Volunteer Lake Monitoring Data Analysis, at Lakes Partnership quarterly meeting.

Diebel, M. (8 February 2011). Implementing the Wisconsin Buffer Initiative: Development of a Phosphorus Index Screening Tool, invited presentation with Steve Richter at Wisconsin Soil and Water Conservation Society meeting.

Diebel, M. (25 January 2011). Water Quality Modeling for the Rock River TMDL, at WM Bureau statewide meeting.

Diebel, M. (14 December 2010). Identifying strategic opportunities for barrier removal to benefit aquatic organisms, at Midwest Fish and Wildlife Conference.

Diebel, Matt. (October 6, 2010). Landscape Planning for Agricultural Non-Point Source Pollution Reduction, Targeted Phosphorus Management Seminar, WDNR South Central Region. Invited talk.

Diebel, M.W., M. Fedora, and S. Cogswell. (October 1, 2010). Identifying strategic opportunities for barrier removal to benefit aquatic organisms. Science in the Northwoods Conference, Boulder Junction, WI.

Diebel, M.W., M. Fedora, and S. Cogswell. (February 23, 2010). Prioritizing road crossing improvement to restore stream connectivity for stream-resident fish. Upper Midwest Stream Restoration Symposium, La Crosse, WI.

Eric Erdmann

Erdmann, E. and S. Greb. (13 April 2011) Wisconsin Lakes Convention; Green Bay, WI: Measurement of Water Clarity in Wisconsin Lakes Using Remote Sensing. Invited talk.

Paul Garrison

Garrison, P. (8-10 May 2012). Index Sampling for 2012 EPA National Lakes Assessment. Madison, WI. Trainer for NLA.

Garrison, P. (3-6 April 2012). Index Sampling for 2012 EPA National Lakes Assessment. Ardmore, OK. Trainer for NLA.

Garrison, P. (24 March 2012) Paleolimnology of Lake Ripley. Lake Ripley Fair. Cambridge.

Garrison, P. (15 February 2012). Eagle Lake zooplankton talk, Eagle Lake Association. Sturtevant.

Garrison, P. (5 March 2012). Paleolimnology of Shell Lake. City of Shell Lake. Shell Lake.

Garrison, P. (18-19 January 2012). Update on activities for Lakes Quarterly, Weston.

Garrison, P. (26-28 Oct. 2011). North American Lake Management Society Symposium. National Lake Assessment. Moderator. Spokane, WA.

Garrison, P. (21-22 Sept. 2011). Using Sediment Cores for Lake Management. Advanced Lake Leaders. Kemp Station.

Garrison, P. (1 June 2011). Report on Max Lake Sediment core. WICCI meeting. Madison.

Garrison, P. (16 April 2011). Paleolimnology of Rock Lake. Rock Lake Fair. Lake Mills.

Garrison, P. and E. Erdmann. (12-14 April 2011). How is my Lake Doing: From Sediment Cores to Satellites. Wisconsin Association of Lakes Annual Meeting.

Garrison, P. (28 February 2011). Silver Lake Association. Silver Lake College, WI: Update of Silver Lake Restoration Project. Invited talk.

Garrison, P. and E. Oost (17-18 February 2011). Long Term Trends in selected WI lakes. Science Services Statewide. Madison.

Garrison, P. (10-11 February 2011). Update on activities for Lakes Quarterly, Weston.

Garrison, P. (9 February 2011). Eagle Lake zooplankton talk, Eagle Lake Association. Sturtevant.

Garrison, P. and G. LaLiberte. (17 November 2010). Dr. Robert Pillsbury's Algae Class. U.Wisconsin-Oshkosh. Algae: Our Little Friends. Invited talk.

Garrison, P. (10 November 2010). Lake Mills Middle School 7th Graders. Lake Ecology. Invited talk.

Garrison, P. and S. Kaplan. (1 October 2010). Science in the Northwoods: Potential Impact of Climate Change on the Hydrology of Headwater Drainage Lakes.

Garrison, P. (15 September 2010). UW Extension, Lake Leaders Institute. Lake Tomahawk, WI.: Paleolimnology as a Lake Management Tool. Invited talk.

Garrison P. (1 April 2010). Wisconsin Lakes Convention; Green Bay, WI: Findings from the Wisconsin Portion of the National Lake Assessment. Invited talk.

Garrison, P. (2 March 2010). Wisconsin DNR Watershed Biologists Statewide Training Meeting; Central Wisconsin Environmental Station, Amherst Junction, WI: Using Sediment Cores for Managing Lakes. Invited talk.

Garrison, P. (4 February 2010). Wisconsin Lakes Partnership (Wisconsin DNR, University of Wisconsin Extension, and Wisconsin Association of Lakes), Quarterly meeting, Weston, WI: Restoration of Hypereutrophic Silver Lake.

Garrison, P. (19 January 2010). Silver Lake Association. Silver Lake College, WI: Update of Silver Lake Restoration Project. Invited talk.

Steven Greb

Greb, S.R. (2012). Update presentation Lake partnership quarterlies, Wausau, WI.

Greb, S.R. (June 2011). International Assoc. of Great lakes Research. Near shore dynamics in Lake Michigan. Duluth, Mn.

Greb, S.R. (2011 and 2012). International Ocean Color Coordinating Group presentation. Plymouth.

Greb, S.R. (2011). Wisconsin Association of Lakes convention poster and presentation, Green Bay, WI.

Greb, S.R. (2011 and 2012). Update presentation Lake partnership quarterlies, Wausau, WI.

Greb, S.R. (April 2009 and May 2011). Remote Sensing of the Environment Symposium presentation. Strasa, Italy

Greb, S.R. (April 2010). Influence of Lawns and Natural Vegetation on Shoreland Runoff Hydrology and Water Quality. Wisconsin Lakes Association Invited Talk. Green Bay, WI.

Greb, S.R. and E. Erdmann. (2 March 2010). Wisconsin Stream and River Flow Trends. Wisconsin DNR Watershed Biologists Statewide Training Meeting; Central Wisconsin Environmental Station, Amherst Junction, WI: Overview of aquatic plant related research activities: monitoring, milfoil, and land use. Invited talk.

Greb, S.R. and E. Erdmann. (Feb 2010). Wisconsin Stream and River Flow Trends. WDNR Brown Bag Seminar GEF2.

Jennifer Hauxwell

Hauxwell, J. (8 February 2012). WDNR Fisheries and Aquatic Sciences Research overview and current projects. WDNR Water Quality Biologists' Annual Meeting, Treehaven, WI. Invited talk.

Hauxwell, J. (1 February 2012). The role of science in aquatic resource use and sustainability. University of Wisconsin-Madison Aquatic Sciences Center, Madison, WI. Invited talk.

Hauxwell, J., G. LaLiberte, M. Werner, and T. Asplund. (28 September 2011). Blue-green algae in Wisconsin waters: cause and locations of blooms, Department monitoring program, ecology and ecological effects, and human health. Wisconsin Natural Resources Board, Kenosha, WI. (The NRB is comprised of 7 Governor-appointed members and sets policy for the Department of Natural Resources and exercises authority and responsibility in accordance with governing state statutes). Invited talk.

Mikulyuk, A., J. Hauxwell, M. Nault. (30 March 2011). Contrasting the effects of early-season harvesting and chemical treatment in Lake Monona (Madison, WI). Dane County Public Information Meeting, Madison, WI. Invited talk.

Hauxwell, J. (16 November 2010). Overview of the WDNR Fisheries and Aquatic Sciences Research Program. MN DNR Fisheries Research Meeting, Duluth, MN. Invited talk.

Mikulyuk, A., J. Hauxwell, M. Nault, S. van Egeren. (9 November 2010). Contrasting the effects of early-season harvesting and chemical treatment in Lake Monona (Madison, WI). Minnesota-Wisconsin Invasive Species Conference, St. Paul, MN.

Nault, M., J. Hauxwell, A. Mikulyuk, M. Nault and S. van Egeren. (9 November 2010). Effects of whole-lake early season 2,4-D on Eurasian watermilfoil (*Myriophyllum spicatum*). Minnesota-Wisconsin Invasive Species Conference, St. Paul, MN.

van Egeren, S., J. Hauxwell, A. Mikulyuk and M. Nault. (9 November 2010). Invasion trajectories and population trends of Eurasian watermilfoil (*Myriophyllum spicatum*) in Wisconsin. Minnesota-Wisconsin Invasive Species Conference, St. Paul, MN.

Balfour, M., J. Hauxwell, A. Mikulyuk, M. Nault and S. van Egeren. (9 November 2010). Invasive aquatic species on our door step: The need for vigilant neighbors. Minnesota-Wisconsin Invasive Species Conference, St. Paul, MN.

Mikulyuk, A., J. Hauxwell, S. van Egeren, M. Nault and M. Balfour. (1 November 2010). Predicting the invasion success of EWM: State of the science and current research. Aquatic Invasive Species Coordinator's Meeting, Stevens Point, WI. Invited Talk.

Mikulyuk A., J. Hauxwell, S. Knight, M. Nault, S. van Egeren and M. Balfour. (1 October 2010). Aquatic macrophyte research in the Northwoods. Science in the Northwoods Conference, Boulder Junction, WI. Available from http://limnology.wisc.edu/Science_in_the_Northwoods.php

Hauxwell, J. (29 September 2010). Overview of the WDNR Fisheries and Aquatic Sciences Research Program. WDNR Northern Region Fisheries Management Meeting, Cable, WI. Invited talk.

Mikulyuk, A., J. Hauxwell, M. Nault, and S. Van Egeren. (24 September 2010). Predicting Invasion Success of Eurasian Watermilfoil (and Curly-leaf Pondweed) State of the Science and Current Research. Workshop on Aquatic Plant Management Issues in the Upper Midwest, Lansing, MI. Hosted by the Michigan Dept. of Natural Resources and Environment (MI DNRE) / Sponsored by the US Army ERDC Water Operations Technical Support (WOTS) Program. Invited talk.

Hauxwell, J., A. Mikulyuk, M. Nault, S. Knight, S. Van Egeren, M. Balfour, T. Asplund, and colleagues. (14 September 2010). Science to Support Natural Resource Management of Aquatic Invasive Species. Aquatic Ecology and Human Impacts on Lake Ecosystems Session of the Wisconsin Lake Leaders Institute, Seminar II, Kemp Natural Resources Station, Woodruff, WI. Invited talk.

Martin Jennings

Jennings, M.J. (May 2012). Muskellunge research in northern Wisconsin. Spring meeting, Hayward chapter of Muskies, Inc.

Westbrook, L., B. Sloss, and M. Jennings. (December, 2011). Rock Bass, Johnny Darters, Walleye and Muskellunge: a Multi-species Approach to Identifying Genetic Management Units. Midwest Fish and Wildlife Conference, Des Moines IA.

Kampa, J.M. and M.J. Jennings. (November, 2011) Fisheries research in the Upper St. Croix and Namekagon Rivers. National Park Service.

Jennings, M.J., G.R. Hatzenbeler, and J.M. Kampa. (September, 2011) Application of angler-based data collection in a muskellunge monitoring program. American Fisheries Society Annual Meeting.

Kampa, J.M., G.R. Hatzenbeler, and M.J. Jennings. (February, 2011). Lake Sturgeon Movement and Abundance in the Namekagon River and St. Croix River during the 1960s and 2000s. Wisconsin Chapter of the American Fisheries Society 40th Annual Meeting, Stevens Point, Wisconsin.

Westbrook, L., B. Sloss, and M. Jennings. (December, 2010). Genetic Structure of Surrogate Species and its Use in Sportfish Management in Wisconsin. Midwest Fish and Wildlife Conference, Minneapolis MN.

Jennings, M.J., G.R. Hatzenbeler, J. Kampa. (December, 2010). Spring capture site fidelity of adult muskellunge in inland lakes. North Central Division of the American Fisheries

Society 71st Midwest Fish and Wildlife Conference, December 12-15, Minneapolis, Minnesota. Invited symposium presentation.
Jennings, M. (September 2010). Fisheries Management regional meeting, Cable, WI.
Fisheries research in the WDNR Northern Region.

Jennings, M. (June 2010). Minnesota DNR Lake Habitat Research Meeting, Brainerd, MN.
Overview of lake habitat research in Wisconsin.

Jeff Kampa

Jennings, M.J., G.R. Hatzenbeler, and J.M. Kampa. 2011. Application of angler-based data collection in a muskellunge monitoring program. American Fisheries Society 141st Annual Meeting, September 4-8, Seattle, Washington.

Kampa, J.M., G.R. Hatzenbeler, and M.J. Jennings. 2011. Lake Sturgeon Movement and Abundance in the Namekagon River and St. Croix River during the 1960s and 2000s. Wisconsin Chapter of the American Fisheries Society 40th Annual Meeting, January 31-February 2, Stevens Point, Wisconsin.

Jennings, M. J., G.R. Hatzenbeler, M.J. Jennings. 2010. Spring capture site fidelity of adult muskellunge in inland lakes. North Central Division of the American Fisheries Society 71st Midwest Fish and Wildlife Conference, December 12-15, Minneapolis, Minnesota.

Kampa, J. (September 28-29, 2010). Northern Region fish research update. WDNR Northern Region Fish Management Meeting. Cable, WI.

Susan Knight

Knight, S. (June 2012). Bog walks for groups. UW-Madison Soils Class Field Trip.

Knight, S., L. Bruckerhoff and J. Havel. (March 2012). Desiccation resistance of invasive *Myriophyllum spicatum* and *Potamogeton crispus*. WI Lakes Convention.

Knight, S. (July 2012). Lake Tomahawk Lake Fair, Plant Display and Education, Kemp Natural Resources Station.

Knight, S. (June 2012). Aquatic Plant ID for middle school students, Kemp Natural Resources Station.

Knight, S. (May 2012). EcoTrek Plant Activity for middle school, Kemp Natural Resources Station.

Knight, S. (April 2012). Name that Plant! Aquatic Plant Identification. Wisconsin Lakes Convention, Green Bay, WI.

Knight, S. (April 2012). Tolerance of Air Exposure and its Impact on Dispersal of Aquatic Invasive Species, Wisconsin Lakes Convention, Green Bay, WI.

Knight, S. (February 2012). Large Purple Bladderwort: Biology and Ecology, Rhinelander, WI.

Knight, S. (December 2011). Testing the Effectiveness of Milfoil Weevils on EWM, Rhinelander, WI.

Knight, S. (September 2011). Aquatic Plant ID for high school students, Johnson Lake, Woodruff, WI.

Knight, S. (September 2011). Plant Display and Education, Minocqua Lake Fair, Minocqua WI.

Knight, S. (August 2011). Plant Display and Education, Open House at Trout Lake Station.

Knight, S. (August 2011). Aquatic Plant Identification, Lac du Flambeau Lake Stewardship Day

Knight, S. (September 2011). Bog walks for groups. UW-Madison Limnology Field Trip.
Knight, S., K. Gauthier, C. Schaal, A. Mikulyuk, T. Asplund, T. Hoyman. (September 2010). Evaluation Protocol for Chemical Treatment of Aquatic Invasive Plants. Science in the Northwoods.

Knight, S. (March 2010). Habitat Implications of Low Water Levels. Wisconsin Association of Lakes, Green Bay WI.

Gina LaLiberte

LaLiberte, G. and E. Wollenburg. (April 10, 2012). Harmful Algal Blooms in Wisconsin Waters. Wisconsin Lakes Convention. Green Bay, WI.

LaLiberte, G. (March 24, 2012). Lake Ripley Seminar on Lake Systems, Algae, Plants, and Lake Management Laws. Algae. Town of Rockland, WI.

LaLiberte, G., E. Wollenburg, and S. Graham. (November 3, 2011). Harmful Algal Blooms in Blass Lake – Health Concerns and Recommended Response. Camp Chi Board Meeting, Wisconsin Dells, WI.

Hauxwell, J., G. LaLiberte, M. Werner, and T. Asplund. (September 28, 2011). Blue-green Algae Informational Item. Wisconsin Natural Resources Board Meeting. Kenosha, WI.

LaLiberte, G., P. Garrison, and S. Greb. (September 14-18, 2011). Dreissenid mussels: novel habitat for *Ellerbeckia* in the Laurentian Great Lakes? North American Diatom Symposium. Polson, MT. (poster)

LaLiberte, G. (June 24, 2011). Northwest Wisconsin Lakes Convention. What's that green blob? Identification and ecology of macroscopic algae and other lake organisms. Minong, WI.

LaLiberte, G. (April 16, 2011). Rock Lake Seminar on Lake Systems, Algae, Plants, and Lake Management Laws. Algae. Lake Mills, WI.

LaLiberte, G. (April 14, 2011). Wisconsin Lakes Convention. What's that green jelly ball? A pictorial guide to macroscopic algae and other organisms in Wisconsin lakes. Green Bay, WI. (poster)

LaLiberte, G. (February 18, 2011). Development of a registry for a potentially toxic exotic blue-green alga in Wisconsin lakes. DNR Science Services Open House. Madison, WI. (poster)

LaLiberte, G. (September 29 – October 1, 2010). Algae as tools for understanding past and present conditions in aquatic systems. Science in the Northwoods, Boulder Junction, WI.

Richard Lathrop

Lathrop, R.C. (6 June 2012). Adapting to climate change in Wisconsin. Presentation to Wisconsin Association of Retired Conservationists, Stoughton, WI.

Lathrop, R.C. (21 April 2012). The Science Behind Efforts to Clean Up the Yahara Lakes. Presentation at Yahara Lakes Summit sponsored by Clean Lakes Alliance, Madison, WI.

Lathrop, R.C. (17 April 2012). Yahara Lakes and Devil's Lake Projects. Presentation to Wisconsin State Laboratory of Hygiene Board, Madison, WI.

Lathrop, R.C. (13 March 2012). Adapting to climate change in Wisconsin: Moving beyond WICCI's first assessment report. Presentation at Climate Adaptation in the Northwoods workshop sponsored by The Nature Conservancy and the U.S. Forest Service, Otsego, MN.

Lathrop, R.C. (26 January 2012). Presentation on lake research projects utilizing State Lab of Hygiene services, Wisconsin State Lab of Hygiene, Madison.

Lathrop, R.C. (24 January 2012). Eutrophication and its Management in the Yahara Lakes. Guest Lecture in Colloquium in Environmental Toxicology, UW-Madison.

Lathrop, R.C. (8 December 2011). Eutrophication and its Management in the Yahara Lakes. Guest Lecture in Limnology Course, UW-Madison.

Lathrop, R.C. and S.R. Carpenter. (29 November 2011). Phosphorus Loading and Lake Response Analyses for the Yahara Lakes. Presentation at Madison Metropolitan Sewerage District meeting on phosphorus trading.

Lathrop, R.C. and S.R. Carpenter. (18 November 2011). Phosphorus Loading and Lake Response Analyses for the Yahara Lakes. Presentation at Clean Lakes Alliance Community Board meeting, Madison.

Lathrop, R.C. and S.R. Carpenter. (10 November 2011). Phosphorus Loading and Lake Response Analyses for the Yahara Lakes. Presentation to the Dane County Lakes and Watershed Commission, Madison, WI.

Lathrop, R.C. and S.R. Carpenter. (9 November 2011). Phosphorus Loading and Lake Response Analyses for the Yahara Lakes. Presentation at UW Center for Limnology Noon Seminar, Madison.

Lathrop, R.C. (15 September 2011). Controlling Phosphorus in Lake Mendota and the Lower Yahara Lakes. Presentation at EPA Region V meeting with DNR, Madison, WI.

Lathrop, R.C. (7 September 2011). Science and Management in the Southern NTL-LTER Lakes. Presentation at North-Temperate Lakes Long-Term Ecological Research project's site review by NSF, Madison, WI.

Lathrop, R.C. (18 August 2011). Wisconsin's Changing Climate: Impacts and Adaptation. Presentation at UW-Stevens Point Environmental Forum, Stevens Point, WI.

Lathrop, R.C. (22 February 2011). Wisconsin's Changing Climate: Impacts and Adaptation. Web-based presentation to national Climate Literacy Network.

Lathrop, R.C. and J.J. Magnuson. (9 February 2011). Discussion of WICCI's First Adaptive Assessment Report. Wisconsin Public Radio's Larry Meiller Show, Madison, WI.

Lathrop, R.C. (8 February 2011). Wisconsin's Changing Climate: Impacts and Adaptation. Presentation at WICCI Summit for First Adaptive Assessment Report, Madison, WI.

Lathrop, R.C. (7 December 2010). Eutrophication and its Management in the Yahara Lakes. Guest Lecture in Limnology Course, UW-Madison.

Lathrop, R.C. (27 September 2010). Eutrophication and its Management in the Yahara Lakes. Presentation at Middleton High School Environmental Science Class.

Lathrop, R.C. (22 September 2010). Wisconsin lake research. Presentation at the Open World Program's Stevens Point-Rostov Veliky Sister Cities tour of Madison, WI.

Lathrop, R.C. (28 July 2010). Eutrophication and its Management in the Yahara Lakes. Dinner presentation at the SERA-17 annual national conference, Madison, WI.

Lathrop, R.C. (22 July 2010). Wisconsin Initiative on Climate Change Impacts (WICCI) Project. Presentation at the Wisconsin Chapter of The Nature Conservancy's annual meeting, Minocqua, WI.

John Lyons

Lyons, J. 2012. Spawning ecology of shovelnose sturgeon and blue sucker in the Lower Wisconsin River. Annual Meeting of the Wisconsin and Michigan Chapters of the American Fisheries Society, February 7-9, 2012, Marinette, WI.

Lyons, J. 2012. The diversity of Wisconsin's fishes: Past, present, and future. Lecture in University of Wisconsin class "Ecology of Fishes", Madison, WI.

Lyons, J. 2012. Biological basis for fish passage at the Prairie du Sac Dam on the Lower Wisconsin River. Presentation to employees of Alliant Energy, Madison, WI.

Lyons, J. 2011. Advances in fish identification methodologies and technologies. Invited participant in a workshop sponsored by the Food and Agricultural Organization of the United Nations, held in Vigo, Spain, October 10-13, 2011.

Pracheil, B.M., P.B. McIntyre, J. Lyons, and M.A. Pegg. 2011. Defining the riverscape: tributaries as a key to Great River fish conservation. Annual Meeting of the American Fisheries Society, September 4-8, 2011, Seattle, Washington.

Stewart, J., S. Westenbroek, M. Mitro, J. Lyons, and C. Buchwald. 2011. An approach to model and evaluate stream temperature response to climate change in Wisconsin. Annual Meeting of the American Fisheries Society, September 4-8, 2011, Seattle, Washington.

Lyons, J. 2011. Balancing the benefits of reconnecting fish populations with the risks of spreading invasive species in the design and operation of fish passage projects. Invited Plenary Talk at 1st Annual National Conference on Engineering and Ecohydrology for Fish Passage, June 27-29, 2011, Amherst, MA.

Lyons, J. 2011. Will goodeids survive this century? Invited talk at the 2011 Convention of the American Livebearers Association, Cleveland, OH, April 7-10, 2011.

Mitro, M., J. Lyons, and J. Stewart. 2011. Use of models to predict climate change impacts and inform adaptation strategies for trout in all Wisconsin streams. Upper Midwest Stream Restoration Symposium, February 27-March 2, 2011, Oconomowoc, WI.

Lyons, J. 2011. Methods to capture fishes from Wisconsin's waters. Lecture and field demonstration for University of Wisconsin class "Natural History Museums", Madison, WI

Lyons, J., D. Rowe, and J. Unmuth. 2011. Fishes and fisheries of the Lower Wisconsin River. Presentation to the Wisconsin Department of Natural Resources Board, Spring Green, WI.

Lyons, J. 2011. Paddlefish and lampreys in the Lower Wisconsin River. Filming and interview for National Geographic Television, Prairie du Sac, WI.

Lyons, J. 2011. Upstream fish passage at the Prairie du Sac Dam on the Wisconsin River. Presentation to the Lower Wisconsin Riverway Board, Sauk City, WI.

Lyons, J. 2011. The diversity of Wisconsin's fishes: Past, present, and future. Lecture in University of Wisconsin class "Ecology of Fishes", Madison, WI.

Lyons, J. 2011. Overview of ongoing research studies. Presentation at the 2011 Wisconsin DNR Statewide Fisheries Management Training Session, Wisconsin Dells, WI.

Lyons, J., M. Mitro, and S. Sharma. 2011. Overview of the findings of the Coldwater Fish and Fisheries Working Group. Presentation to the Wisconsin Initiative on Climate Change Impacts Summit, Madison, WI.

Lyons, J. 2011. Stream natural communities: concepts, applications, and challenges. Presentation to the Wisconsin DNR Statewide Water Quality Stream Biologists Training Session, Tomahawk, WI.

Lyons, J. 2011. Development of multimetric biotic indices (IBI's) to assess aquatic ecosystem integrity in Wisconsin. Lecture given to the Stream Ecology Class, Wisconsin Lutheran College, Wauwatosa, WI.

Lyons, J. 2011. Predicted effects on climate change on the distribution of 50 fish species in Wisconsin streams. Presentation to the Minnesota DNR Fisheries Research Training Session, Duluth, MN.

Mitro, M., J. Lyons, and J. Stewart. 2010. Predicted effects of climate change on the distribution of brook trout and brown trout in Wisconsin streams. 71st Midwest Fish and Wildlife Conference, Minneapolis, MN, December 12-15, 2010.

Medina-Nava, M., J. Lyons, P. P. Ramírez-Herrejón, Z. Rodríguez-Álvarez, and N. Mercado-Silva. 2010. Evaluación de las comunidades de peces y su aplicación en sistemas de monitoreo y manejo de cuencas del centro de México. 12th Congreso Nacional de Ictiología, Puerto Vallarta, México, October 26-29, 2010.

Pedraza-Marrón, C de R., L. Zambrano, N. Mercado-Silva, J. Lyons, M. R. Helmus, K. Piller, and O. Domínguez-Domínguez. 2010. Cambios históticos en la distribución de las especies de peces de agua dulce de centro de México. 12th Congreso Nacional de Ictiología, Puerto Vallarta, México, October 26-29, 2010.

Lyons, J. and N. Mercado-Silva. 2010. El índice de integridad biótica en México: un recopilación. Invited seminar at Universidad Autónoma de Querétaro, Querétaro, México, October 27, 2010.

Mitro, M., J. Lyons, and J. Stewart. (September 28-30, 2010). Predicted effects of climate change on the distribution of wild brook trout and brown trout in Wisconsin streams. Wild Trout X, West Yellowstone, MT.

Lyons, J., J. Stewart, and M. Mitro. (September 12-16, 2010). Use of a watershed-scale GIS model to predict responses of 50 Wisconsin stream fishes to climate warming. Annual Meeting of the American Fisheries Society, Pittsburgh, PA.

Stewart, J., J. Lyons, M. Mitro, L. Wang, and B. Weigel. (September 12-16, 2010). A landscape approach to select stream sites for long-term biomonitoring in Wisconsin. Annual Meeting of the American Fisheries Society, Pittsburgh, PA.

Stewart, J., S. Westenbroek, M. Mitro, J. Lyons, S. Greb, and C. Buchwald. (August 23-27, 2010). Integrating a soil water balance model with an artificial neural network model to predict stream temperature for Wisconsin streams under current conditions and future climate-change scenarios. 2010 Water Quality Conference, American Society of Civil Engineers, Madison, WI.

Sharma, S., J. Vander Zanden, J. Magnuson, and J. Lyons. (June 6-11, 2010). Predicting the effects of climate change and invasion of rainbow smelt on cisco extinctions. American Society of Limnology and Oceanography, Santa Fe, NM.

Stewart, J., J. Lyons, L. Wang, M. Mitro, and M. Miller. (April 25-29, 2010). A framework for selecting least impacted reference streams based on landscape models for use in assessing biotic integrity of wadeable streams in Wisconsin. U.S. EPA National Water Quality Monitoring Council, Monitoring Conference, Denver, CO.

Lyons, J. and P. Kanehl. 2010. (February 1-3, 2010). Understanding (or not...) recruitment of smallmouth bass in southwestern Wisconsin streams. Annual Meeting of the Wisconsin Chapter of the American Fisheries Society, Green Bay, WI.

Lyons, J. 2010. Methods to capture fishes from Wisconsin's waters. Lecture and field demonstration for University of Wisconsin class "Natural History Museums", Madison, WI.

Lyons, J. 2010. Fishes of the Mukwonago River. Field demonstration and lecture given to Southeastern Wisconsin Native Fish Club, Mukwonago, WI.

Lyons, J. 2010. Using the GAP approach to predict effects of climate change on Wisconsin stream fishes. Presentation given to USGS Great Lakes Aquatic Gap Working Group, Middleton, WI.

Lyons, J. 2010. Identification of Wisconsin's non-game fishes. Field training course given to WDNR field staff, Waupaca County, WI.

Lyons, J. 2010. The Wisconsin stream model: function and application. Presentation to the Wisconsin DNR Office of the Great Lakes, Madison, WI.

Lyons, J. 2010. The challenge of reconnecting streams in the age of AIS: Prairie du Sac Dam experience. Presentation at the WDNR Annual Statewide Water Quality Training Conference, Amherst, WI.

Lyons, J. 2010. Upstream fish passage at the Prairie du Sac Dam on the Wisconsin River: the challenges of reconnecting at fragmented river system while preventing the spread of aquatic invasive species. Presentation to Wisconsin DNR Central Office Staff, Madison, WI.

Lyons, J. 2010. The diversity of Wisconsin's fishes: Past, present, and future. Lecture in University of Wisconsin class "Ecology of Fishes", Madison, WI.

Alison Mikulyuk

Mikulyuk, A. and K. Wagner. 2012. Planning and Enhancing the 2012 National Lakes Assessment: Rapid Macrophyte Assessment. National Water Quality Conference. Portland, OR.

Mikulyuk, A. and K. Wagner. 2012. Macrophyte Assemblage Method Field Demonstration. EPA National Train-the-Trainers Event for the 2012 EPA National Lakes Survey in Helen, GA. Invited Talk.

Wagner, K. and A. Mikulyuk. 2012. Macrophyte Assemblage Method Field Training. EPA National Train-the-Trainers Event for the 2012 EPA National Lakes Survey in Helen, GA. Invited Talk.

Mikulyuk, A. and K. Wagner. 2012. Macrophyte Assemblage Characterization Method. EPA National Train-the-Trainers Event for the 2012 EPA National Lakes Survey in Helen, GA. Invited Talk.

Wagner, K., A. Mikulyuk, T. Asplund, E. Ridley, P. Wax, L. Herger, P. Kaufmann, M. Barton. 2011. EPA National Lakes Assessment Macrophyte Assessment Summary. EPA 2012 National Lakes Assessment Steering Committee Meeting. Invited Talk.

Mikulyuk, M., K. Wagner, T. Asplund, E. Ridley. 2011. NLA Macrophyte Assessment. EPA 2012 National Lakes Assessment Steering Committee Meeting. Invited Talk.

Wagner, K., M. Balfour, M. Nault, A. Mikulyuk, S. Van Egeren, J. Hauxwell, S. Knight, J. Skogerboe, T. Asplund. 2011. Evaluation of Aquatic Macrophyte Research. Wisconsin Lakes Partnership Quarterly meeting in Wausau, WI. Invited talk.

Wagner, K., M. Balfour, M. Nault, A. Mikulyuk, S. Van Egeren, J. Hauxwell, S. Knight, J. Skogerboe, T. Asplund. 2011. Science Services Aquatic Macrophyte Research. Wisconsin DNR Statewide Water Quality Biologists Meeting in Tomahawk, WI. Invited talk

Wagner, Kelly, Alison Mikulyuk, Tim Asplund, Erin Ridley, Peter Wax, Lilian Herger, Phil Kaufmann, Martha Balfour. 2011. NLA Macrophyte Assessment Summary. Presentation to the EPA National Lakes Assessment Steering Committee. National Webinar.\

Mikulyuk, A., J. Hauxwell, M. Nault. 2011. Contrasting the effects of early-season harvesting and chemical treatment in Lake Monona (Madison, WI). Dane County Public Information Meeting, Madison, WI.

Mikulyuk, A., J. Hauxwell, M. Nault, S. van Egeren. (9 November 2010). Contrasting the effects of early-season harvesting and chemical treatment in Lake Monona (Madison, WI). Minnesota-Wisconsin Invasive Species Conference, St. Paul, MN.

Nault, M., J. Hauxwell, A. Mikulyuk, J. Skogerboe and S. van Egeren. (9 November 2010). Effects of whole-lake early season 2,4-D on Eurasian watermilfoil (*Myriophyllum spicatum*). Minnesota-Wisconsin Invasive Species Conference, St. Paul, MN.

van Egeren, S., J. Hauxwell, A. Mikulyuk and M. Nault. (9 November 2010). Invasion trajectories and population trends of Eurasian watermilfoil (*Myriophyllum spicatum*) in Wisconsin. Minnesota-Wisconsin Invasive Species Conference, St. Paul, MN.

Balfour, M., J. Hauxwell, A. Mikulyuk, M. Nault and S. van Egeren. (9 November 2010). Invasive aquatic species on our door step: The need for vigilant neighbors. Minnesota-Wisconsin Invasive Species Conference, St. Paul, MN.

Mikulyuk, A., J. Hauxwell, S. van Egeren, M. Nault and M. Balfour. (1 November 2010). Predicting the invasion success of EWM: State of the science and current research. Aquatic Invasive Species Coordinator's Meeting, Stevens Point, WI. Invited Talk.

Mikulyuk A., J. Hauxwell, S. Knight, M. Nault, S. Van Egeren and M. Balfour. (1 October 2010). Aquatic macrophyte research in the Northwoods. Science in the Northwoods Conference, Boulder Junction, WI. Available from http://limnology.wisc.edu/Science_in_the_Northwoods.php

Mikulyuk, A., J. Hauxwell, M. Nault, and S. Van Egeren. (24 September 2010). Predicting Invasion Success of Eurasian Watermilfoil (and Curly-leaf Pondweed) State of the Science and Current Research. Workshop on Aquatic Plant Management Issues in the Upper Midwest, Lansing, MI. Hosted by the Michigan Dept. of Natural Resources and Environment (MI DNRE) / Sponsored by the US Army ERDC Water Operations Technical Support (WOTS) Program. Invited talk.

Hauxwell, J., A. Mikulyuk, M. Nault, S. Knight, S. Van Egeren, M. Balfour, T. Asplund, and colleagues. (14 September 2010). Aquatic Ecology and Human Impacts on Lake Ecosystems Session of the Wisconsin Lake Leaders Institute, Seminar II, Kemp Natural Resources Station, Woodruff, WI. Invited talk.

Mikulyuk A., J. Hauxwell, S. Van Egeren, M. Nault and colleagues. (12 April 2010). Turville Bay Aquatic Plant Management Project: Research Update. Dane County Public Information Meeting, Madison, WI. Invited talk.

Nault, M., J. Hauxwell, A. Mikulyuk. (7 April 2010). Evaluation of Statewide Eurasian Watermilfoil Control Projects. Eurasian watermilfoil research meeting, Oshkosh, WI. Invited talk.

Mikulyuk, A., J. Hauxwell, S. Knight, S. Van Egeren, M. Nault, P. Rasmussen, and colleagues. Wisconsin DNR Watershed Biologists Statewide Training Meeting; Central Wisconsin Environmental Station, Amherst Junction, WI (2 March 2010): Overview of aquatic plant related research activities: monitoring, milfoil, and land use. Invited talk.

Nault, M., A. Mikulyuk, and J. Hauxwell. (22 February 2010). Evaluation of Statewide Eurasian Watermilfoil projects. Wisconsin DNR Northern Region Eurasian Watermilfoil Research Meeting, Rhineland, WI. Invited talk.

Matthew Mitro

Mitro, M. G., P. Kanehl, D. Walchak, and E. Struck. (March 2012). Monitoring trout response to stream habitat development in Wisconsin: lessons from Elk Creek. 5th Annual Driftless Area Symposium (invited), LaCrosse, Wisconsin.

Mitro, M. G., and A. H. Fayram. (March 2012). Fishes of Wisconsin lakes and streams. Franklin/Randall Super Science Saturday (invited), Madison Metropolitan School District, Madison, Wisconsin.

Mitro, M. G., and D. Ropa. (May 2011). Fishes of Lake Wingra. Wingra Watershed Field Experience II (workshop for teachers), Lake Wingra, Madison, Wisconsin.

Mitro, M. G. (March 2011). Climate change and the future of inland trout distribution in Wisconsin. Coulee Region Chapter of Trout Unlimited meeting (invited), LaCrosse, Wisconsin.

Mitro, M. G., Lyons, J. D., and J. S. Stewart. (March 2011). Predicted effects of climate change on the distribution of brook trout and brown trout in Wisconsin streams. 4th Annual Driftless Area Symposium (invited), LaCrosse, Wisconsin.

Mitro, M. G., Lyons, J. D., and J. S. Stewart. (March 2011). Climate change and the distribution of trout in Wisconsin streams: impacts and adaptation strategies. Climate Change Graduate Seminar (invited), University of Wisconsin, Madison, Wisconsin.

Mitro, M. G., Lyons, J. D., and J. S. Stewart. (March 2011). Climate change and the distribution of trout in Wisconsin streams: impacts and adaptation strategies. Joint Meeting of the Wisconsin Society of American Foresters and The Wisconsin Chapter of the Wildlife Society (invited), Wisconsin Dells, Wisconsin.

Mitro, M. G. (March 2011). Wisconsin's wild trout stocking program: source population viability and F1 vs. F2. WDNR Fisheries Management Statewide Meeting (invited), Wisconsin Dells, Wisconsin.

Mitro, M. G., J. Weeks, and D. Vetrano. (March 2011). Trout angling on Timber Coulee Creek then (1984) and now (2008). Poster presented at WDNR Fisheries Management Statewide Meeting, Wisconsin Dells, Wisconsin.

Mitro, M. G., J. Weeks, and D. Vetrano. (February 2011). Trout angling on Timber Coulee Creek then (1984) and now (2008). Poster presented at WDNR Science Services Open House, Madison, Wisconsin.

Mitro, M. G., J. D. Lyons, and J. S. Stewart. (December 2010). Predicted effects of climate change on the distribution of brook trout and brown trout in Wisconsin streams. Midwest Fish and Wildlife Conference, Minneapolis, Minnesota.

Mitro, M. G., J. D. Lyons, and J. S. Stewart. (September 2010). Climate change and the future of inland trout distribution and management in Wisconsin. DNR Science Seminar Series, Madison, Wisconsin.

Mitro, M. G., J. D. Lyons, and J. S. Stewart. (September 2010). Predicted effects of climate change on the distribution of wild brook trout and brown trout in Wisconsin streams. Wild Trout X Symposium, West Yellowstone, Montana.

Lyons, J., J. Stewart, and M. Mitro. (September 2010). Use of a watershed-scale GIS model to predict responses of 50 Wisconsin stream fishes to climate warming. Annual Meeting of the American Fisheries Society, Pittsburgh, Pennsylvania.

Stewart, J., J. Lyons, M. Mitro, L. Wang, and B. Weigel. (September 2010). A landscape approach to select stream sites for long-term biomonitoring in Wisconsin. Annual Meeting of the American Fisheries Society, Pittsburgh, Pennsylvania.

Stewart, J., S. Westenbroek, M. Mitro, J. Lyons, S. Greb, and C. Buchwald. (August 2010). Integrating a soil water balance model with an artificial neural network model to predict stream temperature for Wisconsin streams under current conditions and future climate-change scenarios. 2010 Watershed Management Conference, American Society of Civil Engineers, Madison, Wisconsin.

Lyons, J., J. Stewart, and M. Mitro. (July 2010). Predicted shifts in broad-scale distribution of stream fishes in Wisconsin, USA, in response to climate change. Fish and Climate Change, Fisheries Society of the British Isles Annual Symposium, July 26-30, 2010, Belfast, Northern Ireland.

Michelle Nault

Nault, M. and T. Johnson. (30 April 2012). Aquatic Plants: The Underwater Forest. Dip Into Lakes Seminar, Fond du Lac, WI.

Nault, M. and J. Skogerboe. (11 April 2012). What we're learning from herbicide residual monitoring following treatments for Eurasian Watermilfoil (*Myriophyllum spicatum*) in Wisconsin. Wisconsin Lake Convention, Green Bay, WI.

Nault, M., T. Asplund, J. Hauxwell, M. Barton, and J. Skogerboe. (28 March 2012). Evaluation of Statewide AIS Control Projects. Eurasian watermilfoil research meeting, Rhinelander, WI.

aunt, M. (24 March 2012). Ripley Lake, Jefferson Co. Aquatic Plants. Ripley Lake Management District Meeting, Cambridge, WI.

Nault, M., T. Asplund, J. Hauxwell, M. Barton, and J. Skogerboe. (28 February 2012). Effects of Whole Lake Early Season 2,4-D on Eurasian Watermilfoil (*Myriophyllum spicatum*). Midwest Aquatic Plant Management Society Meeting, Milwaukee, WI.

Nault, M., T. Asplund, J. Hauxwell, M. Barton, and J. Skogerboe. (27 February 2012). What we're learning from herbicide residual monitoring following treatments for Eurasian Watermilfoil (*Myriophyllum spicatum*) in Wisconsin. Midwest Aquatic Plant Management Society Meeting, Milwaukee, WI.

Nault, M., T. Asplund, J. Hauxwell, M. Barton, and J. Skogerboe. (22 February 2012). Herbicide Concentration Monitoring Projects. Lake Technical Team Meeting, Stevens Point, WI.

Nault, M., T. Asplund, J. Hauxwell, M. Barton, and J. Skogerboe. (14 February 2012). EWM Research and Herbicide Treatment Synthesis. APM Applicator Meeting, Oshkosh, WI.

Nault, M., M. Barton, T. Asplund, J. Hauxwell., and J. Skogerboe. (19 January 2012). Herbicide Treatment Synthesis. Wisconsin Lake Partnership Meeting, Wausau, WI.

Asplund, A., M. Nault, and J. Skogerboe. (28 October 2011). What we're learning from early season, large-scale herbicide treatments for Eurasian watermilfoil in Wisconsin. NALMS, Spokane, WA.

Nault, M., and J. Skogerboe. (24 June 2011). Eurasian watermilfoil herbicide research (results that may surprise you). Northwest Lakes Conference, Minong, WI.

Nault, M. (16 April 2011). Rock Lake, Jefferson Co. Aquatic Plants. Rock Lake Association Meeting, Lake Mills, WI.

Nault, M. J. Hauxwell, A. Mikulyuk, T. Asplund, J. Skogerboe, M. Balfour, S. Van Egeren, and K. Wagner. (10 February 2011). Long term trends in Eurasian watermilfoil populations and evaluation of statewide management projects. Wisconsin Lake Partnership Meeting, Wausau, WI.

Nault, M., J. Hauxwell, A. Mikulyuk, T. Asplund, and J. Skogerboe. (20 January 2011). Evaluation of Statewide Eurasian Watermilfoil Control Projects. Eurasian watermilfoil research meeting, Eau Claire, WI.

Nault, M., J. Hauxwell, A. Mikulyuk, T. Asplund, and J. Skogerboe. (19 January 2011). Evaluation of Statewide Eurasian Watermilfoil Control Projects. Eurasian watermilfoil research meeting, Rhinelander, WI.

Nault, M., J. Hauxwell, A. Mikulyuk, T. Asplund, and J. Skogerboe. (18 January 2011). Evaluation of Statewide Eurasian Watermilfoil Control Projects. Eurasian watermilfoil research meeting, Green Bay, WI.

Mikulyuk, A., J. Hauxwell, M. Nault, and S. van Egeren. (9 November 2010). Contrasting the effects of early-season harvesting and chemical treatment in Lake Monona (Madison, WI). Minnesota-Wisconsin Invasive Species Conference, St. Paul, MN.

Nault, M., J. Hauxwell, A. Mikulyuk, J. Skogerboe and S. van Egeren. (9 November 2010). Effects of whole-lake early season 2,4-D on Eurasian watermilfoil (*Myriophyllum spicatum*). Minnesota-Wisconsin Invasive Species Conference, St. Paul, MN.

van Egeren, S., J. Hauxwell, A. Mikulyuk and M. Nault. (9 November 2010). Invasion trajectories and population trends of Eurasian watermilfoil (*Myriophyllum spicatum*) in Wisconsin. Minnesota-Wisconsin Invasive Species Conference, St. Paul, MN.

Balfour, M., J. Hauxwell, A. Mikulyuk, M. Nault and S. van Egeren. (9 November 2010). Invasive aquatic species on our door step: The need for vigilant neighbors. Minnesota-Wisconsin Invasive Species Conference, St. Paul, MN.

Mikulyuk, A., J. Hauxwell, S. van Egeren, M. Nault and M. Balfour. (1 November 2010). Predicting the invasion success of EWM: State of the science and current research. Aquatic Invasive Species Coordinator's Meeting, Stevens Point, WI. Invited Talk.

Mikulyuk A., J. Hauxwell, S. Knight, M. Nault, S. Van Egeren and M. Balfour. (1 October 2010). Aquatic macrophyte research in the Northwoods. Science in the Northwoods Conference, Boulder Junction, WI. Available from http://limnology.wisc.edu/Science_in_the_Northwoods.php

Mikulyuk, A., J. Hauxwell, M. Nault, and S. Van Egeren. (24 September 2010). Predicting Invasion Success of Eurasian Watermilfoil (and Curly-leaf Pondweed) State of the Science and Current Research. Workshop on Aquatic Plant Management Issues in the Upper Midwest, Lansing, MI. Hosted by the Michigan Dept. of Natural Resources and Environment (MI DNRE) / Sponsored by the US Army ERDC Water Operations Technical Support (WOTS) Program.

Hauxwell, J., A. Mikulyuk, M. Nault, S. Knight, S. Van Egeren, M. Balfour, T. Asplund, and colleagues. (14 September 2010). Aquatic Ecology and Human Impacts on Lake Ecosystems Session of the Wisconsin Lake Leaders Institute, Seminar II, Kemp Natural Resources Station, Woodruff, WI.

Mikulyuk A., J. Hauxwell, S. Van Egeren, M. Nault and colleagues. (12 April 2010). Turville Bay Aquatic Plant Management Project: Research Update. Dane County Public Information Meeting, Madison, WI.

Nault, M., J. Hauxwell, A. Mikulyuk. (7 April 2010). Evaluation of Statewide Eurasian Watermilfoil Control Projects. Eurasian watermilfoil research meeting, Oshkosh, WI.

Asplund, T., P. Garrison, N. Kamman, R. Mitchell and M. Nault. (1 April 2010). Learning from the National Lakes Assessment: What's Next for Wisconsin Lakes? Wisconsin Lakes Convention; Green Bay, WI.

Mikulyuk, A., J. Hauxwell, S. Knight, S. Van Egeren, M. Nault, P. Rasmussen, and colleagues. (2 March 2010). Wisconsin DNR Watershed Biologists Statewide Training Meeting; Central Wisconsin Environmental Station, Amherst Junction, WI: Overview of aquatic plant related research activities: monitoring, milfoil, and land use.

Nault, M., A. Mikulyuk, and J. Hauxwell. (22 February 2010). Evaluation of Statewide Eurasian Watermilfoil projects. Wisconsin DNR Northern Region Eurasian Watermilfoil Research Meeting, Rhineland, WI.

Greg Sass

Sass, Greg G. (April 2012). University of Wisconsin-Stevens Point American Fisheries Society Student Subunit Stevens Point, Wisconsin. The Escanaba Lake Research Station: the past, present, and future of Wisconsin's experimental fisheries research lakes.

Sass, Greg G. (April 2012). Wisconsin Lakes Partnership Convention, Green Bay, Wisconsin. The Escanaba Lake Research Station: the past, present, and future of Wisconsin's experimental fisheries research lakes.

Sass, Greg G. (March 2012). UW-Madison, Center for Limnology, Brownbag Seminar, Madison, Wisconsin. The Escanaba Lake Research Station: the past, present, and future of Wisconsin's experimental fisheries research lakes.

Sass, Greg G. (April 2011). Illinois Department of Natural Resources Brownbag Seminar. Springfield, Illinois. The Nature Conservancy's Emiquon Preserve: fish and waterfowl responses to the restoration of two former Illinois River floodplain lakes.

Sass, Greg G. 2011. University of Tennessee at Martin, Martin, Tennessee. The Nature Conservancy's Emiquon Preserve: fish and waterfowl responses to the restoration of two former Illinois River floodplain lakes.

*Chapman, Duane C. and Sass, Greg G. 2010. 71st Midwest Fish and Wildlife Conference, Minneapolis, Minnesota. Zooplankton community composition across a gradient of Asian carp densities and pre- and post-invasion within the Illinois River, USA *Talk given by Duane Chapman due to weather related cancellation for GGS.

Sass, Greg G. (September 20-21, 2010). Asian Carp Marketing Summit, Alton, Illinois. Status of Asian carp in the Midwestern United States.

Sass Greg G. 2010. 17th International Conference on Aquatic Invasive Species, San Diego, California. Capture Efficiency of Asian Carp in the La Grange Pool of the Illinois River Using Traditional Gear.

Sass, Greg G. 2010. 17th International Conference on Aquatic Invasive Species. San Diego, California. The Effects of Visual and Acoustic Deterrents to Prevent the Upstream Movement of Asian Carps.

Sass, Greg G. 2010. University of Illinois at Urbana-Champaign,– NRES Departmental Seminar. Champaign, Illinois. Characterizing the Illinois River in the Context of the Upper Mississippi River System: Fish and Submersed Aquatic Vegetation Communities.

Sass, Greg G. 2010. Western Illinois University, Plenary Speaker for Graduate Student Symposium. Macomb, Illinois. Environmental and Economic Impacts of Asian Carps on the Illinois River.

Sass, Greg G. 2010. University of Florida, Gainesville, Florida. Fish community and food web responses to a whole-lake removal and addition of coarse woody habitat.

Van Middlesworth, T.D., G.G. Sass, B.A. Ray, and T.W. Spier. 2012. 44th Annual Meeting of the Mississippi River Research Consortium. LaCrosse, Wisconsin. Relative abundances and feeding habits of bowfin, gar, and largemouth bass at the Emiquon Preserve and

Reelfoot Lake: Can particular native fish species assemblages control invasive common carp?

Liss, S.A., G.G. Sass, and C.D. Suski. 2012. 44th Annual Meeting of the Mississippi River Research Consortium LaCrosse, Wisconsin. Nutrition and condition of invasive silver carp across large Illinois rivers: Can stress and nutrition influence establishment?

Van Middlesworth, T.D., N.N. Michaels, and G.G. Sass. 2012. 5th Annual Emiquon Science Symposium. Lewistown, Illinois. The Nature Conservancy's Emiquon Preserve: fish community Monitoring, 2007-2011.

Liss, S., G.G. Sass, and C.D. Suski. 2012. 50th Annual Meeting of the Illinois Chapter of the American Fisheries Society. Utica, Illinois. Nutrition and condition of invasive silver carp across large Illinois rivers: can stress and nutrition influence establishment?

Tyszko, S.M., M.A. McClelland, N.N. Michaels, and G.G. Sass. 2012. 50th Annual Meeting of the Illinois Chapter of the American Fisheries Society. Utica, Illinois. Fish community indices of biotic integrity applied to the large rivers of Illinois.

McClelland, M.A., G.G. Sass, T.R. Cook, N.N. Michaels, K.S. Irons, and T.M. O'Hara. 2011. American Fisheries Society 141st Annual Meeting. Seattle, Washington. The long-term Illinois River fish population monitoring program, 1957-2010.

Roth, B.M., N.E. Mandrak, G.G. Sass, T.R. Hrabik, and J. Peters. 2011. American Fisheries Society 141st Annual Meeting. Seattle, Washington. Ichthyofauna of the Great Lakes Basin.

Lamer, J.T., G.G. Sass, J.M. Epifanio, M.A. McClelland, A. Hernandez, and J. Thimmapuram. 2011. American Fisheries Society 141st Annual Meeting. Seattle, Washington. Nuclear and mitochondrial SNP development for molecular Discrimination of bighead carp, silver carp, and their hybrids.

Irons, K.S., G.G. Sass, M.A. McClelland, and T.M. O'Hara. 2011. American Fisheries Society 141st Annual Meeting. Seattle, Washington. Bigheaded carp invasion of the La Grange Reach of the Illinois River: Insights from the Long-term Resource Monitoring Program.

Moody, C.J., G.G. Sass, L.D. Frankland, and R.E. Colombo. 2011. American Fisheries Society 141st Annual Meeting. Seattle, Washington. Demographics of a commercially exploited population of flathead catfish in the Wabash River.

Stuck, J.G., L.D. Frankland, G.G. Sass, and R.E. Colombo. 2011. American Fisheries Society 141st Annual Meeting. Seattle, Washington. Monitoring the population demographics of invasive silver carp in the Illinois River.

Tyszko, S.M., M.A. McClelland, N.N. Michaels, and G.G. Sass. 2011. American Fisheries Society 141st Annual Meeting. Seattle, Washington. Fish community indices of biotic integrity applied to the large rivers of Illinois.

Michaels, N.N., G.G. Sass, T.W. Spier. 2011. American Fisheries Society 141st Annual Meeting. Seattle, Washington. Biomanipulation of the largemouth bass population to control invasive species and eutrophication at The Nature Conservancy's Emiquon Preserve.

Ruebush, B.C., G.G. Sass, and J.H. Chick. 2011. American Fisheries Society 141st Annual Meeting. Seattle, Washington. In-situ tests of sound-bubble-strobe light barrier technologies to prevent range expansions of Asian carp.

Ruebush, B.C., G.G. Sass, and J.H. Chick. 2011. 43rd Annual Mississippi River Research Consortium. La Crosse, Wisconsin. In-situ evaluation of sound-bubble-strobe light barrier technologies to prevent the range expansions of Asian carp.

Michaels, N.N., G.G. Sass, and T.W. Spier. 2011. 43rd Annual Mississippi River Research Consortium. La Crosse, Wisconsin. The Nature Conservancy's Emiquon Preserve: largemouth bass diet response to restoration.

Van Middlesworth, T.D., G.G. Sass, T.W. Spier, B.C. Ruebush, L. Solomon, M.A. McClelland, N.N. Michaels, S.M. Tyszko, and T.R. Cook. 2011. 43rd Annual Mississippi River Research Consortium. La Crosse, Wisconsin. Aquatic vegetation and fish community monitoring at the Nature Conservancy's Emiquon Preserve: testing for regime shifts in ecosystem state.

Bushman, B., G.G. Sass, and M.A. McClelland. 2011. 43rd Annual Mississippi River Research Consortium. La Crosse, Wisconsin. Common carp in the Illinois River.

Van Middlesworth, T.D., G.G. Sass, T.W. Spier, M.A. McClelland, N.N. Michaels, S.M. Tyszko, and T.R. Cook. 2011. 3rd Midwest-Great Lakes Society for Ecological Restoration Chapter Meeting. Springfield, Illinois. Aquatic vegetation and fish community monitoring at the Nature Conservancy's Emiquon Preserve: testing for regime shifts in ecosystem state.

Michaels, N.N., G.G. Sass, and T.W. Spier. 2011. 3rd Midwest-Great Lakes Society for Ecological Restoration Chapter Meeting. Springfield, Illinois. The Nature Conservancy's Emiquon Preserve: largemouth bass diet response to restoration.

Michaels, N.N., G.G. Sass, and T.W. Spier*. 2011. Illinois Lake Management Association and Illinois Chapter American Fisheries Society Joint Annual Conference. Peoria, Illinois. The Nature Conservancy's Emiquon Preserve – Largemouth bass *Micropterus salmoides* diet response to restoration *IL AFS Best Student Paper Award.

Spacapan, M.R., B.C. Ruebush, S. Lischka, and G.G. Sass. 2011. Illinois Lake Management Association and Illinois Chapter American Fisheries Society Joint Annual Conference. Peoria, Illinois. A human-dimensions evaluation of river usage in the La Grange reach of the Illinois River following the invasion of Asian carp.

Ruebush, B.C., G.G. Sass, J.H. Chick, and C.D. Suski. 2011. Illinois Lake Management Association and Illinois Chapter American Fisheries Society Joint Annual Conference. Peoria, Illinois. In-situ evaluation of sound-bubble-strobe light barrier technologies to prevent the range expansions of Asian carp.

Sass, G.G., A.C. Erickson, and M.A. McClelland. 2010. 140th Annual Meeting of the American Fisheries Society Pittsburgh, Pennsylvania. Zooplankton community composition across a gradient of Asian carp densities and pre- and post- invasion within the Illinois River, USA.

Ruebush, B.C., G.G. Sass, and J.H. Chick. 2010. 140th Annual Meeting of the American Fisheries Society Pittsburgh, Pennsylvania. Ecosystem-scale evaluation of sound bubble barrier technologies to prevent range expansions of Asian carps.

Michaels, N.N., G.G. Sass, and T.W. Spier. 2010. 140th Annual Meeting of the American Fisheries Society. Pittsburgh, Pennsylvania. The Nature Conservancy's Emiquon Preserve: The emerging food web in a newly restored floodplain lake.

Irons, K.S., T.M. O'Hara, M.A. McClelland, T.R. Cook, N.N. Michaels, and G.G. Sass. 2010. 140th Annual Meeting of the American Fisheries Society. Pittsburgh, Pennsylvania. Catfishes in the Upper Mississippi River System: distribution and trends as noted by the long term resource monitoring program.

McClelland, M.A., T.R. Cook, K.S. Irons, T.M. O'Hara, G.G. Sass, N.N. Michaels, and C.S. Smith. 2010. 140th Annual Meeting of the American Fisheries Society. Pittsburgh, Pennsylvania. Fifty years of the long term Illinois fish population monitoring program.

O'Hara, T.M., K.S. Irons, M.A. McClelland, and G.G. Sass. 2010. Conservation, Ecology, and Management of Catfish, The Second International Symposium. St. Louis, Missouri. Assessment of channel catfish (*Ictalurus punctatus*) populations in the Upper Mississippi River system.

Irons, K.S., T.M. O'Hara, M.A. McClelland, T.R. Cook, N.N. Michaels, and G.G. Sass. 2010. Conservation, Ecology, and Management of Catfish, The Second International Symposium. St. Louis, Missouri. Catfishes in the Upper Mississippi River system: Distribution and trends as noted by the Long Term Resource Monitoring Program.

Michaels, N.N., G.G. Sass, and T.W. Spier. 2010. 42nd Annual Mississippi River Research Consortium. La Crosse, Wisconsin. The Nature Conservancy's Emiquon Preserve: the emerging food web in a newly restored floodplain lake.

Ruebush, B.C., G.G. Sass, and J.H. Chick. 2010. 42nd Annual Mississippi River Research Consortium. La Crosse, Wisconsin. Ecosystem-scale evaluation of sound bubble barrier technologies to prevent range expansions of Asian carps.

Irons, K.S., T.M. O'Hara, M.A. McClelland, T.R. Cook, N.N. Michaels, and G.G. Sass. 2010. 42nd Annual Mississippi River Research Consortium. La Crosse, Wisconsin. Catfishes in the Upper Mississippi River System. Distribution and trends as noted by the Long Term Resource Monitoring Program.

Sass, G.G., A.C. Erickson, and M.A. McClelland. 2010. 48th Meeting of the Illinois Chapter of the American Fisheries Society. Whittington, Illinois. Zooplankton community composition across a gradient of Asian carp Densities and pre- and post-invasion within the Illinois River, USA.

Irons, K.S., D.C. Chapman, M.A. McClelland, T.M. O'Hara, G.G. Sass, J.A. Thomas, T.R. Cook, and M.S. Pearson. 2010. 48th Meeting of the Illinois Chapter of the American Fisheries Society. Whittington, Illinois. Asian carps in the mid-continent great rivers.

Michaels, N.N., G.G. Sass, T. Spier, T.M. O'Hara, K.S. Irons, M.A. McClelland, and T.R. Cook. 2010. 48th Meeting of the Illinois Chapter of the American Fisheries Society. Whittington, Illinois. The Nature Conservancy's Emiquon Preserve: resetting and restoring the Thompson Lake fish community.

O'Hara, T.M., K.S. Irons, M.A. McClelland, T.R. Cook, N.N. Michaels, and G.G. Sass. 2010. 48th Meeting of the Illinois Chapter of the American Fisheries Society. Whittington, Illinois. Status and trends of channel catfish in the UMRS: explaining variability in year class strength and relative abundances.

Kelly Wagner

Mikulyuk, A. and K. Wagner. (15 March 2012). Macrophyte Assemblage Method Field Demonstration. EPA National Train-the-Trainers Event for the 2012 National Lakes Survey in Helen, GA. Invited talk.

Wagner, K. and A. Mikulyuk. (14 March 2012). Macrophyte Assemblage Method Field Training. EPA National Train-the-Trainers Event for the 2012 National Lakes Survey in Helen, GA. Invited talk.

Mikulyuk, A. and K. Wagner. (13 March 2012). Macrophyte Assemblage Characterization Method. EPA National Train-the-Trainers Event for the 2012 National Lakes Survey in Helen, GA. Invited talk.

Wagner, K., A. Mikulyuk, T. Asplund, E. Ridley, P. Wax, L. Herger, P. Kaufmann, M. Barton. (9 November 2011). NLA Macrophyte Assessment Summary. EPA 2012 National Lakes Assessment Steering Committee Meeting. Invited talk.

Mikulyuk, M., K. Wagner, T. Asplund, E. Ridley. (4 August 2011). NLA Macrophyte Assessment. EPA 2012 National Lakes Assessment Steering Committee Meeting. Invited talk.

Wagner, K., M. Balfour, M. Nault, A. Mikulyuk, S. Van Egeren, J. Hauxwell, S. Knight, J. Skogerboe, T. Asplund. (10 February 2011). Evaluation of Aquatic Macrophyte Research. Wisconsin Lakes Partnership Quarterly meeting in Wausau, WI. Invited talk.

Wagner, K. and S. Van Egeren. (28 January 2011). WisCALM Updates: Aquatic Macrophyte Index Development. Wisconsin DNR Statewide Watershed Biologists Meeting in Tomahawk, WI. Invited talk.

Wagner, K., M. Balfour, M. Nault, A. Mikulyuk, S. Van Egeren, J. Hauxwell, S. Knight, J. Skogerboe, T. Asplund. (27 January 2011). Science Services Aquatic Macrophyte Research. Wisconsin DNR Statewide Water Quality Biologists Meeting in Tomahawk, WI. Invited talk

Carl Watras

Watras, C. J. (June 2010). Visiting Chinese delegation, Seminar on wireless sensor networks to monitor wetland ecosystems, Trout Lake Research Station.

Brian Weigel

Weigel, B.M. (May 2012). Optimizing the Water Quality Bureau stream monitoring framework. WDNR Leadership Academy, Madison, Wisconsin.

Weigel, B.M. (26 April 2012). Water Quality Bureau stream monitoring framework 2012 and beyond. US EPA Region V and WDNR Monitoring Discussion, Janesville, Wisconsin.

Weigel, B.M. (20 March 2012). Development, validation, and application of a macroinvertebrate index of biotic integrity for nonwadeable rivers of Wisconsin. Upper Mississippi River Conservation Committee, Water Quality Technical Committee, Winona, Minnesota.

Weigel, B.M. (February 2012). Water Quality Bureau stream monitoring framework 2012 and beyond. WDNR Stream Biologists Statewide Conference, Rhinelander, Wisconsin.

Weigel, B.M. (December 2011). Water Quality Bureau stream monitoring framework 2012 and beyond. WDNR Water Quality Policy Management Team, Madison, Wisconsin.

Weigel, B.M. (06 June 2011). Introduction to Standardized Collection and Assessment of Macroinvertebrates in Nonwadeable Rivers of Wisconsin. WDNR Water Quality Biologists Field Training, Lincoln County, Wisconsin.

Weigel, B.M. (05 June 2011). Introduction to Standardized Collection and Assessment of Macroinvertebrates in Nonwadeable Rivers of Wisconsin. WDNR Water Quality Biologists Field Training, Rock County, Wisconsin.

Weigel, B.M. (February 2011). Stream macroinvertebrate IBI and HBI responses to stressors. WDNR Stream Biologists Statewide Conference, Rhinelander, Wisconsin.

Weigel, B.M., C. Wagner, and P.D. Kanehl. (March 2011). Effectiveness of riparian management zone BMPs for preserving stream Health. International Society for Sustainable Forestry and Wildlife Society, Wisconsin Dells, Wisconsin.

Weigel, B.M., and C. Wagner. (13 January 2010). Evaluation of forestry water quality best management practices on stream habitat, fish, and macroinvertebrate communities. WDNR Science Services Seminar, Madison, Wisconsin.

Weigel, B.M., P.D. Kanehl, and C. Wagner. (11 February 2010). Evaluation of riparian buffers in timber sales for preserving stream health. WDNR Winter Science Services Seminar Series, Madison, Wisconsin.

Weigel, B.M., and J. Stewart. (15 March 2010). Wadeable Stream Monitoring Sites. Watershed Bureau Stream and Rivers Monitoring Technical Team, Madison, Wisconsin.

Scientist and Technician Biographies

Scientists in the Fisheries and Aquatic Sciences Research Section are experts in their fields of study. In the following section, we provide information on their educational background, their area of expertise, key collaborators, and publications over the past 10 years. Internal management reports, unpublished grant products, and popular articles are also included. Much of the published work would not be possible without the field data collection coordinated by our permanent technicians and LTEs.

Martha Barton, LTE Scientist

Education:

B.S. Biology, University of Central Florida
M.S. Biology, University of Central Florida

Expertise:

Aquatic ecology, aquatic macrophyte monitoring, aquatic invasive plant ecology and management

Publications (past 10 years):

Nault, M., A. Mikulyuk, J. Hauxwell, J. Skogerboe, T. Asplund, M. Barton, K. Wagner, T. Hoyman, and E. Heath. 2012. Herbicide treatments in Wisconsin lakes. *LakeLine* 32: 21-26.

Hauxwell, J. and M. Balfour (eds). 2010. WDNR Fisheries and Aquatic Sciences Research Section 2008-2010 Biennial Report. 134 pp. DNR internal publication.



Matt Diebel, Scientist

Education:

B.A. Biology, Colorado College
M.S. Water Resources Management, University of Wisconsin-Madison
Ph.D. Limnology, University of Wisconsin-Madison

Expertise:

Non-point source pollution, landscape-scale patterns in aquatic ecosystems, distributions of Wisconsin stream fishes, statistical modelling, Nitrogen stable isotopes

Key collaborators:

US Geological Survey; UW-Madison Center for Limnology; USDA Forest Service

Publications (past 10 years):

Peer-reviewed Journals:



- Diebel, M., M. Fedora, S. Cogswell, and J.R. O'Hanley. In review. Effects of road crossings on habitat connectivity for stream-resident fish.
- O'Hanley, J., J. Wright, M. Diebel, M. Fedora, and C. Soucy. In review. Restoring stream habitat connectivity: A proposed method for prioritizing the removal of resident fish passage barriers.
- Bartrons, M., M. Pape, M. Diebel, C. Gratton, and M.J. Vander Zanden. In review. Empirical model of the potential flux of aquatic productivity from lakes and streams onto land.
- Januchowski-Hartley, S., P. McIntyre, M. Diebel, P. Doran, D. Infante, C. Joseph, and J. D. Allan. In review. Restoring aquatic ecosystem connectivity requires expanding barrier inventories.
- Diebel, M. W., J. T. Maxted, O. P. Jensen, and M. J. Vander Zanden. 2010. A spatial autocorrelative model for targeting stream restoration to benefit sensitive non-game fishes. *Canadian Journal of Fisheries and Aquatic Sciences* 67:165-176.
- Diebel, M. W., and M. J. Vander Zanden. 2009. Nitrogen stable isotopes in streams: effects of agricultural sources and transformations. *Ecological Applications* 19:1127-1134.
- Diebel, M. W., J. T. Maxted, S. Han, D. M. Robertson, and M. J. Vander Zanden. 2009. Landscape planning for agricultural non-point source pollution reduction III: Assessing phosphorus and sediment reduction potential. *Environmental Management* 43:69-83.
- Maxted, J., M. Diebel, and M. Vander Zanden. 2009. Landscape Planning for Agricultural Non-Point Source Pollution Reduction. II. Balancing Watershed Size, Number of Watersheds, and Implementation Effort. *Environmental Management* 43:60-68.
- Diebel, M. W., J. T. Maxted, P. Nowak, and M. J. Vander Zanden. 2008. Landscape planning for agricultural non-point source pollution reduction I: A geographical allocation framework. *Environmental Management* 42:789-802.
- Helmus, M. R., K. Savage, M. W. Diebel, J. T. Maxted, and A. R. Ives. 2007. Separating the determinants of phylogenetic community structure. *Ecology Letters* 10:917-925.
- Vander Zanden, M. J., Y. Vadeboncoeur, M. W. Diebel, and E. Jeppesen. 2005. Primary consumer stable nitrogen isotopes as indicators of nutrient source pathways. *Environmental Science and Technology* 39:7509-7515.
- Fitzpatrick, F. A., M. W. Diebel, M. A. Harris, T. L. Arnold, M. A. Lutz, and K. D. Richards. 2005. Effects of urbanization on the geomorphology, habitat, hydrology and fish index of biotic integrity of streams in the Chicago area, Illinois and Wisconsin. Pages 87-115 in L. R. Brown, R. H. Gray, R. M. Hughes, and M. Meador, editors. *Effects of Urbanization on Stream Ecosystems*. American Fisheries Society, Symposium 47, Bethesda, Maryland.
- Reports, Articles, Guidelines, and Protocols:
- Diebel, M. 2012. Great Lakes Aquatic Connectivity Project website.
<http://conserveonline.org/workspaces/streamconnect>

Diebel, M., C. Hardin, and P. Ertel. 2011. Great Lakes road-stream crossing inventory instructions. <http://conserveonline.org/workspaces/streamconnect>

Diebel, M., M. Fedora, and S. Cogswell. 2009. Prioritizing road crossing improvement to restore stream connectivity for stream-resident fish. Proceedings of the 2009 International Conference on Ecology and Transportation. Duluth, MN.

University of Wisconsin-Madison, College of Agricultural and Life Sciences. 2005. Wisconsin Buffer Initiative final report. http://www.nelson.wisc.edu/people/novak/wbi/pdf/wbi_final_report.pdf

Fitzpatrick, F. A., M. C. Peppler, H. E. Schwar, J. A. Hoopes, and M. W. Diebel. 2005. Monitoring channel morphology and bluff erosion at two installations of flow-deflecting vanes, North Fish Creek, Wisconsin, 2000–03. U.S. Geological Survey Scientific Investigations Report 04-5272.

Water Resources Management Workshop. 2004. Innovating stormwater management on the University of Wisconsin-Madison campus. Gaylord Nelson Institute for Environmental Studies, University of Wisconsin-Madison. <http://www.nelson.wisc.edu/wrm/workshops/2003/>

Diebel, M. W. and D. J. Sullivan. 2003. Surface-water-resources information for the Ho-Chunk Nation lands and vicinity, Wisconsin. U.S. Geological Survey Water Resources Investigations Report 02-4307.

David Dreikosen, Technician

Education:

B.S. Zoology, University of Wisconsin-Madison

Expertise:

Sampling gear, ageing techniques, ecology and fish population dynamics

Publications (past 10 years):

See those listed under Newman.



Eric Erdmann, LTE Scientist

Education:

B.S., Wildlife Ecology, University of Wisconsin-Madison

Graduate Certificate, Geographic Information Systems (GIS), University of Wisconsin-Madison

M.S., Wildlife Ecology, University of Wisconsin-Madison



Expertise:

Ecology, Remote Sensing, GIS, Landscape Ecology

Publications (past 10 years):

Peer-reviewed journals:

Erdmann, E.S., C.A. Ribic, D.L. Patterson-Fraser, W.R. Fraser. In press. Characterization of winter foraging locations of Adélie Penguins along the Western Antarctic Peninsula, 2001-2002. Deep Sea Research Part II: Topical Studies in Oceanography.

Ribic, C.A., S.B. Sheavly, D.J. Rugg, E.S. Erdmann. 2011. Trends in marine debris along the U.S. Pacific Coast and Hawai'i 1998-2007. Marine Pollution Bulletin 64: 994-1004.

Mikulyuk, A., S. Sharma, S. Van Egeren, E. Erdmann, M. Nault, J. Hauxwell. 2011. The relative role of environmental, spatial and land-use patterns in explaining aquatic macrophyte community composition. Canadian Journal of Fisheries and Aquatic Sciences 68: 1778-1789.

Gorman, K.B., E.S. Erdmann, B.C. Pickering, P.J. Horne, J.R. Blum, H.M. Lucas, D.L. Patterson-Fraser, W.R. Fraser. 2010. A new high-latitude record for the Macaroni Penguin (*Eudyptes chrysolophus*) at Avian Island, Antarctica. Polar Biology Vol. 33: 1155-1158.

Ribic, C.A., S.B. Sheavly, D.J. Rugg, E.S. Erdmann. 2010. Trends and Drivers of Marine Debris on the Atlantic Coast of the United States 1997-2007. Marine Pollution Bulletin 60(8): 1231-1242.

Devenish, E.S., H.P. Nelson, F. Lucas, E.S. Erdmann. 2007. A preliminary assessment of the species richness of the Madamas Watershed: a proposed national park. Living World, Journal of the Trinidad and Tobago Field Naturalists' Club, pp. 69-78.

Reports, Articles, Guidelines, and Protocols:

Betz, C.R., T. Asplund, J. Hurley, T. Bernthal, A. Coulson, E. Erdmann, P. Garrison, S. Greb, B. Hansis, D. Higgins, R. Hunt, P. Juckem, E. O'Brian, D. Robertson, C. Wolbers. 2010. Water Resources Working Group. Wisconsin Initiative on Climate Change Impacts. (Working group reviewers: J. Hauxwell and D. Higgins; WICCI Science Council Reviewers: S. Dunwoody, B. Johnson, and J. Kutzbach). UW Nelson Institute for Environmental Studies and Wisconsin Dept. Natural Resources.

Erdmann, E.S. and S.R. Greb. 2010. Using Landsat Satellite Imagery to Monitor Wisconsin Lake Water Clarity: An Update for 2009. Wisconsin Department of Natural Resources, Madison, Wisconsin.

Paul Garrison, Scientist

Education:

B.S., Biology, Montana State University
M.S., Biology, Montana State University

Expertise:

Paleolimnology, lake restoration, lake assessment, wetland assessment, stream assessment, lake classification

Key collaborators:

USGS; Bad River Band of the Lake Superior Tribe of Chippewa Indians; Lac Courte Oreilles Band of the Lake Superior Tribe of Chippewa Indians; UW-Milwaukee—The Water Institute; UW-Stevens Point, Dr. Samantha Kaplan; Michigan State University, Dr. Patricia Sorrano, WDNR Office of Great Lakes, Lakes Program, Water Quality Bureau, Whitefish Lake Conservation Organization; Big Round Lake District; Lake Arbutus Lake Association; Silver Lake Lake Association; Barron County Land and Water Conservation; City of Shell Lake. Benton County, Minnesota Conservation Department. Clear Lake, Iowa Lake Improvement Association.



Publications (past 10 years):

Peer-reviewed journals:

Garrison, P.J., G.D. LaLiberte, and B.P. Ewart. 2010. The importance of water level changes and shoreline development in the eutrophication of a shallow, seepage lake. *Proceedings of the Academy of Natural Sciences, Philadelphia*. 160: 113-126.

Drevnick, P.E., D.E. Canfield, P.R. Gorski, A.C. Shinneman, D.R. Engstrom, D.C.G. Muir, G.R. Smith, P.J. Garrison, L.B. Cleckner, J.P. Hurley, R.B. Noble, R.R. Otter, and J.T. Oris. 2007. Deposition and cycling of sulfur controls mercury accumulation in Isle Royale fish. *Environ. Sci. & Tech.* 41: 7266-7272.

Wang, L., D.M. Robertson, and P.J. Garrison. 2007. Linkages between nutrients and assemblages of macroinvertebrates and fish in wadeable streams: Implication to nutrient criteria development. *Environmental Management* 39: 194-212.

Robertson, D. M., D. J. Graczyk, P. J. Garrison, L. Wang, G. LaLiberte, and R. Bannerman. 2006. Nutrient concentrations and their relations to the biotic integrity of wadeable streams in Wisconsin. *U.S. Geological Survey Professional Paper 1722*, 120 pp.

Garrison, P.J. and S.A. Fitzgerald. 2005. The role of shoreland development and commercial cranberry farming in a lake in Wisconsin, USA. *J. Paleolimnol.* 33: 169-188.

Fitzpatrick F.A., Garrison P.J., Fitzgerald S.A. and Elder J.F. 2003. Nutrient, trace-element, and ecological history of Musky Bay, Lac Courte Oreilles, Wisconsin, as inferred from sediment cores. *U.S. Geological Survey Water-Resources Investigation Report 02-4225*. 141 pp.

- Robertson, D.M. G.L. Goddard, E.A. Mergener, W.J. Rose, P.J. Garrison. 2002. Hydrology and water quality of Geneva Lake, Walworth County, Wisconsin. U.S. Geological Survey Water-Resources Investigation Report 02-4039. 73 pp
- Garrison, P.J. 2001. Problem Identification. C. Holdren, W. Jones, and J. Taggart (eds). In *Managing Lakes and Reservoirs*. N. Am. Lake Manage. Soc. and Terene Inst., in coop. With Off. Water Assess. Watershed Prot. Div. U.S. Environ. Prot. Agency, Madison, WI. pp. 101-138.
- Garrison, P.J. 2001. Book Review of *Conservation Management of Freshwater Habitats-Lakes, Rivers, and Wetlands* by P.S. Maitland & N.C. Morgan. *J. Paleolimnol.* 25:545-547.
- Garrison, P.J. and R.E. Wakeman. 2000. Use Of Paleolimnology To Document The Effect Of Lake Shoreland Development On Water Quality. *J. Paleolimnol.* 24:369-393.
- Reports, Articles, Guidelines, and Protocols:
- Garrison, P.J. and G. LaLiberte. 2012. Paleocological Study of Shell Lake, Washburn County. Wisconsin Department of Natural Resources. PUB-SS-1088 2011. 19 pp.
- Garrison, P.J. 2012. Paleocological Study Dunes Lake, Door County and Water Quality Assessment of 3 Nearby Streams. Wisconsin Department of Natural Resources. PUB-SS-1093 2012. 16 pp.
- Garrison, P.J. 2011. Evaluation of the Bad River Wetlands—2006. Wisconsin Department of Natural Resources. PUB SS-1084 2011. 23 pp.
- Garrison, P.J. 2011. Paleocological Study of Honest John Lake, Ashland County. Wisconsin Department of Natural Resources. PUB-SS-1085 2011. 12 pp.
- Garrison, P.J. 2011. Paleocological Study of Bear Trap Slough, Ashland County. Wisconsin Department of Natural Resources. PUB-SS-1087 2011. 10 pp.
- Garrison, P., Kaplan, S, and LaLiberte, G. 2011. Max Lake Sediment Core Report to the Wisconsin Focus on Energy. Wisconsin Department of Natural Resources. 11 pp.
- Betz, C.R., T. Asplund, J. Hurley, T. Bernthal, A. Coulson, E. Erdmann, P. Garrison, S. Greb, B. Hansis, D. Higgins, R. Hunt, P. Juckem, E. O'Brian, D. Robertson, C. Wolbers. 2010. Water Resources Working Group. Wisconsin Initiative on Climate Change Impacts. (Working group reviewers: J. Hauxwell and D. Higgins; WICCI Science Council Reviewers: S. Dunwoody, B. Johnson, and J. Kutzbach). UW Nelson Institute for Environmental Studies and Wisconsin Dept. Natural Resources.
- Garrison, P. and G. LaLiberte. 2010. Paleocological Study of Lake Chetac, Sawyer County. Bureau of Science Services miscellaneous publication. PUB-SS-1069 2010.
- Garrison, P.J. 2010. Paleocological Study of Tainter Lake, Dunn County. Wisconsin Department of Natural Resources. PUB SS-1075 2010. 18pp.
- Garrison, P.J. and G. LaLiberte. 2009. Sediment Core Study of Little Rock Lake, Benton County, Minnesota. Wisconsin Department of Natural Resources. PUB-SS-1065. 15 pp.

- Garrison, P.J. 2009. Destratifying Moderate Shallow Lakes. Lakeline.
- Garrison, P.J. and R. Pillsbury. 2009. Paleocological Study of Lake Ripley, Jefferson County. Wisconsin Department of Natural Resources. PUB-SS-1062. 17 pp.
- Garrison, P.J. and G. LaLiberte. 2009. Paleocological Study of Lake Chetac, Sawyer County. Wisconsin Department of Natural Resources. PUB-SS-1069. 17 pp.
- Garrison, P.J. and G. LaLiberte. 2009. Sediment Core Study of Little Rock Lake, Benton County, Minnesota. Wisconsin Department of Natural Resources. PUB-SS-1065. 17 pp.
- Garrison, P.J. and G. LaLiberte. 2009. Paleocological Study of Berry Lake Oconto County. Wisconsin Department of Natural Resources. PUB-SS-1058. 17 pp.
- Garrison, P., M.Gansberg, S. Hogler, D. Pozorski, P. Cunningham, and C. Schaal. 2008. The Restoration of Silver Lake, Manitowoc County. Wisconsin Department of Natural Resources. PUB-SS-1046 2009. 59 pp.
- Garrison, P., M. Jennings, A.Mikulyuk, J.Lyons, P.Rasmussen, J.Hauxwell, D. Wong, J.Brandt, and G.Hatzenbeler. 2008. Implementation and Interpretation of Lakes Assessment Data for the Upper Midwest. Final Report to the U.S. EPA Grant No. X7-83124601. PUB-SS-1044 2008. 72 pp.
- Garrison, P.J. 2008. Paleocological Study of Grindstone Lake, Sawyer County. Wisconsin Department of Natural Resources. PUB-SS-1042 2008. 16 pp.
- Garrison, P.J. 2008. Paleocological Study of Bullhead Lake, Manitowoc County. Wisconsin Department of Natural Resources. PUB-SS-1039 2008. 11 pp.
- Garrison, P.J., S.R.Greb, and G. LaLiberte. 2008. Western Lake Michigan Nearshore Survey of Water Chemistry and Cladophora Distribution. Wisconsin Department of Natural Resources. PUB SS-1038 2008. 20pp.
- Garrison, P.J. 2008. A Paleocological Study of Rusk County Lakes. Wisconsin Department of Natural Resources. PUB-SS 1037 2008. 23 pp.
- Garrison, Paul J. 2008. Paleolimnology - A Reflection of Our History. Lake Tides. University of Wisconsin Extension. 33: 4-5.
- Garrison, P.J. 2007. Paleocological Study of Big Round Lake, Polk County. Wisconsin Department of Natural Resources. PUB-SS-1034 2007. 17 pp.
- Garrison, P.J. and G. LaLiberte. 2007. Evaluation of the Bad River Streams 2006. Wisconsin Department of Natural Resources. PUB SS-1031 2007. 26 pp.
- Garrison, P.J. and G. LaLiberte. 2007. Evaluation of the Bad River Wetlands—2004 & 2005. Wisconsin Department of Natural Resources. PUB SS-1030 2007. 11pp.
- Garrison, P.J. 2007. Paleocological Study of Lake Arbutus, Clark/Jackson Counties. Wisconsin Department of Natural Resources. PUB-SS-1029 2007. 14 pp.

- Garrison, P.J. 2006. Paleocological Study of Whitefish Lake, Douglas County. Wisconsin Department of Natural Resources. PUB-SS-1028 2006. 22 pp.
- Garrison, Paul J. 2007. Numbers and Limnological Variables. *LakeLine*. 27:21-24.
- Garrison, Paul J. 2007. Paleolimnology - History in the Mucking. *Lake Tides*. University of Wisconsin Extension. 32:1-3.
- Garrison, P., G. Laliberte, D. Konkel, G. Hatzenbeler, and M. Jennings. 2006. Inventory of Chippewa County Lakes in the Chippewa County Forest, Wisconsin. Wisconsin Department of Natural Resources. PUB-SS-1026 2006. 95 pp.
- Hauxwell, J., G. LaLiberte, A. Mikulyuk, P. Garrison, and G. Vorhes. 2006. Use of Plants and Diatoms for Nutrient Assessment in North Temperate Depressional Wetlands. Wisconsin Department of Natural Resources. PUB-SS-1023 2006. 98 pp.
- Garrison, P.J. 2006. Paleocological Study of Butternut Lake, Price/Ashland Counties. Wisconsin Department of Natural Resources. PUB-SS-1020 2006. 15 pp.
- Garrison, P.J. 2006. Evaluation of the Bad River Wetlands—2003. Wisconsin Department of Natural Resources. PUB-SS-1019 2006. 33pp.
- Greb, S., P. Garrison, and S. Pfeiffer. 2005. Cladophora and Water Quality of Lake Michigan: A Systematic Survey of Wisconsin Nearshore Areas. Report to WDNR Office of Great Lakes. 16pp.
- Garrison, P.J., D.W. Marshall, L. Stremic-Thompson, P.L. Cicero, and P.D. Dearlove. 2005. Effects of Pier Shading on Littoral Zone Habitat and Communities in Lakes Ripley and Rock, Jefferson County, Wisconsin. Wisconsin Department of Natural Resources. PUB-SS-1006 2005. 18pp.
- Garrison, P.J. 2005. Paleocological Study of Lake Owen, Bayfield County. Wisconsin Department of Natural Resources. PUB-SS-1014 2005. 14 pp.
- Garrison, P.J. 2005. Paleocological Study of Mercer and Grand Portage Lakes, Iron County. Wisconsin Department of Natural Resources. PUB-SS-1013 2005. 17 pp.
- Garrison, P.J. 2005. Paleocological Study. of Round Lake, Sawyer County. Wisconsin Department of Natural Resources. PUB-SS-1011 2005. 13 pp.
- Garrison, P.J. 2004. Paleocological Study of Lake Nagawicka, Waukesha County. Wisconsin Department of Natural Resources. PUB-SS-993 2004.
- Garrison, P.J. 2004. Tiny Shrimp: Not for the Bar-B. *Lake Tides*. University of Wisconsin Extension. 29:6-7.
- Garrison, P.J. 2002. What the Green Lake's Sediments tell us about its History. Wisconsin Department of Natural Resources. PUB-SS_964 2002.
- Garrison, P.J. 2002. Evaluation of the Bad River Wetlands using the Diatom Community. Wisconsin Department of Natural Resources.

Lillie, R.A., P.J. Garrison, S.I. Dodson, R.A. Bautz, and G.D. LaLiberte. 2002. Refinement and Expansion of Wetland Biological Indices for Wisconsin: Final Report to USEPA Region V, Wetland Grant #CD975115-01-0. WDNR Publication PUB-SS-968 2002.

Elder, J.F., D.M. Robertson, and P.J. Garrison. 2000. Chemical Composition of Surficial Sediment in Geneva Lake, Wisconsin. USGS Fact Sheet. FS-121-00.

Garrison, P.J. 2000. Paleoecological Study of Geneva Lake, Walworth County. Wisconsin Department of Natural Resources. PUB-SS-952 2000.

Garrison, P.J. 2000. Paleoecological Study of Beulah Lake, Walworth County. Wisconsin Department of Natural Resources. PUB-SS-950 2000.

Garrison, P.J. 2000. Report on Rock River Basin 1998, Rivers and Streams Study. Wisconsin Department of Natural Resources. PUB-SS-951 2000.

Jeremiah Gorne, LTE Technician

Education:

B.S., Northland College, Natural Resources

Expertise:

Aquatic ecology, community ecology, lake assessment



Steven Greb, Scientist

Education:

B.S., Chemistry and Watershed Management, University of Wisconsin-Stevens Point

M.S., Forest Hydrology, Utah State University

Expertise:

Limnology and hydrology, agricultural and urban runoff and pollutants, pathogens, acid rain chemistry, satellite remote sensing of complex waters

Key collaborators:

US Geological Survey; US EPA; University of Wisconsin-Madison, Stevens Point, and Milwaukee; NASA; UW-Extension

Publications (past 10 years):

Peer-reviewed journals:



O'Donnell, D. M., S. W. Effler, M. G. Perkins, C. M. Strait, Z. Lee and S. Greb. 2012. Resolution of optical gradients and pursuit of optical closure for Green Bay, Lake Michigan. *Journal of Great Lakes Research* (in review).

Greb, S.R., A. Martin and J.W. Chipman. 2010. Water Clarity Monitoring of Wisconsin Lakes (USA) using Landsat Satellites. *Proceedings from the International Society of Remote Sensing of the Environment*.

Wilson, T., J. Norman, S. Greb, and A. Roa. 2003. Development of an urban thermal temperature model. *Water Research* 23.

Greb, S.R., S.R. Corsi, R.T. Bannerman, and R.E. Pitt. 2000. Evaluation of the Multichambered Treatment Train, a retrofit water-quality management practice. *Water Environment Research* 72:207-215.

Reports, Articles, Guidelines, and Protocols:

Greb, S. 2011. Measuring Water Clarity: Volunteers Clearly Make a Difference. *Lake Tides*, Vol. 36, No. 1

Betz, C.R., T. Asplund, J. Hurley, T. Bernthal, A. Coulson, E. Erdmann, P. Garrison, S. Greb, B. Hansis, D. Higgins, R. Hunt, P. Juckem, E. O'Brian, D. Robertson, C. Wolbers. 2010. Water Resources Working Group. Wisconsin Initiative on Climate Change Impacts. (Working group reviewers: J. Hauxwell and D. Higgins; WICCI Science Council Reviewers: S. Dunwoody, B. Johnson, and J. Kutzbach). UW Nelson Institute for Environmental Studies and Wisconsin Dept. Natural Resources.

Graczyk, D.J., S.R. Greb. 2006. Soil data at sites near Geneva Lake, Lake Geneva, Wisconsin, and Long Lake, near New Auburn, Wisconsin: USGS Open-File Report 2006-1191, 10 p.

Hunt, R.J., S.R. Greb, and D.J. Graczyk. 2006. Evaluating the effects of nearshore development on Wisconsin lakes. USGS Fact Sheet FS 2006-3033, 4 p.

Greb, S. 2006. Occurrence and origins of pathogens in Wisconsin's urban streams. US EPA 104b(3) grant. Final Report.

Greb, S., Garrison, P. and S. Pfeiffer. 2004. *Cladophora* and water quality of Lake Michigan: A systematic survey of Wisconsin nearshore areas. pp. 73-80, In: Bootsma, H.A., Jensen, E.T., Young, E.B. and J.A. Berges (eds.), *Cladophora* Research and Management in the Great Lakes, Proceedings of a workshop held at the Great Lakes Water Institute, University of Wisconsin – Milwaukee, December, 2004.

Greb, S.R. 2003. Freshwater water quality monitoring by remote sensing; current and potential applications and needs assessment. A report to the Integrated Global Observing Strategy (IGOS) Water Cycle Committee, United Nations Environmental Programme. 22pp.

Greb, S., R. Hunt, and D. Graczyk. 2003. Hydrology, nutrients concentrations, and nutrient yields in nearshore areas of four lakes in northern Wisconsin, 1999-2001. *Water-Resources Investigation Report* 03-4144.

Graczyk, D.W., R.J. Hunt, S.R. Greb, C.A. Buchwald, and J.T. Krohelski. 2003. Hydrology, water quality, and yields from near-shore flows to four lakes in northern Wisconsin, 1999-2001. US Geological Survey. Water-Resource Investigations Report 03-17.

Gene Hatzenbeler, Technician

Education:

B.A., Biology and Chemistry,
Valley City State University, North Dakota
M.S., Biology, University of
Wisconsin-Eau Claire, Eau Claire, Wisconsin

Expertise:

Aquatic ecology, community ecology, lake assessment

Publications (past 10 years):

See those listed under Jennings, Kampa, and Garrison.
In addition:

Hatzenbeler, G.R. 2008. Effects of daily bag limit of 10 panfish on bluegill growth. Report to WDNR Fish Management Statewide Panfish Team.

Hatzenbeler, G.R., M. Engel, and J. Wanner. 2006. Movement of radio-tagged shovelnose sturgeon in the Chippewa River, July 2001 to October 2002. Final Report, Wisconsin DNR, Baldwin, Wisconsin.

Engel, M., J. Wanner, G.R. Hatzenbeler. 2006. Shovelnose sturgeon spawning populations in the Chippewa and Red Cedar Rivers. Final Report. Wisconsin DNR, Baldwin, Wisconsin.

Hatzenbeler, G.R., J.M. Kampa, M J. Jennings, and E E. Emmons. 2004. A comparison of fish and aquatic plant assemblages to assess health and condition of small Wisconsin Lakes. *Lake and Reservoir Management*. 20 (3): 211-218

Margenau T.J., S. J. Gilbert, and G. R. Hatzenbeler. 2003. Angler catch and harvest of northern pike in northern Wisconsin. *N. Am. J. Fish. Managem.* 23: 307-312.

Hatzenbeler G.R., M. A. Bozek, M. J. Jennings, and E. E. Emmons. 2000. Seasonal variation in fish assemblages structure and habitat structure in the nearshore littoral zones of Wisconsin lakes. *N.Am. J. Fish. Managem.* 20: 360-368.

Jennifer Hauxwell, Scientist and Chief

Education:

B.S., Biology, University of Michigan
Michigan Secondary Teaching Certification in Biology and
Chemistry, University of Michigan
Ph.D., Biology/Aquatic Ecology, Boston University Marine
Program, Woods Hole, MA



Expertise: Aquatic ecology, vegetation monitoring, aquatic invasive plant population dynamics and management

Key collaborators:

DNR Lakes program, DNR Water Quality Bureau, DNR Fisheries Management Bureau, DNR Bureau of Endangered Resources, Susan Knight, Kelly Wagner, Alison Mikulyuk, Michelle Nault, Martha Barton, UW-Stevens Point Fisheries Unit Coop, UW-Madison Center for Limnology

Publications (past 10 years):

Peer-reviewed journals:

Hansen, G.J.A., M.J. Vander Zanden, M. Blum, M. Clayton, E. Hain, J. Hauxwell, M. Izzo, M. Kornis, P.B. McIntyre, A. Mikulyuk, E. Nilsson, J.D. Olden, M. Papeş, S. Sharma. Submitted. Are invasive species more abundant than native species? *Frontiers in Ecology and the Environment*.

Mikulyuk, A., S. Sharma, S. Van Egeren, E. Erdmann, M.E. Nault, and J. Hauxwell. 2011. The relative role of environmental, spatial, and land-use patterns in explaining aquatic macrophyte community composition. *Canadian Journal of Fisheries and Aquatic Sciences* 68:1778-1789.

Mikulyuk, A., J. Hauxwell, P. Rasmussen, S. Knight, K. Wagner, M. Nault, and D. Ridgely. 2010. Testing a methodology for assessing aquatic plant communities in temperate inland lakes. *Lake and Reservoir Management* 26:54-62.
-Manuscript nominated for the James LaBounty Best Paper Award for 2010 by the North American Lake Management Society.

Sass, L.L., M.A. Bozek, J. Hauxwell, K. Wagner, S. Knight. 2010. Response of aquatic macrophytes to human perturbations in the watersheds of Wisconsin lakes. *Aquatic Botany* 93:1-8.

Kosten, S., A. Kamarainen, E. Jeppesen, E.H. van Nes, E.T.H.M. Peeters, N. Mazzeo, L. Sass, J. Hauxwell, N. Hansel-Welch, T.L. Lauridsen, M. Søndergaard, R.W. Bachmann, G. Lacerot, and M. Scheffer. 2009. Probability of submerged vegetation dominance differs among climate zones. A large dataset study of shallow lakes across Europe and the Americas. *Global Change Biology* 15:2503-2517.

Knight, S., and J. Hauxwell. 2010. Distribution and abundance of aquatic plants- human impacts. In: G. Likens (editor-in-chief), *Biogeochemistry of Inland Waters*. Elsevier, Oxford, United Kingdom.

Knight, S., and J. Hauxwell. 2009. Distribution and abundance of aquatic plants - human impacts. In: G. Likens (editor-in-chief), *Encyclopedia of Inland Waters*. Elsevier, Oxford, United Kingdom.

Fox, S., E. Stieve, I. Valiela, J. Hauxwell, and J. McClelland. 2008. Macrophyte abundance in Waquoit Bay: effects of land-derived nitrogen loads on seasonal and multi-year biomass patterns. *Estuaries and Coasts* 31:532-541.

- Hauxwell, J., T.K. Frazer, and C.W. Osenberg. 2007. An annual cycle of biomass and productivity of *Vallisneria americana* Michx in a subtropical spring-fed estuary. *Aquatic Botany* 87: 61-68.
- Wagner, K.I., J. Hauxwell, P.W. Rasmussen, F. Koshere, P. Toshner, K. Aron, D.R. Helsel, S. Toshner, S. Provost, M. Gansberg, J. Masterson, and S. Warwick. 2007. Whole-lake herbicide treatments for Eurasian watermilfoil in four Wisconsin lakes: effects on vegetation and water clarity. *Lake and Reservoir Management* 23:83-94.
-Manuscript honored as Best Journal Article of the Year (2006-2007) by the North American Lake Management Society (November 2007, Orlando, FL).
- Hauxwell, J., J. Cebrián, and I. Valiela. 2006. Light dependence of *Zostera marina* annual growth dynamics in estuaries subject to different degrees of eutrophication. *Aquatic Botany* 84:17-25.
- Hauxwell, J., and I. Valiela. 2004. Effects of nutrient loading on shallow seagrass-dominated coastal systems: patterns and processes. In S.L. Nielsen, M.F. Pedersen, and G. Banta (Eds.), *The influence of primary producers on estuarine nutrient cycling*. Kluwer Academic Publishers, the Netherlands.
- Hauxwell, J., C.W. Osenberg, and T.K. Frazer. 2004. Conflicting management goals: manatees and invasive competitors inhibit restoration of a native macrophyte. *Ecological Applications* 14:571-586.
- Hauxwell, J., T.K. Frazer, and C.W. Osenberg. 2004. Grazing by manatees excludes both new and established wild celery transplants: implications for restoration in Kings Bay, FL, USA. *Journal of Aquatic Plant Management* 42:49-53.
- Hauxwell, J., J. Cebrián, and I. Valiela. 2003. Eelgrass (*Zostera marina* L.) loss in temperate estuaries: relationship to land-derived nitrogen loads and effect of light limitation imposed by algae. *Marine Ecology Progress Series* 247:59-73.
- Hauxwell, J., J. Cebrián, C. Furlong, and I. Valiela. 2001. Macroalgal canopies contribute to eelgrass (*Zostera marina*) decline in temperate estuarine ecosystems. *Ecology* 82:1007-1022.
-Manuscript later featured in: McGlathery, K.J. 2001. Macroalgal blooms contribute to the decline of seagrass nutrient-enriched coastal waters. *Journal of Phycology (Algae Highlights)* 37:453-456.
- Hauxwell, J., J. Cebrián, J.A. Herrera-Silveira, J. Ramírez R., A. Zaldivar J., N. Gomez, and N. Aranda. 2001. Measuring production of *Halodule wrightii* Ascherson: additional evidence suggests clipping underestimates growth rate. *Aquatic Botany* 69:41-54.
- Havens, K.E., J. Hauxwell, A.C. Tyler, S. Thomas, K.J. McGlathery, J. Cebrián, I. Valiela, A.D. Steinman, and S.-J. Hwang. 2001. Complex interactions between autotrophs in shallow marine and freshwater ecosystems: implications for community responses to nutrient stress. *Environmental Pollution* 113:95-107.
- Valiela, I., M.L. Cole, J. McClelland, J. Hauxwell, J. Cebrián, and S. Joye. 2000. Role of salt marshes as part of coastal landscapes. Pp. 23-38. In: M.P. Weinstein and D.A. Kreeger (eds.), *Concepts and Controversies in Tidal Marsh Ecology*. Kluwer Academic Publishing, Dordrecht, the Netherlands.

Valiela, I., G. Tomasky, J. Hauxwell, M.L. Cole, J. Cebrián, and K.D. Kroeger. 2000. Operationalizing sustainability: management and risk assessment of land-derived nitrogen loads to estuaries. *Ecological Applications* 10:1006-1023.

Reports, Articles, Guidelines, and Protocols:

Nault, M., A. Mikulyuk, J. Hauxwell, J. Skogerboe, T. Asplund, M. Barton, K. Wagner, T. Hoyman, and E. Heath. 2012. Herbicide treatments in Wisconsin lakes. *LakeLine* 32:21-26.

Betz, C.R., T. Asplund, J. Hurley, T. Bernthal, A. Coulson, E. Erdmann, P. Garrison, S. Greb, B. Hansis, D. Higgins, R. Hunt, P. Juckem, E. O'Brian, D. Robertson, C. Wolbers. 2010. Water Resources Working Group. Wisconsin Initiative on Climate Change Impacts. (Working group reviewers: J. Hauxwell and D. Higgins; WICCI Science Council Reviewers: S. Dunwoody, B. Johnson, and J. Kutzbach). UW Nelson Institute for Environmental Studies and Wisconsin Dept. Natural Resources.

Hauxwell, J., M. Balfour (ed). 2010. WDNR Fisheries and Aquatic Sciences Research Program 2009-2010 Biennial Report. 133 pp. DNR internal publication.

Hauxwell, J., S. Knight, K. Wagner, A. Mikulyuk, M. Nault, and S. Chase. 2010. Recommended baseline monitoring of aquatic plants in Wisconsin: Point-Intercept Sampling Design, Collection Protocol, Data Analysis, and Applications. DNR Publication #: SS 1068 2010.

Hauxwell, J. (ed). 2009. WDNR Fisheries and Aquatic Sciences Research Section 2007-2008 Biennial Report. 103 pp. DNR internal publication.

Mikulyuk, A., J. Hauxwell, M. Nault, K. Wagner, L. Herman, and S. Knight. 2009. Governor's Council on Invasive Species and Wisconsin DNR - Technical Reviews of 35 Potentially Invasive Aquatic Plants and Algae in Wisconsin. DNR Publication pending.

Garrison, P., M. Jennings, A. Mikulyuk, J. Lyons, P. Rasmussen, J. Hauxwell, D. Wong, J. Brandt, and G. Hatzenbeler. 2008. Implementation and interpretation of lakes assessment data for the Upper Midwest. Final Report to US EPA. DNR Publication SS 1044 2008.

Hauxwell, J. 2008. Stopping the Spread: A Proposed Rule Aims to Identify, Classify and Control Invasive Species. *Lake Tides* 33:8. (University of Wisconsin Extension Lakes Publication - <http://www.uwsp.edu/cnr/uwexplakes/laketides/vol33-4/Fall08LT.pdf>).

Knight, S., J. Hauxwell. 2007. Raking in the Data. *Lake Tides* 32: 10. (University of Wisconsin Extension Lakes Publication - <http://www.uwsp.edu/cnr/uwexplakes/laketides/vol32-2/LTspring07.pdf>).

Hauxwell, J., G. LaLiberte, A. Mikulyuk, P. Garrison, and G. Vorhes. 2006. Use of Plants and Diatoms for Nutrient Assessment in North Temperate Depressional Wetlands. Final Report, US EPA, Region V, Chicago, IL. DNR Publication #: PUB-SS-1023 2006.

Hauxwell, J., K. Wagner, and A. Mikulyuk. 2005. Whole Lake Herbicide Debate Deserves a Dose of Science. *Lake Tides* 30: 1-4. (University of Wisconsin Extension Lakes Publication - http://www.uwsp.edu/cnr/uwexlakes/laketides/vol30-4/2005%20FallLT_screen.pdf).

Hauxwell, J., T. Bernthal, R. Lillie, E.J. Judziewicz, and S. Kenney. 2004. Field Testing the Wisconsin Depressional Wetland Macroinvertebrate and Plant Indices of Biological Integrity for Application by Trained Volunteers. Final Report, US EPA, Region V, Chicago, IL. Pp. 1-73. (http://dnr.wi.gov/org/es/science/publications/SS_1017_2005_NoAppendices.pdf).

Hauxwell, J., S. Knight, K. Wagner, and A. Mikulyuk. 2004. Recommended Baseline Monitoring of Aquatic Macrophytes in Wisconsin - Point-Intercept Sampling Method, Collection Protocol, and Data Analyses. Wisconsin Department of Natural Resources, Madison WI. Pp. 1-10. (<http://www.uwsp.edu/cnr/uwexlakes/ecology/APM/APM%20Appendix.pdf>).

Hauxwell, J., P. Garrison, and K. Wagner. 2004. Guidelines for Whole-Lake Fluridone Re-Treated Research Lakes in Wisconsin - Potter and Random Lakes. Wisconsin Department of Natural Resources, Madison WI. Pp. 1-20.

Hauxwell, J., T.K. Frazer, and C.W. Osenberg. 2003. Effects of Herbivores and Competing Primary Producers on *Vallisneria americana* in Kings Bay: Implications for Restoration and Management. Final Report, Southwest Florida Water Management District, Surface Water Improvement and Management Program, Tampa, FL. Pp. 1-68.

Hauxwell, J., C. Jacoby, T.K. Frazer, and J. Stevely. 2001. Nutrients and Florida's coastal waters: the links between people, increased nutrients, and changes to coastal aquatic systems. Florida Sea Grant publication (SGEB-55), Gainesville, FL. <http://nsgl.gso.uri.edu/flsgp/flsgpg01010.pdf>

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Ph.D., Biology, University of Illinois at Urbana-Champaign

Expertise:

Fish Ecology and life history, community ecology, conservation genetics, lakes assessment



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Publications (past 10 years):

Peer-reviewed journals:

- Jennings, M.J. 2012. Longear sunfish *Lepomis megalotis*. Fishes of Wisconsin website, in press.
- Jennings, M. J., G. R. Hatzenbeler, and J. M. Kampa. 2011. Spring capture site fidelity of adult muskellunge in inland lakes. *North American Journal of Fisheries Management* 31:461-467.
- Jennings, M.J., B.L. Sloss, G.R. Hatzenbeler, J.M. Kampa, T.D. Simonson, S.P. Avelallemant, G.A. Lindenberger, and B.D. Underwood. 2010. Implementation of genetic conservation practices in a muskellunge propagation and stocking program. *Fisheries* 35:388-395.
- Jennings, M.J., G.R. Hatzenbeler, and J.M. Kampa. 2009. Retention of passive integrated transponders in adult muskellunge, and applications to broodstock management. *North American Journal of Aquaculture* 71:330-332.
- Jennings, M.J., G.R. Hatzenbeler, M.A. Bozek, and C. Edwards. 2009. Natural and human influences on fish species richness in small north temperate lakes: Implications for bioassessment. *Journal of Freshwater Ecology* 24:7-18.
- Sloss, B.L., Jennings, M.J., Franckowiak, R. and Pratt, D. 2008. Genetic identity of brook trout in Lake Superior south shore streams: potential for genetic monitoring of stocking and rehabilitation efforts. *Transactions of the American Fisheries Society* 137:1244-1251.
- Wilson, C., Stott, W., Miller, L., D'Amelio, S., Jennings, M. and A. Cooper 2008. Conservation genetics of Lake Superior brook trout: issues, questions and directions. *North American Journal of Fisheries Management* 28:1307-1320.
- Wagner, C.P., M.J. Jennings, J.M. Kampa, and D.H. Wahl. 2007. Survival, growth, and tag retention in Age-0 muskellunge implanted with passive integrated transponders. *North American Journal Fisheries Management* 27:873-877.
- Jennings, M.J., J. M. Kampa, G. R. Hatzenbeler and E. E. Emmons. 2005. Evaluation of supplemental walleye stocking in northern Wisconsin lakes. *North American Journal of Fisheries Management* 25:1171-1178.
- Newbrey, M., M. B. Bozek, J. Cook and M. J. Jennings. 2005. Branching complexity and morphological characteristics of coarse woody structure as lacustrine fish habitat. *Canadian Journal of Fisheries and Aquatic Sciences* 62:2110-2123.
- Kampa, J. M., M. J. Jennings, and G. R. Hatzenbeler. 2004. Short-term survival of small walleye fingerlings stocked into Wisconsin lakes. Pages 99-103 in Mary Nickum, Patricia Mazik, John Nickum, and Don MacKinlay, editors. *Propagated fish in resource management*. American Fisheries Society, Symposium 44, Bethesda, Maryland.
- Hatzenbeler, G.H., J.M. Kampa, and M.J. Jennings. 2004. A comparison of fish and aquatic plant assemblages to assess health and condition of small Wisconsin lakes. *Lake and Reservoir Management*, 20:211-218.
- Jennings, M.J., E.E. Emmons, G.R. Hatzenbeler, C. Edwards, and M.A. Bozek. 2003. Is littoral habitat affected by residential development and land-use changes in watersheds of Wisconsin lakes? *Lake and Reservoir Management* 19:272-279.

Saunders, R., M.A. Bozek, C. Edwards, and M.J. Jennings. 2002. Habitat features affecting smallmouth bass nesting success in four northern Wisconsin lakes. Pp. 119-130 in M.S. Ridgway and D.P. Philipp, eds. *Black Bass: Ecology, Conservation and Management*. American Fisheries Society, Bethesda, Md.

Bozek, M.A., P. Short, C. Edwards, M.J. Jennings, and S. Newman. 2002. Habitat selection of nesting smallmouth bass (*Micropterus dolomieu dolomieu*) in two north temperate lakes. Pp. 131-144 in M.S. Ridgway and D.P. Philipp, eds. *Black Bass: Ecology, Conservation and Management*. American Fisheries Society, Bethesda, Md.

Jennings, M.J. and D.P. Philipp. 2002. Alternative mating tactics in sunfishes (*Centrarchidae*): a mechanism for hybridization? *Copeia* 2002: 1102-1105.

Reports, Articles, Guidelines, and Protocols:

Jennings, M.J., G.R. Hatzenbeler, J.M. Kampa. 2011. Threatened fishes of the upper St. Croix River drainage. Final Report, State Wildlife Grants program.

Jennings, M.J. 2009. Science in the spotlight: keeping the fight in the state fish. Wisconsin Fishing Report. Publication # PUB-FH-506-rev 2009.

Garrison, P., M. Jennings, A. Mikulyuk, J. Lyons, P. Rasmussen, J. Hauxwell, D. Wong, J. Brandt, and G. Hatzenbeler. 2008. Implementation and interpretation of lakes assessment data for the Upper Midwest. Final Report to US EPA. DNR Publication SS 1044 2008.

Garrison, P., LaLiberte, G., Konkell, D., Hatzenbeler, G., and M. Jennings. 2006. Inventory of Chippewa County lakes in the Chippewa County Forest, Wisconsin. Wisconsin Department of Natural Resources PUB SS-1026 2006.

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Education:

B.S., Biology and Fisheries Management,
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M.S., Fisheries, University of Missouri

Expertise:

Fish population dynamics, fish propagation, life history of percids, centrarchids, and esocids



Key collaborators:

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Publications (past 10 years):

Peer-reviewed journals:

Jennings, M. J., G. R. Hatzenbeler, and J. M. Kampa. 2011. Spring capture site fidelity of adult muskellunge in inland lakes. *North American Journal of Fisheries Management* 31:461-467.

Jennings, M. J., B. L. Sloss, G. R. Hatzenbeler, J. M. Kampa, T. D. Simonson, S. P. Avelallemant, G. A. Lindenberger, and B. D. Underwood. 2010. Implementation of genetic conservation practices in a muskellunge propagation and stocking program. *Fisheries* 35:388-395.

Kampa, J. M., and G. R. Hatzenbeler. 2009. Survival and growth of walleye fingerlings stocked at two sizes in 24 Wisconsin lakes. *North American Journal of Fisheries Management* 29:996-1000.

Jennings, M.J., G.R. Hatzenbeler, and J.M. Kampa. 2009. Retention of passive integrated transponders in adult muskellunge, and applications to broodstock management. *North American Journal of Aquaculture* 71:330-332.

Wagner, C.P., M.J. Jennings, J.M. Kampa, and D.H. Wahl. 2007. Survival, growth, and tag retention in age-0 muskellunge implanted with passive integrated transponders. *North American Journal of Fisheries Management* 27:873-877.

Jennings, M.J., J.M. Kampa, G. R. Hatzenbeler, and E.E. Emmons. 2005. Evaluation of supplemental walleye stocking in northern Wisconsin lakes. *North American Journal of Fisheries Management*, 25:1171-1178.

Kampa, J. K., M. J. Jennings, and G. R. Hatzenbeler. 2004. Short-term survival of small walleye fingerlings stocked into Wisconsin lakes. *American Fisheries Society Symposium* 44:99-103.

Hatzenbeler, G. R., J. M. Kampa, M. J. Jennings, and E. E. Emmons. 2004. A comparison of fish and aquatic plant assemblages to assess ecological health of small Wisconsin lakes. *Lake and Reservoir Management* 20(3):211-218.

Reports, Articles, Guidelines, and Protocols:

Kampa, J. M. 2010. Biosecurity Workshop Summary. WDNR Biosecurity Workshop, June 9-10, Madison.

Kampa, J. M. 2010. Science in the spotlight: Wisconsin has stock in walleye. Wisconsin Fishing Report. Wisconsin Department of Natural Resources Fisheries Management Publication # PUB-FH-506-rev2010.

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Education:

B.S., Fish Management and Biology, University of Wisconsin at Stevens Point
M.S., Biology, Tennessee Technological University

Expertise:

Fisheries and habitat monitoring, field operations

Publications (past 10 years):

See those listed under Lyons and Weigel.

In addition:

Miller, M.A., C.C. Colby, P.D. Kanehl, et. al. 2009. Assessment of wadeable stream resources in the driftless area ecoregion in Western Wisconsin using a probabilistic sampling design. *Environmental Monitoring and Assessment* 150: 75-89



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Field operations, fisheries monitoring

Publications (past 10 years):

See those listed under Newman.



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B.A., 1977 Dartmouth College
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Expertise: Aquatic Plants, Aquatic Ecology, Bog Ecology

Publications (past 10 years):

Mikulyuk, A., J. Hauxwell, P. Rasmussen, S. Knight, K. I. Wagner, M. E. Nault and D. Ridgely. 2010. Testing a methodology for assessing plant communities in temperate inland lakes. *Journal of Lake and Reservoir Management* 26: 54-62.



Sass, L.L., M.A. Bozek, J.A. Hauxwell, K. Wagner and S. Knight. 2010. Response of aquatic macrophytes to human land use perturbations in the watersheds of Wisconsin lakes, U.S.A. *Aquatic Botany* 93: 1-8.

Hauxwell, J., S. Knight, K. Wagner, A. Mikulyuk, M. Nault, M. Porzky and S. Chase. 2010. Recommended Baseline Monitoring of aquatic plants in Wisconsin: Sampling design, field and laboratory procedures, data entry and analysis and applications. Wisconsin Department of Natural Resources Bureau of Science Services, PUB-SS-1068 2010.

Knight S. and Hauxwell J. 2009. Distribution and Abundance of Aquatic Plants– Human Impacts. In: Gene E. Likens, (Editor) *Encyclopedia of Inland Waters*. Volume 3, pp. 45-54 Oxford: Elsevier.

Gina LaLiberte, LTE Scientist

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B.S., Biology, University of Michigan

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Expertise:

Algal ecology and taxonomy, aquatic ecology, paleolimnology, bioassessment of aquatic systems

Publications (past 10 years):

See those listed under Garrison. In addition:

Lowe, R.L. and G.D. LaLiberte. 2006. Benthic Stream Algae: Distribution and Structure. In F.R. Hauer and G.A. Lamberti (Eds.), *Methods in Stream Ecology*. Second Edition. Academic Press: San Diego.

Rier, S, R.J. Stevenson, G. LaLiberte. 2006. Photo-acclimation response of benthic stream algae across experimentally manipulated light gradients: A comparison of growth rates and net primary productivity. *Journal of Phycology* 42:560-567.



Richard Lathrop, Scientist

Education:

Ph.D., University of Wisconsin-Madison

Oceanography and Limnology, 1998

M.S., University of Michigan, Ann Arbor

Natural Resources (Aquatic Ecology), 1975

B.A., Lehigh University

Biology, 1971

Expertise:

Lake eutrophication and algae blooms (especially Madison lakes), lake restoration and management, climate change impacts in Wisconsin



Publications, selected (past 10 years):

U.S. Fish and Wildlife Service. 2012. National Fish, Wildlife and Plants Climate Adaptation Strategy. (R. Lathrop was a contributing author to the report based on his membership of the "Inland Waters" Technical Team.)

Lathrop, R. 2011. Wisconsin Initiative on Climate Change Impacts. Wisconsin's changing climate: impacts and adaptation. UW Nelson Institute for Environmental Studies and Wisconsin Dept. Natural Resources. (R. Lathrop was a contributing author, an Editorial Team member, and Co-Chair of the Science Council for WICCI that produced the report.)

Lathrop, R.C. 2007. Perspectives on the eutrophication of the Yahara lakes. *Lake and Reserv. Manage.* 23:345-365.

Stedman, R.C., R.C. Lathrop, B. Clark, J. Ejsmont-Karabin, P. Kasprzak, K. Nielsen, D. Osgood, M. Powell, A.-M. Ventelä, K.E. Webster, and A. Zhukova. 2007. Perceived environmental quality and place attachment in North American and European temperate lake districts. *Lake and Reserv. Manage.* 23:330-344.

Carpenter, S.R., R.C. Lathrop, P. Nowak, E.M. Bennett, T. Reed, and P.A. Soranno. 2006. The ongoing experiment: restoration of Lake Mendota and its watershed, p. 236-256. In: J.J. Magnuson, T.K. Kratz, and B.J. Benson [eds.], *Long-term dynamics of lakes in the landscape*. Oxford University Press, New York.

Lathrop, R., K. Bradbury, B. Halverson, K. Potter, and D. Taylor. 2005. Groundwater, stream flow, and lake level responses to urbanization in the Yahara lakes basin. *LakeLine* 25:39-46.

Lathrop, R.C., B.M. Johnson, T.B. Johnson, M.T. Vogelsang, S.R. Carpenter, T.R. Hrabik, J.F. Kitchell, J.J. Magnuson, L.G. Rudstam, R.S. Stewart. 2002. Stocking piscivores to improve fishing and water clarity: a synthesis of the Lake Mendota biomanipulation project. *Freshwat. Biol.* 47:2410-2424.

Reports, Articles, Guidelines, and Protocols:

Lathrop, R.C., and S.R. Carpenter. 2011. Phosphorus loading and lake response analyses for the Yahara lakes. Yahara CLEAN project.

Pomplun, S., R. Lathrop, A. Coulson, and E. Katt-Reinders. 2011. Managing our future: Getting ahead of a changing climate. *Wisconsin Natural Resources*. February 2011:20-25.

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John Lyons, Scientist

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Key collaborators:

WDNR Fish Management, Water Quality and Endangered Resources programs, U.S. Geological Survey, UW-Stevens Point, UW-Madison Center for Limnology, UW-Madison Zoological Museum, Michigan State University, Michigan DNR, Illinois DNR, Minnesota DNR, U.S. Fish and Wildlife Service, U. S. Environmental Protection Agency, Alliant Energy Corporation, Wisconsin River Alliance, Friends of the Lower Wisconsin River, Wisconsin Lutheran College, Waukesha County Land Trust, The Nature Conservancy, Wisconsin Initiative on Climate Change Impacts

Publications (past 10 years):

Peer-reviewed journals:

Lyons, J. 2012. Development and validation of two fish-based indices of biotic integrity for assessing perennial coolwater streams in Wisconsin, USA. *Ecological Indicators*. In Press.

Lyons, J., editor. 2012. *Fishes of Wisconsin E Book*. Wisconsin Department of Natural Resources, Madison, and U. S. Geological Survey, Middleton, WI, <http://www.fow-ebook.us>

- Mercado-Silva, N., J. Lyons, E. Díaz-Pardo, S. Navarrete, A. Gutiérrez-Hernández. 2012. Environmental factors associated with fish assemblage patterns in a high gradient river of the Gulf of Mexico slope. *Revista Mexicana de Biodiversidad*. 83: 117-128.
- Moncayo-Estrada, R., J. Lyons, C. Escalera-Gallardo, and O. T. Lind. 2012. Long-term change in the biotic integrity of a shallow tropical lake: a decadal analysis of the Lake Chapala fish community. *Lake and Reservoir Management* 28: 92-104.
- Mitro, Matthew G., John Lyons, and Sapna Sharma. 2011. Executive summary: coldwater fish and fisheries. Pages 170-173 in E. Katt-Reinders, editor. *Wisconsin's changing climate: impacts and adaptations*. Wisconsin Initiative on Climate Change Impacts. Nelson Institute for Environmental Studies, University of Wisconsin-Madison and the Wisconsin Department of Natural Resources, Madison, Wisconsin.
- Mitro, Matthew G., John Lyons, and Sapna Sharma. 2011. Wisconsin Initiative on Climate Change Impacts: Coldwater Fish and Fisheries Working Group Report. 31 pages.
- Lyons, J. 2011. Pugnose shiner, *Notropis anogenus*. Online account in: Lyons, J., editor. 2012. *Fishes of Wisconsin E Book*. Wisconsin Department of Natural Resources, Madison, and U. S. Geological Survey, Middleton, WI, <http://www.fow-ebook.us>
- Lyons, J. 2011. Smallmouth bass, *Micropterus dolomieu*. Online account in: Lyons, J., editor. 2012. *Fishes of Wisconsin E Book*. Wisconsin Department of Natural Resources, Madison, and U. S. Geological Survey, Middleton, WI, <http://www.fow-ebook.us>
- Mathuriau, C., N. Mercado-Silva, J. Lyons, and L. M. Martínez-Rivera. 2011. Los bioindicadores para evaluar la calidad de los ecosistemas acuáticos en México: estado actual y perspectivas/Fish and macroinvertebrates as freshwater ecosystem bioindicators in Mexico: current state and perspectives. Pages 251-261 in U. Oswald-Spring, editor. Universidad Nacional Autónoma de México, México, D.F./Springer-Verlag, Berlin.
- Mercado-Silva, N., E. Santana-Castellón, L. M. Martínez-Rivera, J. Lyons, and T. Moermond. 2011. Subsistence fisheries in the Sierra de Manantlán Biosphere Reserve (Jalisco/Colima, Mexico). *E-Gnosis* 9(7): 1-19. (<http://www.e-gnosis.com.mx>)
- Sharma, S., M. J. Vander Zanden, J. J. Magnuson, and J. Lyons. 2011. Comparing climate change and species invasions as drivers of coldwater fish population extirpations. *PLoS ONE* 6(8): e22906. 9 pages.
- Wang, L., D. Infante, J. Lyons, J. Stewart, and A. Cooper. 2011. Effects of dams in river networks on fish assemblages in non-impoundment sections of rivers in Michigan and Wisconsin, USA. *River Research and Application* 27: 473-487.
- Lyons, J. 2010. Indices of ecological integrity: a state agency's perspective. Pages 357-358 in W. Hubert and M. Quist, editors. *Inland Fisheries Management in North America*, Third Edition. American Fisheries Society, Bethesda, Maryland.
- Lyons, J., J. Stewart, and M. Mitro. 2010. Predicted effects of climate warming on the distribution of 50 stream fishes in Wisconsin, U.S.A. *Journal of Fish Biology* 77: 1867-1898.

- Cochran, P. A., and J. Lyons. 2010. Attachments by parasitic lampreys within the branchial cavities of their hosts. *Environmental Biology of Fishes* 88: 343-349.
- Rabeni, C., J. Lyons, J. Peterson, and N. Mercado-Silva. 2009. Sampling fish in wadeable warmwater streams. Pages 43-58 in S. Bonar, D. Willis, and W. Hubert, editors. *Standard methods for sampling freshwater fishes in North America*. American Fisheries Society.
- Lyons, J., T. Zorn, J. Stewart, P. Seelbach, K. Wehrly, and L. Wang. 2009. Defining and characterizing coolwater streams and their fish assemblages in Michigan and Wisconsin, USA. *North American Journal of Fisheries Management* 29: 1130-1151.
- Bloom, D. D., K. R. Piller, J. Lyons, N. Mercado-Silva, and M. Medina-Nava. 2009. Systematics and biogeography of the silverside tribe Menidiini (Teleostomi: Atherinopsidae) based on the mitochondrial ND2 gene. *Copeia* 2009: 408-417.
- Helmus, M. R., L. B. Allen, O. Domínguez-Domínguez, E. Díaz-Pardo, P. Gesundheit, J. Lyons, and N. Mercado-Silva. 2009. Threatened fishes of the world: *Allotoca goslinei* Smith and Miller, 1987 (Goodeidae). *Environmental Biology of Fishes* 84: 187-188.
- Contreras-Balderas, S., G. Ruiz-Campos, J. J. Schmitter-Soto, E. Díaz-Pardo, T. Contreras-McBeath, M. Medina-Soto, L. Zambrano-González, A. Varela-Romero, R. Mendoza-Alfaro, C. Ramírez-Martínez, M. A. Leija-Tristán, P. Almada-Villela, D. A. Hendrickson, and J. Lyons. 2008. Freshwater fishes and water status in México: a country-wide appraisal. *Aquatic Ecosystem Health and Management* 11: 245-256.
- Jelks, H. L., S. J. Walsh, N. M. Burkhead, S. Contreras-Balderas, E. Díaz-Pardo, D. A. Hendrickson, J. Lyons, N. E. Mandrak, F. McCormick, J. S. Nelson, S. P. Platania, B. A. Porter, C. B. Renaud, J. J. Schmitter-Soto, E. B. Taylor, and M. L. Warren. 2008. Conservation status of imperiled North American freshwater and diadromous fishes. *Fisheries* 33: 372-407.
- Marshall, D. W., and J. Lyons. 2008. Documenting and halting declines of nongame fishes in southern Wisconsin. Pages 171-181 in D. M. Waller and T. P. Rooney, editors. *The Vanishing Present: Wisconsin's changing lands, waters, and wildlife*. University of Chicago Press.
- Bloom, D. D., K. R. Piller, J. Lyons, and N. Mercado-Silva. 2008. Threatened fishes of the world: *Chirostoma aculeatum* Barbour, 1973 (Atherinopsidae). *Environmental Biology of Fishes* 82: 221-222.
- Soto-Galera, E., J. Paulo-Maya, and J. Lyons. 2008. Threatened fishes of the world: *Chirostoma riojai* Solorzano and López, 1965 (Atherinopsidae). *Environmental Biology of Fishes* 83: 343-344.
- Brendan, T. O., L. Wang, R. D. Clark, P. W. Seelbach, and J. Lyons. 2007. Comparison between model-predicted and field-measured stream habitat features for evaluating fish assemblage-habitat relationships. *Transactions of the American Fisheries Society* 136: 580-592.
- Lyons, J. 2006. A fish-based index of biotic integrity to assess intermittent headwater streams in Wisconsin, USA. *Environmental Monitoring and Assessment* 122: 239-258.

- Lyons, J., P. Hanson, and E. White. 2006. A photo-based computer system for identifying Wisconsin fishes. *Fisheries* 31(6):269-275.
- Wang, L., J. Lyons, and P. Kanehl. 2006. Habitat and fish responses to multiple agricultural best management practices in a warm water stream. *Journal of the American Water Resources Association* 42:1047-1062.
- Wang, L., P. W. Seelbach, and J. Lyons. 2006. Effects of human disturbance on the influence of catchment, riparian, and reach scale factors on fish assemblages. Pages 199-219 in R. M. Hughes, L. Wang, and P. W. Seelbach, editors. *Influences of landscapes on stream habitats and biological assemblages. American Fisheries Society Symposium Number 48*, Bethesda, Maryland.
- Weigel, B. M., J. Lyons, and P. W. Rasmussen. 2006. Fish assemblages and biotic integrity of a highly modified floodplain river, the Upper Mississippi, and a large relatively unimpacted tributary, the lower Wisconsin. *River Research and Applications* 22:923-936.
- Weigel, B. M., J. Lyons, P. W. Rasmussen, and L. Wang. 2006. Relative influence of environmental variables at multiple spatial scales on fishes in Wisconsin's warmwater rivers. Pages 493-511 in R. M. Hughes, L. Wang, and P. W. Seelbach, editors. *Influences of landscapes on stream habitats and biological assemblages. American Fisheries Society Symposium Number 48*, Bethesda, Maryland.
- Domínguez-Domínguez, O., N. Mercado-Silva, and J. Lyons. 2005. Conservation status of Mexican goodeids: Problems, perspectives, and solutions. Pages 515-523 in M. C. Uribe and H. J. Grier, editors. *Viviparous fishes. New Life Publications, Homestead, Florida.*
- Domínguez-Domínguez, O., N. Mercado-Silva, J. Lyons, and H. J. Grier. 2005. The viviparous goodeid fishes. Pages 525-569 in M. C. Uribe and H. J. Grier, editors. *Viviparous fishes. New Life Publications, Homestead, Florida.*
- Lyons, J. 2005. Fish assemblage structure, composition, and biotic integrity of the Wisconsin River. Pages 345-363 in R. Calamusso, R. Hughes, and J. Rinne, editors. *Historical changes in large river fish assemblages of North America. American Fisheries Society Symposium Number 45*, Bethesda, Maryland.
- Lyons, J. 2005. Distribution of *Sicydium Valenciennes* 1837 (Pisces: *Gobiidae*) in Mexico and Central America. *Hidrobiológica* 15:239-243.
- Lyons, J. 2005. Longitudinal and lateral patterns of fish species composition and biotic integrity in the lower Wolf River, Wisconsin, a relatively undegraded floodplain river. *Journal of Freshwater Ecology* 20:47-58.
- Medina-Nava, M., J. Lyons, T. Zubieta-Rojas, E. Solorio-Ornelas, J. P. Ramírez-Herrejón, and R. Galván-Morales. 2005. Conservation of two sites in central Mexico with a high diversity of livebearing fishes. Pages 499-504 in M. C. Uribe and H. J. Grier, editors. *Viviparous fishes. New Life Publications, Homestead, Florida.*
- Piller, K. R., C. C. Wilson, C. E. Lee, and J. Lyons. 2005. Conservation genetics of inland lake trout in the Upper Mississippi River basin: stocked or native ancestry? *Transactions of the American Fisheries Society.*

- Bart, H. L., R. D. Suttkus, J. Lyons, and N. Mercado-Silva. 2004. A preliminary analysis of the taxonomic status of *Ictiobus meridionalis* (Günther). In M. de L. Lozano-Vilano and A. J. Contreras-Balderas, editors. Proceedings of the Homenaje al Doctor Andrés Reséndez Medina. Universidad Autónoma de Nuevo León, Monterrey, México.
- Cochran, P. A., and J. Lyons. 2004. Field and laboratory observations on the ecology and behavior of the silver lamprey (*Ichthyomyzon unicuspis*) in Wisconsin. *Journal of Freshwater Ecology* 19:245-253.
- Lyons, J., and N. Mercado-Silva. 2004. *Notropis calabazas* (Teleostei; Cyprinidae): new species from the Río Pánuco basin of central México. *Copeia* 2004:868-875.
- Cochran, P. A., J. Lyons, and M. R. Gehl. 2003. Parasitic attachments by overwintering silver lampreys, *Ichthyomyzon unicuspis*, and chestnut lampreys, *Ichthyomyzon castaneus*. *Environmental Biology of Fishes* 68:65-71.
- Guzman-Arroyo, M., and J. Lyons. 2003. Los peces de las aguas continentales del estado de Jalisco, México. Análisis preliminar. *E-Gnosis* 1(12):1-38. (www.e-gnosis.com.mx)
- Lyons, J. 2003. *Algansea aphanea* (Pisces: Cyprinidae) in the state of Jalisco, Mexico. *Revista Biología Tropical* 51:283.
- Lyons, J. 2003. Recruitment patterns of walleye and sauger in the lower Wisconsin River. Pages 79-80 in T. P. Barry and J. A. Malison, editors. Proceedings of Percis III, the Third International Percid Fish Symposium, Madison, Wisconsin, July 20-24, 2003. University of Wisconsin Sea Grant Institute, Madison.
- Wang, L., J. Lyons, and P. Kanehl. 2003. Impacts of urban land cover on trout streams in Wisconsin and Minnesota. *Transactions of the American Fisheries Society* 132:825-839.
- Wang, L., J. Lyons, P. Rasmussen, P. Seelbach, T. Simon, M. Wiley, P. Kanehl, E. Baker, S. Niemala, and P. M. Stewart. 2003. Watershed, reach, and riparian influences on stream fish assemblages in the Northern Lakes and Forest Ecoregion, USA. *Canadian Journal of Fisheries and Aquatic Sciences* 60:491-505.
- Cochran, P. A., J. Lyons, and M. G. Bolek. 2002. *Necturus maculosus maculosus* (Common mudpuppy). *Herpetological Review* 33(2):144.
- Lyons, J., and P. Kanehl. 2002. Seasonal movements of smallmouth bass in streams. Pages 149-160 in M. Ridgway and D. P. Philipp, editors. Black bass: ecology, conservation, and management. American Fisheries Society Symposium Number 31, Bethesda, Maryland.
- Mercado-Silva, N., J. Lyons, G. Salgado-Maldonado, and M. Medina-Nava. 2002. Validation of a fish-based index of biotic integrity for streams and rivers of central México. *Reviews in Fish Biology and Fisheries* 12:179-191.
- Orbe-Mendoza, A. A., J. Acevedo-García, and J. Lyons. 2002. Lake Pátzcuaro fishery management plan. *Reviews in Fish Biology and Fisheries* 12:207-217.

- Wang, L., and J. Lyons. 2002. Fish and benthic macroinvertebrate assemblages as indicators of stream degradation in urbanizing watersheds. Pages 227-249 in T. P. Simon, editor. *Biological response signatures: Multimetric index patterns for assessment of freshwater aquatic assemblages*. CRC Press, Boca Raton, Florida.
- Wang, L., J. Lyons, and P. Kanehl. 2002. Effects of watershed best-management practices on habitat and fishes in Wisconsin streams. *Journal of the American Water Resources Association* 38:663-680.
- Cochran, P. A., and J. Lyons. 2001. The saffron shiner (*Notropis rubricroceus*) as a nest associate of the creek chub (*Semotilus atromaculatus*). *Journal of the Tennessee Academy of Science* 76:61-62.
- Lyons, J., R. R. Piette, and K. W. Niermeyer. 2001. Development, validation, and application of a fish-based index of biotic integrity for Wisconsin's large warmwater rivers. *Transactions of the American Fisheries Society* 130:1077-1094.
- Stewart, J. S., L. Wang, J. Lyons, J. A. Horwath, and R. Bannerman. 2001. Influences of watershed, riparian-corridor, and reach-scale characteristics on aquatic biota in agricultural watersheds. *Journal of the American Water Resources Association* 37:1475-1487.
- Wang, L., J. Lyons, P. Kanehl, and R. Bannerman. 2001. Impacts of urbanization on stream habitat and fish across multiple spatial scales. *Environmental Management* 28:255-266.
- Lyons, J., P. A. Cochran, and D. Fago. 2000. Wisconsin fishes 2000. Status and distribution. University of Wisconsin Sea Grant, Madison.
- Lyons, J., A. Gutiérrez-Hernández, E. Díaz-Pardo, E. Soto-Galera, M. Medina-Nava, and R. Pineda-López. 2000. Development of a preliminary index of biotic integrity (IBI) based on fish assemblages to assess ecosystem condition in the lakes of central México. *Hydrobiologia* 418:57-72.
- Lyons, J., and N. Mercado-Silva. 2000. Peces dulceacuicolas mexicanos: *Allodontichthys* (Goodeidae). *Zoología Informa* 43:3-16.
- Lyons, J., S. W. Trimble, and L. K. Paine. 2000. Grass versus trees: managing riparian areas to benefit streams of central North America. *Journal of the American Water Resources Association* 36:919-930.
- Lyons, J., B. M. Weigel, L. K. Paine, and D. J. Undersander. 2000. Influence of intensive rotational grazing on bank erosion, fish habitat quality, and fish communities in southwestern Wisconsin trout streams. *Journal of Soil and Water Conservation* 55:271-276.
- Wang, L., J. Lyons, P. Kanehl, R. Bannerman, and E. Emmons. 2000. Watershed urbanization and changes in fish communities in southeastern Wisconsin streams. *Journal of the American Water Resources Association* 36:1173-1189.
- Wang, L., J. Lyons, P. Kanehl, D. Marshall, and M. Sorge. 2000. Responses of stream habitat, macroinvertebrates, and fish to watershed BMPs: Lessons from Wisconsin. Pages

1-12 in Proceedings of the Watershed Management 2000 Conference, Vancouver, British Columbia, Canada, July 9-12, 2000. Water Environment Federation, Ottawa, Canada.

Weigel, B. M., J. Lyons, L. K. Paine, S. I. Dodson, and D. J. Undersander. 2000. Using stream macroinvertebrates to compare riparian land use practices on cattle farms in southwestern Wisconsin. *Journal of Freshwater Ecology* 15:93-106.

Reports, Articles, Guidelines, and Protocols:

Lathrop, R., J. Magnuson, E. Katt-Reinders, S. Pomplun, A. Coulson, S. Dunwoody, D. Liebl, T. Sinclair, J. Sullivan, D. Watermolen, D. Webb, C. Anderson, T. Asplund, C. Betz, W. Bland, G. Clark, A. Dorland, S. Gayan, H.J. Harris, D. Hart, J. Hurley, G. Kraft, C. Kucharik, J. LaGro, O. LeDee, J. Lyons, K. Martin, S. McLellan, M. Meyer, M. Mitro, P. Moy, P. Nowak, J. Patz, K. Potter, D. Vimont, and W. Walker. 2011. Wisconsin Initiative on Climate Change Impacts. Wisconsin's changing climate: impacts and adaptation. UW Nelson Institute for Environmental Studies and Wisconsin Dept. Natural Resources.

Mitro, M. G., J. Lyons, and J. S. Stewart. 2010. Predicted effects of climate change on the distribution of wild brook trout and brown trout in Wisconsin streams. Proceedings of Wild Trout X, West Yellowstone, MT, September 28-30, 2010.

Westenbroek, S., J. Stewart, C. Buchwild, M. Mitro, J. Lyons, and S. Greb. 2010. A model for evaluating stream temperature response to climate change scenarios in Wisconsin. Proceedings of the 2010 Watershed Management Conference, American Society of Civil Engineers, Madison, WI, August 23-27, 2010.

McKenna, J., P. Steen, J. Lyons, and J. Stewart. 2009. Applications of a broad-spectrum tool for conservation and fisheries analysis: aquatic gap analysis. *Gap Analysis Bulletin* 16:45-52.

Lyons, J. 2008. Seeing the "big picture" for Wisconsin stream fisheries. *Science in the Spotlight*. Page 4, 2008 Wisconsin Fishing Report, Wisconsin Department of Natural Resources, Madison. PUB-FH-506 2008.

Garrison, P., M. Jennings, J. Lyons, J. Hauxwell, G. Hatzenbeler, A. Mikulyuk, P. Rasmussen, D. Wong, and J. Brandt. 2008. Implementation and interpretation of lakes assessment data for the Upper Midwest. Wisconsin Department of Natural Resources, Madison, Bureau of Science Services Miscellaneous Publication PUB-SS-1044.

Lyons, J., and J. Stewart. 2008. Using products from the Great Lakes Aquatic Gap Program to classify the biotic communities of Wisconsin streams. Internal WDNR and USGS Report.

Lyons, J. 2008. Using the Wisconsin stream model to estimate the potential natural community of Wisconsin streams. Internal WDNR Report.

Lyons, J. 2008. Wisconsin stream model. Additional details of methodology and results for fish modeling. Internal WDNR Report.

Lyons, J. 2008. Proposed temperature and flow criteria for natural communities for flowing waters. Internal WDNR Report.

Lyons, J. 2007. An overview of the Wisconsin stream model. Internal WDNR Report.

Lyons, J. 2006. A sampling framework for smallmouth bass in Wisconsin's streams and rivers. Technical Appendix. Internal WDNR Report.

Lyons, J. 2006. Status of the *Algansea aphanea* (Cyprinidae), a rare Mexican fish. *American Currents* 32(1):14-16.

Lyons, J. 2004. Study SSDM: Effects of flow regulation and restriction of passage due to hydroelectric project operation on the structure of fish and invertebrate communities in Wisconsin's large river systems. Final Report: Phase II: Menominee River. Fish and habitat conditions prior to flow regulation changes. Wisconsin Department of Natural Resources, Federal Aid in Sport Fish Restoration Project WI F-95-P, Study SSDM, Final Report.

Lyons, J. 2004. Goodeid status update, January 2004. *American Currents* 30(2):11-18.

Lyons, J. 2003. Priorities for captive maintenance of Mexican goodeids. *Livebearers* (Bulletin of the American Livebearers Association) No. 177, pp. 24-25; Reprinted in *Tropical Fish Hobbyist* 52(7):116 (2004).

Lyons, J. 2000. Cichlids of the Lacondon rainforest. *Tropical Fish Hobbyist* 49(4):72-81.

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Peer-reviewed Publications (past 10 years):

Hansen, G.J.A., M.J.Vander Zanden, M. Blum, M. Clayton, E. Hain, J. Hauxwell, M. Izzo, M. Kornis, P.B. McIntyre, A. Mikulyuk, E. Nilsson, J.D. Olden, M. Papeş, S. Sharma.

Submitted. Are invasive species more abundant than native species? *Frontiers in Ecology and the Environment*.

Mikulyuk, A., S. Sharma, S. Van Egeren, E. Erdmann, M.E. Nault, and J. Hauxwell. 2011. The relative role of environmental, spatial, and land-use patterns in explaining aquatic macrophyte community composition. *Canadian Journal of Fisheries and Aquatic Sciences* 68: 1778-1789.

Mikulyuk, A., J. Hauxwell, P. Rasmussen, S. Knight, K. Wagner, M. Nault, and D. Ridgely. 2010. Testing a methodology for assessing aquatic plant communities in temperate inland lakes. *Lake and Reservoir Management* 26: 54-62.

-Manuscript nominated for the James LaBounty Best Paper Award for 2010 by the North American Lake Management Society.

CABI. 2010. *Salvinia auriculata* [original text by A. Mikulyuk]. In: *Invasive Species Compendium*. Wallingford, UK: CABI. Available online at <http://www.cabi.org.ISC/>.

CABI. 2010. *Potamogeton crispus*. [original text by A. Mikulyuk and M. E. Nault]. In: *Invasive Species Compendium*. Wallingford, UK: CABI. Available online at <http://www.cabi.org.ISC/>.

CABI. 2010. *Cabomba caroliniana*. [original text by A. Mikulyuk and M. E. Nault]. In: *Invasive Species Compendium*. Wallingford, UK: CABI. Available online at <http://www.cabi.org.ISC/>.

CABI. 2010. *Salvinia minima*. [original text by A. Mikulyuk and M. E. Nault]. In: *Invasive Species Compendium*. Wallingford, UK: CABI. Available online at <http://www.cabi.org.ISC/>.

CABI. 2010. *Trapa natans*. [original text by A. Mikulyuk and M. E. Nault]. In: *Invasive Species Compendium*. Wallingford, UK: CABI. Available online at <http://www.cabi.org.ISC/>.

CABI. 2010. *Hygrophila polysperma*. [original text by M. E. Nault and A. Mikulyuk]. In: *Invasive Species Compendium*. Wallingford, UK: CABI. Available online at <http://www.cabi.org.ISC/>.

CABI. 2010. *Lagarosiphon major*. [original text by M. E. Nault and A. Mikulyuk]. In: *Invasive Species Compendium*. Wallingford, UK: CABI. Available online at <http://www.cabi.org.ISC/>.

CABI. 2010. *Hydrocharis morsus-ranae*. [original text by M. E. Nault and A. Mikulyuk]. In: *Invasive Species Compendium*. Wallingford, UK: CABI. Available online at <http://www.cabi.org.ISC/>.

CABI. 2010. *Nymphoides peltata*. [original text by M. E. Nault and A. Mikulyuk]. In: *Invasive Species Compendium*. Wallingford, UK: CABI. Available online at <http://www.cabi.org.ISC/>.

CABI. 2010. *Ludwigia grandiflora*. [original text by A. Mikulyuk and M. E. Nault]. In: *Invasive Species Compendium*. Wallingford, UK: CABI. Available online at <http://www.cabi.org.ISC/>.

- CABI. 2010. *Ludwigia peploides* [original text by A. Mikulyuk and M. E. Nault]. In: Invasive Species Compendium. Wallingford, UK: CABI. Available online at <http://www.cabi.org.ISC/>.
- CABI. 2010. *Crassula helmsii* [original text by M. Nault and A. Mikulyuk]. In: Invasive Species Compendium. Wallingford, UK: CABI. Available online at <http://www.cabi.org.ISC/>.
- Caruso, C. M., H. Maherali, A. Mikulyuk, K. Carlson and R. B. Jackson. 2005. Genetic variance and covariance for physiological traits in *Lobelia*: Are there constraints on adaptive evolution? *Evolution* 59: 826-837.
- Reports, Articles, Guidelines, and Protocols:
- Nault, M., A. Mikulyuk, J. Hauxwell, J. Skogerboe, T. Asplund, M. Barton, K. Wagner, T. Hoyman, and E. Heath. 2012. Herbicide treatments in Wisconsin lakes. *LakeLine* 32:21-26.
- Hauxwell, J., S. Knight, K. Wagner, A. Mikulyuk, M. Nault, and S. Chase. 2010. Recommended baseline monitoring of aquatic plants in Wisconsin: Point-Intercept Sampling Design, Collection Protocol, Data Analysis, and Applications. DNR Publication #: SS 1068 2010.
- Mikulyuk, A. 2009. What can plants tell us? *Lake Tides*. 34(1)1-2.
- Mikulyuk, A. and M. E. Nault. 2009. Carolina fanwort (*Cabomba caroliniana*): A technical review of distribution, ecology, impacts and management. Miscellaneous publication PUB-SS-1047 2009. Madison, WI: Wisconsin Department of Natural Resources.
- Mikulyuk, A. and M. E. Nault. 2009. Curly-leaf pondweed (*Potamogeton crispus*): A technical review of distribution, ecology, impacts and management. Miscellaneous publication PUB-SS-1052 2009. Madison, WI: Wisconsin Department of Natural Resources.
- Nault, M. E. and A. Mikulyuk. 2009. East Indian hygrophila (*Hygrophila polysperma*). A technical review of distribution, ecology, impacts, and management. Miscellaneous publication PUB-SS-1049 2009. Madison, WI: Wisconsin Department of Natural Resources.
- Nault, M. E. and A. Mikulyuk. 2009. European frog-bit (*Hydrocharis morsus-ranae*): A technical review of distribution, ecology, impacts, and management. Miscellaneous publication PUB-SS-1048 2009. Madison, WI: Wisconsin Department of Natural Resources.
- Nault, M. E. and A. Mikulyuk. 2009. Yellow floating heart (*Nymphoides peltata*). A technical review of distribution, ecology, impacts, and management. Miscellaneous publication PUB-SS-1051 2009. Madison, WI: Wisconsin Department of Natural Resources.
- Mikulyuk, A., J. Hauxwell, M. Nault, K. Wagner, L. Herman, and S. Knight. 2009. Governor's Council on Invasive Species and Wisconsin DNR - Technical Reviews of 35 Potentially Invasive Aquatic Plants and Algae in Wisconsin. DNR Publication pending.
- Garrison, P., M. Jennings, A. Mikulyuk, J. Lyons, P. Rasmussen, J. Hauxwell, D. Wong, J. Brandt, and G. Hatzenbeler. 2008. Implementation and interpretation of lakes

assessment data for the Upper Midwest. Final Report to US EPA. DNR Publication SS 1044 2008.

Hauxwell, J., G. LaLiberte, A. Mikulyuk, P. Garrison, and G. Vorhes. 2006. Use of Plants and Diatoms for Nutrient Assessment in North Temperate Depressional Wetlands. Final Report, US EPA, Region V, Chicago, IL. DNR Publication #: PUB-SS-1023 2006.

Hauxwell, J., K. Wagner, and A. Mikulyuk. 2005. Whole Lake Herbicide Debate Deserves a Dose of Science. *Lake Tides* 30: 1-4. (University of Wisconsin Extension Lakes Publication - http://www.uwsp.edu/cnr/uwexlakes/laketides/vol30-4/2005%20FallLT_screen.pdf).

Hauxwell, J., S. Knight, K. Wagner, and A. Mikulyuk. 2004. Recommended Baseline Monitoring of Aquatic Macrophytes in Wisconsin - Point-Intercept Sampling Method, Collection Protocol, and Data Analyses. Wisconsin Department of Natural Resources, Madison WI. Pp. 1-10. (<http://www.uwsp.edu/cnr/uwexlakes/ecology/APM/APM%20Appendix.pdf>).

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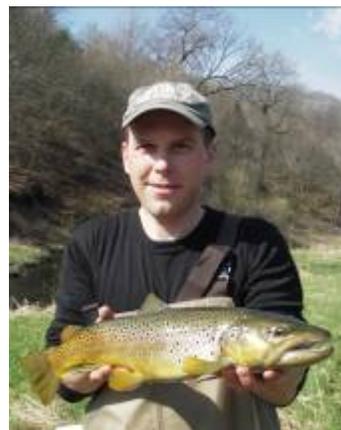
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Publications (past 10 years):

Peer-reviewed journals:

Mitro, M., J. Lyons, and S. Sharma. 2011. Executive summary: coldwater fish and fisheries. Pages 170-173 in E. Katt-Reinders, editor. *Wisconsin's changing climate: impacts and adaptations*. Wisconsin Initiative on Climate Change Impacts. Nelson Institute for Environmental Studies, University of Wisconsin-Madison and the Wisconsin Department of Natural Resources, Madison, Wisconsin.

Mitro, M. G., J. Lyons, and J. Stewart. 2010. Predicted effects of climate change on the distribution of wild brook trout and brown trout in Wisconsin streams. Pages 69-76 in R. F. Carline and C. LoSapio, editors. *Conserving wild trout: Proceedings of Wild Trout X*. Bozeman, Montana.

- Lyons, J., J. Stewart, and M. Mitro. 2010. Predicted effects of climate warming on the distribution of 50 stream fishes in Wisconsin, U.S.A. *Journal of Fish Biology* 77: in press.
- Grear, J. S., M. W. Meyer, J. H. Cooley Jr., A. Kuhn, W. H. Piper, M. G. Mitro, H. S. Vogel, K. M. Taylor, K. P. Kenow, S. M. Craig, and D. E. Nacci. 2009. Population growth and demography of common loons in the northern United States. *Journal of Wildlife Management* 73:1108-1115.
- Mitro, M. G., D. C. Evers, M. W. Meyer, and W. H. Piper. 2008. Common loon survival rates and mercury in New England and Wisconsin. *Journal of Wildlife Management* 72:665-673.
- Fayram, A. H., and M. G. Mitro. 2008. Relationships between reach-scale habitat variables and biotic integrity, brook trout density, and brown trout density in Wisconsin streams. *North American Journal of Fisheries Management* 28:1601-1608.
- Wehrly, K. E., L. Wang, and M. G. Mitro. 2007. Field-based estimates of thermal tolerance limits for trout: incorporating exposure time and temperature fluctuation. *Transactions of the American Fisheries Society* 136:365-374.
- Mitro, M. G. 2004. Stocking trout of wild parentage to restore wild populations: an evaluation of Wisconsin's wild trout stocking program. Pages 255-264 in S. E. Moore, R. F. Carline, and J. Dillon, editors. *Working together to ensure the future of wild trout: Proceedings of Wild Trout VIII*. Yellowstone National Park, Wyoming.
- Mitro, M. G. 2003. Demography and viability analyses of a diamondback terrapin population. *Canadian Journal of Zoology* 81:716-726.
- Mitro, M. G., A. V. Zale, and B. A. Rich. 2003. The relation between age-0 rainbow trout (*Oncorhynchus mykiss*) abundance and winter discharge in a regulated river. *Canadian Journal of Fisheries and Aquatic Sciences* 60:135-139.
- Mitro, M. G., and A. V. Zale. 2002. Seasonal survival, movement, and habitat use of age-0 rainbow trout in the Henrys Fork of the Snake River, Idaho. *Transactions of the American Fisheries Society* 131:271-286.
- Mitro, M. G. and A. V. Zale. 2002. Estimating abundances of age-0 rainbow trout by mark-recapture in a medium-sized river. *North American Journal of Fisheries Management* 22:188-203.
- Mitro, M. G. 2001. Ecological model testing: verification, validation, or neither? *Bulletin of the Ecological Society of America* 82:235-237.
- Mitro, M. G., and A. V. Zale. 2000b. Predicting fish abundance using single-pass removal sampling. *Canadian Journal of Fisheries and Aquatic Sciences* 57:951-961.
- Mitro, M. G., and A. V. Zale. 2000a. Use of distance sampling to estimate rainbow trout redd abundances in the Henry's Fork of the Snake River, Idaho. *Intermountain Journal of Sciences* 6:223-231.

Reports, Articles, Guidelines, and Protocols:

- Mitro, M. G. In Press. Statistical methods for determining significant change. Chapter 5 *in* C. Jones, editor. Fishers and Farmers Monitoring Protocol.
- Lathrop, R., J. Magnuson, E. Katt-Reinders, S. Pomplun, A. Coulson, S. Dunwoody, D. Liebl, T. Sinclair, J. Sullivan, D. Watermolen, D. Webb, C. Anderson, T. Asplund, C. Betz, W. Bland, G. Clark, A. Dorland, S. Gayan, H.J. Harris, D. Hart, J. Hurley, G. Kraft, C. Kucharik, J. LaGro, O. LeDee, J. Lyons, K. Martin, S. McLellan, M. Meyer, M. Mitro, P. Moy, P. Nowak, J. Patz, K. Potter, D. Vimont, and W. Walker. 2011. Wisconsin Initiative on Climate Change Impacts. Wisconsin's changing climate: impacts and adaptation. UW Nelson Institute for Environmental Studies and Wisconsin Dept. Natural Resources.
- Mitro, M., J. Lyons, and S. Sharma. 2011. Wisconsin Initiative on Climate Change Impacts: Coldwater Fish and Fisheries Working Group Report. 31 pages.
- Mitro, M. G. 2010. Groundwater key for trout as our climate warms. Wisconsin Trout 22(1):6.
- Mitro, M.G. and Angela L. White. 2008. Viral hemorrhagic septicemia and freshwater fisheries: the state of the science. Wisconsin DNR Technical Bulletin Series No. 196.
- Griffin, J., M. Mitro, L. Claggett, T. Treska, and A. Fayram. 2006. Trout Team Stream Monitoring Assignment. Report prepared for the Wisconsin DNR Fisheries Management Board. 22 pages.
- Munns, Jr., W. and M. Mitro. 2006. Assessing Risks to Populations at Superfund and RCRA Sites: Characterizing Effects on Populations (Final). U.S. Environmental Protection Agency, Washington, D.C., EPA/600/R-06/038.
<http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=154006>
- Stewart, J., M. Mitro, E. A. Roehl, Jr., and J. Risley. 2006. Numerically optimized empirical modeling of highly dynamic, spatially expansive, and behaviorally heterogeneous hydrologic systems – part 2. In Proceedings of the 7th International Conference on Hydroinformatics, Nice, France.
- Roehl, E., J. Risley, J. Stewart, and M. Mitro. 2006. Numerically optimized empirical modeling of highly dynamic, spatially expansive, and behaviorally heterogeneous hydrologic systems – part 1. In Proceedings for the Environmental Modeling and Software Society Conference. Burlington, Vermont.
- Mitro, M. G. 2002. Population modeling to support ecological risk assessment. Divisional Peer Review. Atlantic Ecology Division, NHEERL, ORD, U.S. EPA. 10 pp.
- Mitro, M. G., T. R. Gleason, and R. Gobell. 2002. Matrix population modeling for assessing risk of pesticides to bird populations. Report for Office of Prevention, Pesticides, and Toxic Substances, U.S. EPA. 31 pp.
- Mitro, M. G., and ten coauthors. 2000. Assessment of scup *Stenotomus chrysops*. Report prepared for the Atlantic States Marine Fisheries Commission Summer Flounder, Scup, and Black Sea Bass Technical Committee and submitted to the 31st Northeast Regional Stock Assessment Workshop. 74 pp.

Mitro, M. G. 2000. Deterministic and stochastic stock projection analyses for tautog. Report prepared for the Atlantic States Marine Fisheries Commission Tautog Technical Committee and Management Board. 24 pp.

Ken Morrison, LTE Scientist

Education:

B.S., Botany, University of Wisconsin

Expertise:

Limnology, Biogeochemistry, Airshed-Watershed Interactions, Aquatic Ecology, Plankton Biology



Publications (past 10 years):

Watras, CJ, Morrow, M., Morrison, K., Scannell, S., Yazicioglu, S., Hanson, P., Read, JS, Hu, Y-H. 2012. Wetland Observatories: monitoring the impact of weather and climate on hydrochemical dynamics with wireless sensor networks (WSNs). (in review)

Watras, CJ., PC Hanson, TL Stacy, KM Morrison, J. Mather, Y-H Hu and P.Milewski. 2011 . A temperature compensation method for CDOM sensors in freshwater. *Limnology and Oceanography, Methods* 9:296-301.

Watras, CJ, KA Morrison, JL Rubsam and B. Rodger. 2009. Atmospheric mercury cycles in northern Wisconsin. *Atmospheric Environment* 43:4070-4077.

Watras, CJ and KA Morrison. 2008. The response of two remote, temperate lakes to changes in atmospheric mercury deposition, sulfate and the water cycle. *Can. J. Fish. Aquat. Sci.* 65:100-116.

Watras, CJ, KA Morrison, O.Regnell, T.K. Kratz. 2006. The methylmercury cycle in Little Rock Lake during acidification and recovery. *Limnol. Oceanogr.* 51(1):257-270.

Watras, CJ, KA Morrison, A. Kent, N. Price, O.Regnell, C. Eckley, H.Hintelmann, T. Hubacher. 2005. Sources of methylmercury to a wetland-dominated lake in northern Wisconsin. *Environ. Sci. Technol.* 39:4747-4758.

Eckley, C., CJ Watras, H. Hintelmann, K. Morrison, A. Kent, O. Regnell. 2005. Mercury methylation in the hypolimnetic waters of lakes with and without connection to wetlands in northern Wisconsin. *Can. J. Fish. Aquat. Sci.* 62: 400- 411.

Schwalbe, JP, TR. Hrabik, CJ. Watras, and KA. Morrison. 2004. Lake Specific Changes in Mercury Concentrations of Yellow Perch (*Perca flavescens*) as a Result of a Decrease in Atmospheric Hg Deposition in northern Wisconsin. ASLO Annual Meeting, Savannah, GA, June 2004. (Abstract).

Watras, CJ, KA Morrison and TK Kratz. 2002. Seasonal enrichment and depletion of Hg and SO₄ in Little Rock Lake: relationship to seasonal changes in atmospheric deposition. *Can.J. Fish. Aquat. Sci.* 59: 1660-1667.

Michelle Nault, LTE Scientist

Education:

B.S. Biology, Zoology, & Biological Aspects of Conservation, with a certificate (minor) in Environmental Studies at the University of Wisconsin-Madison

Expertise:

Aquatic ecology, aquatic macrophyte monitoring, aquatic invasive plant ecology and management

Publications (past 10 years):

Peer-reviewed journals:

Mikulyuk, A., S. Sharma, S. Van Egeren, E. Erdmann, M.E. Nault, J. Hauxwell. 2011. The relative role of environmental, spatial, and land-use patterns in explaining aquatic macrophyte community composition. *Canadian Journal of Fisheries and Aquatic Sciences*. 68:1778-1789.

Mikulyuk, A., J. Hauxwell, P. Rasmussen, S. Knight, K. Wagner, M. Nault, and D. Ridgely. 2010. Testing a methodology for assessing aquatic plant communities in temperate inland lakes. *Lake and Reservoir Management*. 26:54-62.

Reports, Articles, Guidelines, and Protocols:

Nault, M., A. Mikulyuk, J. Hauxwell, J. Skogerboe, T. Asplund, M. Barton, K. Wagner, T. Hoyman, E. Heath. 2012. Building a Framework for Scientific Evaluation of Large-scale Herbicide Treatments in Wisconsin Lakes. *NALMS LakeLine*. 32 (1):21-26.

Nault, M. 2012. Governor's Council on Invasive Species and Wisconsin DNR - Technical Reviews of 42 Potentially Invasive Aquatic Plants and Algae in Wisconsin. DNR Publication pending.

Nault, M., A. Mikulyuk. 2011. Aquatic Invasive Species: Technical Reviews of Distribution, Ecology, Impacts, and Management. *Australian Swamp Stonecrop (*Crassula helmsii*)*. Wisconsin Department of Natural Resources - [PUB-SS-1078 2011].

Hauxwell, J., S. Knight, K. Wagner, A. Mikulyuk, M. Nault, and S. Chase. 2010. Recommended baseline monitoring of aquatic plants in Wisconsin: Point-Intercept Sampling Design, Collection Protocol, Data Analysis, and Applications. Wisconsin Department of Natural Resources - [PUB-SS-1068 2010].

Nault, M., Mikulyuk, A., J. Hauxwell, K. Wagner, L. Herman, and S. Knight. 2009. Governor's Council on Invasive Species and Wisconsin DNR - Technical Reviews of 35 Potentially Invasive Aquatic Plants and Algae in Wisconsin. DNR Publication pending.

Nault, M., A. Mikulyuk. 2009. Aquatic Invasive Species: Technical Reviews of Distribution, Ecology, Impacts, and Management. *African Elodea (*Lagarosiphon major*)*. Wisconsin Department of Natural Resources - [PUB-SS-1050 2009].



- Mikulyuk, A., M. Nault. 2009. Aquatic Invasive Species: Technical Reviews of Distribution, Ecology, Impacts, and Management. Water spangles (*Salvinia minima*). Wisconsin Department of Natural Resources - [PUB-SS-1053 2009].
- Mikulyuk, A., M. Nault. 2009. Aquatic Invasive Species: Technical Reviews of Distribution, Ecology, Impacts, and Management. Water chestnut (*Trapa natans*). Wisconsin Department of Natural Resources - [PUB-SS-1054 2009].
- Nault, M., A. Mikulyuk. 2009. Aquatic Invasive Species: Technical Reviews of Distribution, Ecology, Impacts, and Management. Yellow floating heart (*Nymphaoides peltata*). Wisconsin Department of Natural Resources - [PUB-SS-1051 2009].
- Nault, M., A. Mikulyuk. 2009. Aquatic Invasive Species: Technical Reviews of Distribution, Ecology, Impacts, and Management. European frog-bit (*Hydrocharis morsus-ranae*). Wisconsin Department of Natural Resources - [PUB-SS-1048 2009].
- Nault, M., A. Mikulyuk. 2009. Aquatic Invasive Species: Technical Reviews of Distribution, Ecology, Impacts, and Management. East Indian Hygrophila (*Hygrophila polysperma*). Wisconsin Department of Natural Resources - [PUB-SS-1049 2009].
- Mikulyuk, A., M. Nault. 2009. Aquatic Invasive Species: Technical Reviews of Distribution, Ecology, Impacts, and Management. Curly-leaf pondweed (*Potamogeton crispus*). Wisconsin Department of Natural Resources - [PUB-SS-1052 2009].
- Mikulyuk, A., M. Nault. 2009. Aquatic Invasive Species: Technical Reviews of Distribution, Ecology, Impacts, and Management. Carolina fanwort (*Cabomba caroliniana*). Wisconsin Department of Natural Resources - [PUB-SS-1047 2009].
- CABI. 2010. *Salvinia auriculata* [original text by A. Mikulyuk]. In: Invasive Species Compendium. Wallingford, UK: CABI. Available online at <http://www.cabi.org/ISC/>.
- CABI. 2010. *Potamogeton crispus*. [original text by A. Mikulyuk and M. E. Nault]. In: Invasive Species Compendium. Wallingford, UK: CABI. Available online at <http://www.cabi.org/ISC/>.
- CABI. 2010. *Cabomba caroliniana*. [original text by A. Mikulyuk and M. E. Nault]. In: Invasive Species Compendium. Wallingford, UK: CABI. Available online at <http://www.cabi.org/ISC/>.
- CABI. 2010. *Salvinia minima*. [original text by A. Mikulyuk and M. E. Nault]. In: Invasive Species Compendium. Wallingford, UK: CABI. Available online at <http://www.cabi.org/ISC/>.
- CABI. 2010. *Trapa natans*. [original text by A. Mikulyuk and M. E. Nault]. In: Invasive Species Compendium. Wallingford, UK: CABI. Available online at <http://www.cabi.org/ISC/>.
- CABI. 2010. *Hygrophila polysperma*. [original text by M. E. Nault and A. Mikulyuk]. In: Invasive Species Compendium. Wallingford, UK: CABI. Available online at <http://www.cabi.org/ISC/>.

CABI. 2010. *Lagarosiphon major*. [original text by M. E. Nault and A. Mikulyuk]. In: Invasive Species Compendium. Wallingford, UK: CABI. Available online at <http://www.cabi.org.ISC/>.

CABI. 2010. *Hydrocharis morsus-ranae*. [original text by M. E. Nault and A. Mikulyuk]. In: Invasive Species Compendium. Wallingford, UK: CABI. Available online at <http://www.cabi.org.ISC/>.

CABI. 2010. *Nymphoides peltata*. [original text by M. E. Nault and A. Mikulyuk]. In: Invasive Species Compendium. Wallingford, UK: CABI. Available online at <http://www.cabi.org.ISC/>.

CABI. 2010. *Ludwigia grandiflora*. [original text by A. Mikulyuk and M. E. Nault]. In: Invasive Species Compendium. Wallingford, UK: CABI. Available online at <http://www.cabi.org.ISC/>.

CABI. 2010. *Ludwigia peploides* [original text by A. Mikulyuk and M. E. Nault]. In: Invasive Species Compendium. Wallingford, UK: CABI. Available online at <http://www.cabi.org.ISC/>.

CABI. 2010. *Crassula helmsii* [original text by M. Nault and A. Mikulyuk]. In: Invasive Species Compendium. Wallingford, UK: CABI. Available online at <http://www.cabi.org.ISC/>.

Steve Newman, Scientist (Retired)

Education:

B.S., Fisheries Biology, University of Minnesota

Expertise:

Walleye biology and population dynamics, smallmouth bass biology and population dynamics, regulations, sampling design and techniques

Key collaborators:

UW-Stevens Point; Wisconsin Cooperative Fishery Research Unit; USDA Forest Service; Bowling Green State University; UW-Madison; Dairyman's, Incorporated; University of Notre Dame



Publications (past 10 years):

Peer-reviewed journals:

Franckowiak, R. P., B. L. Sloss, M. A. Bozek, and S. P. Newman. 2009. Temporal effective size limits of a managed walleye *Sander vitreus* population and implications for genetic-based management. *Journal of Fish Biology* 74: 1086-1103.

Smith, K., J. Miner, D. Wiegmann, and S. Newman. 2009. Individual differences in exploratory and antipredator behaviour in juvenile smallmouth bass (*Micropterus dolomieu*). *Behavior*. 146:283-294.

Schueller, A., M. Hansen, and S. Newman. 2008. Modeling the sustainability of walleye populations in northern Wisconsin lakes. *North American Journal of Fisheries Management* 28:1916-1927.

Schueller, A.M., M.J. Hansen, S.P. Newman, and C.J. Edwards. 2005. Density dependence of walleye maturity and fecundity in Big Crooked Lake, Wisconsin, 1997-2003. *North American Journal of Fisheries Management* 25:841-847.

Hansen, M.J., S.P. Newman, and C.J. Edwards. 2004. A reexamination of the relationship between electrofishing catch rate and age-0 walleye density in northern Wisconsin lakes. *North American Journal of Fisheries Management* 24:429-439.

Wiegmann, D.W., L.A., Angeloni, J.R. Baylis, and S.P. Newman. 2004. Negative maternal or paternal effects on tactic inheritance under a conditional strategy. *Evolution* 58:1530-1535.

Fry, A.P., M.A. Bozek, C.J. Edwards, and S.P. Newman. 2003. Diet overlap and predation between smallmouth bass and walleye in a north temperate lake. *Journal of Freshwater Ecology* 18:43-54

Saunders, R., M. Bozek, C. Edwards, M. Jennings, and S. Newman. 2002. Habitat features affecting smallmouth bass nesting success in four northern Wisconsin lakes. Pages 119-130 in: M. S. Ridgway and D. P. Philipp, eds. *Black Bass: Ecology Conservation and Management*.

Bozek, M., P. Short, C. Edwards, M. Jennings, and S. Newman. 2002. Habitat selection of nesting smallmouth bass *Micropterus dolomieu* in two north temperate lakes. Pages 119-130 in: M. S. Ridgway and D. P. Philipp, eds. *Black Bass: Ecology Conservation and Management*.

Newby, J., M. Hansen, S. Newman, and C. Edwards. 2000. Catchability of walleyes to angling in Escanaba Lake, Wisconsin, 1980-1995. *North American Journal of Fisheries Management* 20:873-881

Newman, S. and M. Hoff. 2000. Evaluation of a 16-inch minimum length limit for smallmouth bass in Palette Lake, Wisconsin. *North American Journal of Fisheries Management* 20:78-87.

Engel, S., M. Hoff, and S. Newman. 2000. Walleye fry hatching, diet, growth, and abundance in Escanaba Lake, Wisconsin, 1985-1992. *WDNR Research Rept. No. 184*.

Gillooly, J., T. O'Keefe, S. Newman, and J. Baylis. 2000. A long-term view of density-dependent recruitment in smallmouth bass from Nebish Lake, Wisconsin. *Journal of Fish Biology* 56:542-551.

Reports, Articles, Guidelines, and Protocols:

Nate, N., M.J. Hansen, L.G. Rudstam, R.L. Knight, and S.P. Newman. 2011. Population and community dynamics of walleye. In: B.A. Barton (editor-in-chief), *Biology, Management, and Culture of Walleye and Sauger*. American Fisheries Society. Bethesda, Maryland.

- Schmaltz, P.J., A.H. Fayram, D.A. Isermann, S.P. Newman, and C.J. Edwards. 2011. Harvest and exploitation. In: B.A. Barton (editor-in-chief), *Biology, Management, and Culture of Walleye and Sauger*. American Fisheries Society. Bethesda, Maryland.
- Newman, S. D. Dreikosen, G. Matzke, G. Kubenik, M. Lorenzoni, and M. Snyder. 2010. Northern Highland Fisheries Research Area population and harvest monitoring. Annual Report, Northern Highland Fishery Research Area, Woodruff, Wisconsin.
- Newman, S. D. Dreikosen, G. Matzke, G. Kubenik, M. Lorenzoni, and M. Snyder. 2009. Northern Highland Fisheries Research Area population and harvest monitoring. Annual Report, Northern Highland Fishery Research Area, Woodruff, Wisconsin.
- Newman, S. D. Dreikosen, G. Matzke, G. Kubenik, M. Lorenzoni, and M. Snyder. 2008. Northern Highland Fisheries Research Area population and harvest monitoring. Annual Report, Northern Highland Fishery Research Area, Woodruff, Wisconsin.
- Newman, S., D. Dreikosen, G. Matzke, G. Kubenik, and M. Lorenzoni. 2007. Northern Highland Fisheries Research Area population and harvest monitoring. Annual Report, Northern Highland Fishery Research Area, Woodruff, Wisconsin.
- Newman, S., D. Dreikosen, G. R. Matzke, G. R. Kubenik, R. J. Ortlieb, and M. D. Lorenzoni. 2006. Northern Highland Fisheries Research Area population and harvest monitoring. Annual Report, Northern Highland Fishery Research Area, Woodruff, Wisconsin.
- Newman, S. P., D. S. Dreikosen, L. D. Eslinger, and G. R. Kubenik. 2005. Northern Highland Fisheries Research Area population and harvest monitoring. Annual Report, Northern Highland Fishery Research Area, Woodruff, Wisconsin.
- Newman, S., D. Dreikosen, L. Eslinger, and G. Kubenik. 2004. Northern Highland Fisheries Research Area population and harvest monitoring. Annual Report, Northern Highland Fishery Research Area, Woodruff, Wisconsin.
- Newman, S., J. Marron, D. Dreikosen, and G. Kubenik. 2003. Northern Highland Fisheries Research Area population and harvest monitoring. Annual Report, Northern Highland Fishery Research Area, Woodruff, Wisconsin.
- Newman, S., R. Franckowiak, D. Dreikosen, and G. Kubenik. 2002. Northern Highland Fisheries Research Area population and harvest monitoring. Annual Report, Northern Highland Fishery Research Area, Woodruff, Wisconsin.
- Newman, S., R. Franckowiak, D. Dreikosen, and G. Kubenik. 2001. Northern Highland Fisheries Research Area population and harvest monitoring. Annual Report, Northern Highland Fishery Research Area, Woodruff, Wisconsin.
- Newman, S., D. Dreikosen, and G. Kubenik. 2000. Northern Highland Fisheries Research Area population and harvest monitoring. Annual Report, Northern Highland Fishery Research Area, Woodruff, Wisconsin.
-

Randal Piette, Technician

Education:

B.S., University of Wisconsin, Stevens Point
M.S., University of Wisconsin, Stevens Point

Expertise:

Warmwater rivers and streams, flathead catfish,
freshwater mussels

Publications (past 10 years):

See those listed under Lyons and under Jennings. In addition:



Piette, R., A. Niebur. 2012. Red River Freshwater Mussel and Fisheries Assessment for Relicensing the Gresham Municipal Utilities Upper Red lake (FERC No. 2484) and Weed Dam (FERC No. 2464) Hydroelectric Projects. Wisconsin Department of Natural Resources Report.

Piette, R. 2012. Freshwater Mussel Survey Report: Mill Creek. Wisconsin Department of Natural Resources Survey Report.

Piette, R. 2012. Freshwater Mussel Report: Highway 49 Bridge crossing of Little Wolf River. Wisconsin Department of Natural Resources Report.

Piette, R. 2012. Freshwater Mussel Survey Report: Iola, Wisconsin. Wisconsin Department of Natural Resources Report.

Piette, R. 2012. Freshwater Mussel Survey Report: Milwaukee River, Campbellsport, Wisconsin. Wisconsin Department of Natural Resources Report.

Piette, R. 2012. Fox River Mussel Survey – Grand River Locks. Wisconsin Department of Natural Resources Report.

Piette, R. 2012. Freshwater Mussel Survey report: Wolf River. Wisconsin Department of Natural Resources Report.

Moerke, A., J. Mistak, R. Piette, and A. Selle. 2012. Final Report: Little Quinnesec Fisheries Settlement Project. Project Final Report.

Piette, R. 2011. Lower Menominee River Freshwater Mussel Survey, Summary of 2011 Results. Wisconsin Department of Natural Resources Report.

Piette, R., and A. Niebur. 2011. Movement of adult male flathead catfish in the Upper Fox River and Wolf River systems determined by radiotelemetry. American Fisheries Society Symposium 77:455-471.

Piette, R. January 2006. Status and Distribution of Greater Redhorse in the Waupaca River. Wisconsin Department of Natural Resources Research Report.

Piette, R. March 2005. Guidelines for Sampling Freshwater Mussels in Wadable Streams. Wisconsin Department of Transportation. Report No. 0092-01-09. Otis, K. J., R.R. Piette

Jeff Rubsam, LTE Technician

Expertise

Water quality monitoring, rain sampling, trace metal clean sampling, aqueous mercury analysis, wireless wetland monitoring



Publications (past 10 years)

Watras, C.J., K.A. Morrison, J.L. Rubsam and B. Rodger. 2009. Atmospheric mercury cycles in northern Wisconsin. Atmospheric Environment 43:4070-4077.

Greg Sass, Scientist

Education:

B.S. University of South Florida
M.S. University of Wisconsin-Madison
Ph.D. University of Wisconsin-Madison

Expertise:

My research interests within the field of aquatic ecology have primary emphasis on fish ecology, ichthyology, and fisheries biology. Specific interests involve predator-prey interactions, bioenergetics, population dynamics, and ecosystem-based fisheries management. Ongoing research focuses on long-term resource monitoring of the large rivers of Illinois, invasive species ecology and management, and floodplain lake restoration ecology. In addition, I study the response of fish communities and food webs to whole-lake manipulations of coarse woody habitat in several northern Wisconsin lakes, the ecosystem effects of a whole-lake removal of an exotic fish and crayfish, and exotic sea lamprey and lake trout interactions and food web dynamics in Lake Superior. Current research is aimed at better understanding walleye exploitation in northern Wisconsin lakes and the influences of invasive species and global climate change on aquatic ecosystems in Wisconsin.



Key collaborators: DNR Fisheries Research, DNR Fisheries Management, UW-Madison Center for Limnology, UW-Stevens Point, UWSP Fisheries Cooperative Unit, University of Minnesota-Duluth, Michigan State University, University of Illinois, Western Illinois University, Eastern Illinois University, University of Tennessee at Martin, University of Florida, Humboldt University at Berlin, University of British Columbia, University of Washington, USGS, U.S. Army Corps of Engineers, University of Notre Dame, Great Lakes Indian Fish and Wildlife Commission

Publications (past 10 years):

Peer-reviewed publications:

- McClelland, M.A., G.G. Sass, T.R. Cook, K.S. Irons, N.N. Michaels, T.M. O'Hara, and C.S. Smith. 2012. The long-term Illinois fish population monitoring program. Fisheries (In Press).
- McClelland, M.A. and G.G. Sass. 2012. Assessing fish collections from random and fixed site sampling methods on the Illinois River. Journal of Freshwater Ecology, 1-9, iFirst.
- Spacapan, M., C.A. Miller, and G.G. Sass. 2012. An evaluation of river usage in the Mississippi River basin following the invasion of Asian carp. Northeast Recreation Research Symposium, Cooperstown, New York, USA.
- McClelland, M.A., K.S. Irons, G.G. Sass, T.M. O'Hara, and T.R. Cook. 2011. A comparison of two electrofishing programmes used to monitor fish on the Illinois River, Illinois, USA. River Research and Applications. DOI:10.1002/rra.1590
- Sass, G.G., S.R. Carpenter, J.E. Gaeta, J.F. Kitchell, and T.D. Ahrenstorff. 2012. Whole-lake addition of coarse woody habitat: response of fish populations. Aquatic Sciences-Research Across Boundaries 74:255-266.
- Ruebush, B.C., G.G. Sass, J.H. Chick, and J.D. Stafford. 2012. In situ tests of sound-bubble-strobe light barrier technologies to prevent range expansions of Asian carp. Aquatic Invasions. 7:37-48.
- Weis, J.J. and G.G. Sass. 2011. Largemouth bass nest site selection in small, north temperate lakes varying in littoral coarse woody habitat abundances. North American Journal of Fisheries Management 31:943-951.
- Ahrenstorff, T.D., T.R. Hrabik, J.D. Stockwell, D.L. Yule, and G.G. Sass. 2011. Seasonally dynamic diel vertical migrations of *Mysis diluviana*, coregonine fishes, and siscowet lake trout in the pelagia of western Lake Superior. Transactions of the American Fisheries Society 140:1504-1520.
- Gaeta, J.W., M.J. Guarascio, G.G. Sass, and S.R. Carpenter. 2011. Lakeshore residential development and growth of largemouth bass (*Micropterus salmoides*): a cross-lakes comparison. Ecology of Freshwater Fish 20:92-101.
- Rach, J.J., G.G. Sass, J.A. Luoma, and M.P. Graikowski. 2010. Effects of water hardness on size and hatching success of silver carp eggs. North American Journal of Fisheries Management 30:230-237.
- Sass, G.G., T.R. Cook, K.S. Irons, M.A. McClelland, N.N. Michaels, T.M. O'Hara, and M.R. Stroub. 2010. A mark-recapture population estimate for invasive silver carp (*Hypophthalmichthys molitrix*) in the La Grange Reach, Illinois River. Biological Invasions 12:433-436.
- Ahrenstorff, T.D., G.G. Sass, and M.R. Helmus. 2009. The influence of littoral zone coarse woody habitat on home range size, spatial distribution, and feeding ecology of largemouth bass (*Micropterus salmoides*). Hydrobiologia 623:223-233.
- Helmus, M.R. and G.G. Sass. 2008. The rapid effects of a whole-lake reduction of coarse woody debris on fish and benthic macroinvertebrates. Freshwater Biology 53:1423-1433.

- Irons, K.S., G.G. Sass, M.A. McClelland, and J.D. Stafford. 2007. Reduced condition factor of two native fish species coincident with invasion of non-native Asian carps in the Illinois River, U.S.A. Is this evidence for competition and reduced fitness? *Journal of Fish Biology* 71:258-273.
- Mercado-Silva, N., G.G. Sass, B.M. Roth, S.J. Gilbert, and M.J. Vander Zanden. 2007. Walleye recruitment decline as a consequence of rainbow smelt invasions in Wisconsin lakes. *Canadian Journal of Fisheries and Aquatic Sciences* 64: 1543-1550.
- Roth, B.M., I.C. Kaplan, G.G. Sass, P.T. Johnson, A.E. Marburg, A.C. Yannarell, T.V. Willis, M.G. Turner, and S.R. Carpenter. 2007. Linking terrestrial and aquatic ecosystems: the role of woody habitat in lake food webs. *Ecological Modeling* 203:439-452.
- Sass, G.G., J.F. Kitchell, S.R. Carpenter, T.R. Hrabik, A.E. Marburg, and M.G. Turner. 2006. Fish community and food web responses to a whole-lake removal of coarse woody habitat. *Fisheries* 31:321-330.
- Sass, G.G., C.M. Gille, J.T. Hinke, and J.F. Kitchell. 2006. Whole-lake influences of littoral structural complexity and prey body morphology on fish predator-prey interactions. *Ecology of Freshwater Fish* 15:301-308.
- Sass, G.G. and J.F. Kitchell. 2005. Can growth be used as a surrogate measure of walleye (*Sander vitreus*) abundance change? *Canadian Journal of Fisheries and Aquatic Sciences* 62:2159-2168.
- Sass, G.G., S.W. Hewett, T.D. Beard, Jr., A.H. Fayram, and J.F. Kitchell. 2004. The role of density-dependence in growth patterns of ceded territory walleye populations of northern Wisconsin: effects of changing management regimes. *North American Journal of Fisheries Management* 24:1262-1278.
- Flaherty, C.M., G.G. Sass, and K.E. Stiles. 2003. Human mercury toxicity and ice angler fish consumption: are people eating enough to cause health problems? *Risk Analysis* 23:497-504.
- Sass, G.G. and P.J. Motta. 2002. The effects of satiation on strike mode and prey capture kinematics in the largemouth bass, *Micropterus salmoides*. *Environmental Biology of Fishes* 65:441-454.

Book Chapters

- Roth, B.M., T.R. Hrabik, G.G. Sass, J. Peters, and N.E. Mandrak. 2011. Fish and decapods crustaceans of the Great Lakes basin. In: *Great Lakes Fisheries Science and Policy*, 2nd Edition. W.W. Taylor, N.J. Leonard, and A. Lynch (eds). Michigan State University Press, East Lansing, Michigan
- Irons, K.S., G.G. Sass, M.A. McClelland, and T.M. O'Hara. 2011. The long-term resource monitoring program: insights into the Asian carp invasion of the Illinois River, Illinois, USA. In: *Invasive Asian Carps in North America*. D.C. Chapman and M.H. Hoff (eds.). American Fisheries Society Symposium 74. Bethesda, Maryland. pp. 31-50.
- Sass, G.G. 2009. Coarse woody debris in lakes and streams. In: *Encyclopedia of Inland Waters*. Volume 1. G.E. Likens (ed.). Oxford: Elsevier. pp. 60-69.

Sass, G.G. 2008. The black sheep. In: *Biologists in the field; stories, tales, and anecdotes from 150 years of field biology.* M.R. Jeffords, S.L. Post, and C.Warwick (eds.). Illinois Natural History Survey Educational Material 02.

Kitchell, J.F. and G.G. Sass. 2008. Great Lakes ecosystems: invasions, food web dynamics, and the challenge of ecological restoration. In: *The Vanishing Present: Wisconsin's Changing Lands, Waters, and Wildlife.* D.M. Waller and T.P. Rooney (eds.). The University of Chicago Press, Chicago, Illinois. pgs. 157-170.

Reports, Articles, Guidelines, and Protocols:

Sass, G.G., J.H. Chick, and B.S. Ickes. 2012. Setting quantitative fish management targets for the Upper Mississippi River System. LTRMP technical report (in press).

Sass, G.G., T.R. Cook, K.S. Irons, M.A. McClelland, N.N. Michaels, and T.M. O'Hara 2012. Experimental and comparative approaches to determine factors supporting or limiting submersed aquatic vegetation in the Illinois River and its backwaters. LTRMP technical report (in press).

Garvey, J.E., G.G. Sass, J. Trushenski, D. Glover, P.M. Charlebois, J. Leavengood, B.M. Roth, G. Whitledge, B.C. Small, S.J. Tripp, and S. Secchi. 2012. Fishing down the bighead and silver carps: reducing the risk of invasion to the Great Lakes. Final report to the Illinois Department of Natural Resources.

Van Middlesworth, T.D., N.N. Michaels, and G.G. Sass. 2012. Fish and aquatic vegetation monitoring of The Nature Conservancy's Emiquon Preserve. Illinois Natural History Survey Technical Report 2012 (01).

Van Middlesworth, T.D., N.N. Michaels, and G.G. Sass. 2011. Fish and aquatic vegetation monitoring of The Nature Conservancy's Emiquon Preserve. Illinois Natural History Survey Technical Report 2011 (06).

Michaels, N.N. and G.G. Sass. 2010. Fish and aquatic vegetation monitoring of The Nature Conservancy's Emiquon Preserve. Illinois Natural History Survey Technical Report 2010 (14).

Sass, G.G., M.A. McClelland, T.R. Cook, K.S. Irons, T.M. O'Hara, and N.N. Michaels. 2009. Factors supporting or limiting submersed aquatic vegetation establishment and growth in the Starved Rock reach of the Illinois River. U.S. Army Corps of Engineers Technical Report, Rock Island District.

McClelland, M.A. and G.G. Sass. 2009. The long-term Illinois River fish Population monitoring program: project F-101-R-16-20 final report (2004-2008) with program amendment, 2009. Illinois Natural History Survey Technical Report 2009 (21).

McClelland, M.A. and G.G. Sass. 2009. The long-term Illinois River fish population monitoring program: project F-101-R-20. Illinois Natural History Survey Technical Report 2009 (7).

Michaels, N.N. and G.G. Sass. 2009. Fish and aquatic vegetation monitoring of The Nature Conservancy's Emiquon Preserve. Illinois Natural History Survey Technical Report 2009 (10).

McClelland, M.A. and G.G. Sass. 2008. The long-term Illinois River fish population monitoring program: project F-101-R-19. Illinois Natural History Survey Technical Report 2008 (10).

Michaels, N.N. and G.G. Sass. 2008. Fish and aquatic vegetation monitoring of The Nature Conservancy's Emiquon Preserve. Illinois Natural History Survey Technical Report 2008 (56).

O'Hara, T.M., M.A. McClelland, K.S. Irons, T.R. Cook, and G.G. Sass. 2008. The effect of a recently completed Habitat Rehabilitation and Enhancement Project (HREP) on fish abundances in the La Grange Reach of the Illinois River using Long Term Resource Monitoring Program (LTRMP) data. U.S. Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse, Wisconsin. LTRMP Technical Report 2008-T001. 16 pp. (Reference 2006APE17b.)

McClelland, M.A. and G.G. Sass. 2007. The long-term Illinois River fish population monitoring program: project F-101-R-18. Illinois Natural History Survey Technical Report 2007 (24).

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Publications (past 10 years):

Van Egeren, S.J., S.I. Dodson, B. Torke, J. Maxted. 2010. Factors affecting zooplankton community structure in Southeast Wisconsin Till Plain Lakes. *Hydrobiologia* 668: 137-146.

Dodson, S.I., A.L. Newman, S. Will-Wolf, M.L. Alexander, M.P. Woodford, and S.J. Van Egeren. 2009. The relationship between zooplankton community structure and lake characteristics in temperate lakes (Northern Wisconsin, USA). *Journal of Plankton Research*, 31(1): 93-100.

Watershed Bureau Monitoring Technical Team. 2009. Wisconsin Consolidated Assessment and Listing Methodology (WisCALM): Lakes: Fish and Aquatic Life Assessment Methods. Watershed Bureau, Wisconsin Department of Natural Resources, Madison, Pp. 26-37.

Van Egeren, S.J., 2009. Implementing the Great Lakes Compact: Wisconsin Conservation and Efficiency Measures Report. Urban and Regional Planning (URPL), Department of, University of Wisconsin-Madison. Extension Report 2009-01.

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Publications (past 10 years):

See those listed under Hauxwell, Nault, and Mikulyuk. In addition:

Wagner, K. and A. Mikulyuk. 2012. Rapid Macrophyte Habitat Assessment Methodology. Wisconsin Department of Natural Resources Bureau of Science Services, PUB-SS-XXXX 2012. Madison, Wisconsin, USA.

Wagner, K.I., S.K. Gallagher, M. Hayes, B.A. Lawrence, and J.B. Zedler. 2008. Wetland restoration in the new millennium: do research efforts match opportunities? *Restoration Ecology* 16(3): 367-372.

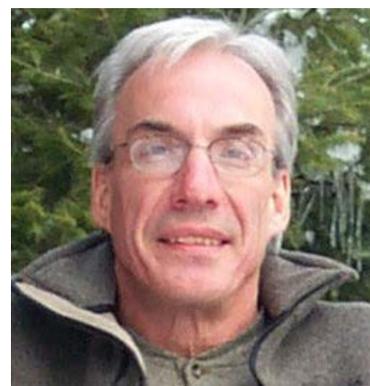
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Publications (past 10 years):

Watras, C.J., Morrow, M., Morrison, K., Scannell, S., Yazicioglu, S., Hanson, P., Read, J.S., Hu, Y-H. 2012. Wetland Observatories: monitoring the impact of weather and climate on hydrochemical dynamics with wireless sensor networks (WSNs). (in review)

Watras, C.J., P.C. Hanson, T.L. Stacy, K.M. Morrison, J. Mather, Y-H Hu and P. Milewski. 2011. A temperature compensation method for CDOM sensors in freshwater. *Limnology and Oceanography, Methods* 9:296-301.

- Meyer, M.W., P.W. Rasmussen, C.J. Watras, B.M. Fevold and K.P. Kenow. 2011. Bi-phasic trends in mercury loon concentrations in blood of Wisconsin loons during 1992-2010. *Ecotoxicology* 20: 1659-1668.
- Watras, C.J. 2010. Mercury Pollution in Remote Freshwaters. Pp. 648-657. In G.E. Likens (ed). *Biogeochemistry of Inland waters*. Elsevier, Oxford, United Kingdom.
- Watras, C.J., K.A. Morrison, J.L. Rubsam and B. Rodger. 2009. Atmospheric mercury cycles in northern Wisconsin. *Atmospheric Environment* 43:4070-4077.
- Regnell, O., C.J. Watras, B. Troedsson, A. Helgee, and T. Hammar. 2009. Mercury in a Boreal Forest Stream - Role of Historical Mercury Pollution, TOC, Temperature, and Water Discharge *Environmental Science and Technology* 43:3514-3521.
- Watras, C.J. 2009. Mercury pollution in remote freshwaters. In G.E. Likens (ed). *Encyclopedia of Inland Waters*, Oxford, Elsevier, vol. 3, pp 100-109.
- Watras, C.J. and K.A. Morrison. 2008. The response of two remote, temperate lakes to changes in atmospheric mercury deposition, sulfate and the water cycle. *Can. J. Fish. Aquat. Sci.* 65:100-116.
- Frost, T.M., J.M. Fischer, P.L. Brezonik, M.J. Gonzalez, T.K. Kratz, C.J. Watras, K.E. Webster. 2006. The experimental acidification of Little Rock Lake. in J.J. Magnuson, T.K. Kratz & B.J. Benson [eds]. *Long-term dynamics of lakes in the landscape*. Oxford University Press, NY, NY. Pp 168-186.
- Watras, C.J., K.A. Morrison, O. Regnell, T.K. Kratz. 2006. The methylmercury cycle in Little Rock Lake during acidification and recovery. *Limnol. Oceanogr.* 51:257-270.
- Kent, A.D., C.J. Watras, C. Eckley, O. Regnell, H. Hintelmann and K.D. McMahon. 2006. Microbial community structure is correlated with mercury methylation in northern Wisconsin lakes. Eighth International Conference on Mercury as a Global Pollutant, Madison, WI. August 6-11, 2006 (Abstract).
- Kent, A.D., C.J. Watras, C. Eckley, O. Regnell, K.D. McMahon, and H. Hintelmann. 2005. Microbial community composition and mercury methylation in the anoxic hypolimnia of stratified Wisconsin lakes. ASLO Annual Summer Meeting, June 19-24, 2005, Santiago de Compostela, Spain (Abstract).
- Kent, A.D., C.J. Watras, C. Eckley, O. Regnell, K.D. McMahon, and H. Hintelmann. 2005. Mercury Methylation Varies with Pelagic Microbial Community Composition in Lakes Within the Great Lakes Basin. International Association for Great Lakes Research: 48th Annual Meeting, Ann Arbor MI, May 23-27, 2005. (Abstract).
- Kent, A.D., C.J. Watras, O. Regnell, C. Eckley, and H. Hintelmann. 2005. Analysis of microbial community structure associated with mercury methylation in northern Wisconsin lakes. *Am. Soc. Limnol Oceanogr. Aquatic Sciences Meeting*, Salt Lake City, February, 2005. (Abstract).

- Watras, C.J., K.A. Morrison, A. Kent, N. Price, O. Regnell, C. Eckley, H. Hintelmann, T. Hubacher. 2005. Sources of methylmercury to a wetland-dominated lake in northern Wisconsin. *Environ. Sci. Technol.* 39: 4747-4758.
- Eckley, C., C.J. Watras, H. Hintelmann, K. Morrison, A. Kent, O. Regnell. 2005. Mercury methylation in the hypolimnetic waters of lakes with and without connection to wetlands in northern Wisconsin. *Can. J. Fish. Aquat. Sci.* 62: 400- 411.
- Schwalbe, J.P., T.R. Hrabik, C.J. Watras, and K.A. Morrison. 2004. Lake Specific Changes in Mercury Concentrations of Yellow Perch (*Perca flavescens*) as a Result of a Decrease in Atmospheric Hg Deposition in northern Wisconsin. ASLO Annual Meeting, Savannah, GA, June 2004. (Abstract).
- Hudson, R.J.M., C.W. Shade, D.S. Segala, C.J. Watras, and H. Hintelman. 2002. Mercury bioavailability in aquatic ecosystems. Canadian Society for Chemistry, Annual Meeting. Vancouver, BC. June 2002. (Abstract).
- Watras, C.J., K.A. Morrison, and T.K. Kratz. 2002. Seasonal enrichment and depletion of Hg and SO₄ in Little Rock Lake: relationship to seasonal changes in atmospheric deposition. *Can. J. Fish. Aquat. Sci.* 59: 1660-1667.
- Mauro, J.B.N., J.R.D. Guimarães, H. Hintelmann, C. Watras, L. Haack, and S.A.C. Souza. 2002. Mercury Methylation in Macrophytes, Periphyton and Water: Comparative Studies with Stable and Radio-Mercury Additions. *Analytical and Bioanalytical Chemistry* 374: 983-989.
- Hrabik, T.R., and C.J. Watras. 2002. Recent declines in mercury concentration in a freshwater fishery: isolating the effects of de-acidification and decreased atmospheric mercury deposition in Little Rock Lake. *Sci. Tot. Environ.* 297: 229- 237.
- Mauro, J.B.N., H. Hintelmann, L. Haack, J.R.D. Guimaraes, and C.J. Watras. 2001. Hg methylation potential in aquatic macrophytes and periphyton of the Everglades nutrient removal area, Florida. Sixth International Conference on Mercury as a Global Pollutant. Minamata, Japan. October 2001. (Abstract).
- Mauro, J.B.N., C.J. Watras, K.A. Morrison, and J.R.D. Guimaraes. 2001. Mercury methylation in anoxic waters of a temperate lake. Sixth International Conference on Mercury as a Global Pollutant. Minamata, Japan. October 2001. (Abstract).
- Watras, C.J. 2000. Transport and Fate of Mercury in Aquatic Ecosystems. 16th Annual International Conference on Contaminated Soils, Sediments and Water. Amherst, MA. October 2000. (Abstract).
- Watras, C.J., K.A. Morrison, R.J.M. Hudson, T.M. Frost, and T.K. Kratz. 2000. Declining mercury in northern Wisconsin: temporal patterns in bulk precipitation and a precipitation-dominated lake. *Environ. Sci Technol.* 34: 4051-4057.
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B.S., Biology, University of Wisconsin-Stevens Point

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Publications (past 10 years):

Peer-reviewed journals:

Weigel, B.M., and J.J. Dimick. 2011. Development, validation, and application of a macroinvertebrate-based index of biotic integrity for nonwadeable rivers of Wisconsin. Submitted to *Journal of the North American Benthological Society* 30:665-679.

Robertson, D.Z., B.M. Weigel, and D.J. Graczyk. 2008. Nutrient concentrations and their relations to the biotic integrity of nonwadeable rivers in Wisconsin. US Geological Survey, Professional Paper 1754.

Weigel, B.M., and D.M. Robertson. 2007. Identifying biotic integrity and water chemistry relations in nonwadeable rivers of Wisconsin: toward the development of nutrient criteria. *Environmental Management* 40:691-708.

Wang, L., B.M. Weigel, P. Kanehl, and K. Lohman. 2006. Influence of riffle and snag habitat specific sampling on stream macroinvertebrate assemblage measures in bioassessment. *Environmental Monitoring and Assessment* 119:245-273.

Weigel, B.M., J. Lyons, and P.W. Rasmussen. 2006. Fish assemblages and biotic integrity of a highly modified floodplain river, the Upper Mississippi, and a large, relatively unimpacted tributary, the Lower Wisconsin. *River Research and Applications* 22:923-936.

Weigel, B.M., J. Lyons, P.W. Rasmussen, and L. Wang. 2006. Relative influence of environmental variables at multiple spatial scales on fishes in Wisconsin's warmwater nonwadeable rivers. Pages 493-511 in Hughes, R.M., L. Wang, and P. Seelbach (editors), *Landscape Influences on Stream Habitats and Biological Assemblages*. American Fisheries Society Symposium 48, Bethesda, MD.

Weigel, B.M., E.E. Emmons, J.S. Stewart, and R. Bannerman. 2005. Buffer width and continuity for preserving stream health in agricultural landscapes. Wisconsin Department of Natural Resources, Research/Management Findings 56:1-4.

Weigel, B.M. 2003. Development of stream macroinvertebrate models that predict watershed and local stressors in Wisconsin. *Journal of the North American Benthological Society* 22:123-142.

Weigel, B.M., L. Wang, P.W. Rasmussen, J.T. Butcher, P.M. Stewart, T.P. Simon, and M.J. Wiley. 2003. Relative influence of variables at multiple spatial scales on stream macroinvertebrates in the Northern Lakes and Forest ecoregion, USA. *Freshwater Biology* 48: 1440-1461.

Weigel, B.M., L.J. Henne, and L.M. Martinez-R. 2002. Macroinvertebrate-based index of biotic integrity for protection of streams in west-central Mexico. *Journal of the North American Benthological Society* 21:686-700.

Lyons, J., B.M. Weigel, L.K. Paine, and D.J. Undersander. 2000. Riparian land-use effects on fish habitat and fish communities in southwestern Wisconsin streams. *Journal of Soil and Water Conservation* 55:271-276.

Weigel, B.M., J.Lyons, L.K. Paine, S.I. Dodson, and D.J. Undersander. 2000. Using stream arthropods to compare riparian land-use practices on cattle farms in southwestern Wisconsin. *Journal of Freshwater Ecology* 15: 93-106.

Reports, Articles, Guidelines, and Protocols:

Weigel, B.M. 2012. Water Quality Bureau Stream Monitoring Framework 2012 and Beyond. Wisconsin Department of Natural Resources, Madison, Wisconsin.

Weigel, B.M. 2011. Introduction to standardized collection and assessment of macroinvertebrates in nonwadeable rivers of Wisconsin. Wisconsin Department of Natural Resources, Madison, Wisconsin.

Weigel, B.M. 2011. Optimization of the Water Quality Bureau stream monitoring design for resource assessment and cost efficiency. Leadership Academy, Wisconsin Department of Natural Resources, Madison, Wisconsin.

Weigel, B.M. 2010. Wadeable streams monitoring program: Site selection 2010-2015 using a GRTS and Natural Communities framework. Wisconsin Department of Natural Resources, Madison, Wisconsin.

Watershed Bureau Monitoring Technical Team. 2010. Wisconsin Consolidated Assessment and Listing Methodology (WisCALM): Stream and river protocol modifications for phosphorus impairment assessment. Watershed Bureau, Wisconsin Department of Natural Resources, Madison, Pp. 1-8.

Weigel, B.M. 2009. Long-term trends in fish assemblage, biotic integrity, and the smallmouth bass fishery after dam removals on the Baraboo River. Wisconsin Department of Natural Resources, Pp. 1-39.

Weigel, B.M. 2008. Baseline Monitoring – Rivers Program: Status and Review 2003-2007. Wisconsin Department of Natural Resources, Madison, Wisconsin. Pp. 1-16.

Weigel, B.M. 2008. Statewide Mail Survey to Estimate 2006-2007 Angler Effort, Catch, and Harvest in Wisconsin. Wisconsin Department of Natural Resources, Madison, Wisconsin. Pp. 1-13.

Weigel, B.M. 2006. Water Division Monitoring Strategy: Rivers Monitoring. Wisconsin Department of Natural Resources, Madison, Wisconsin.

Weigel, B.M. 2003. Baseline Monitoring – Nonwadeable Streams Strategy. Wisconsin Department of Natural Resources, Madison, Wisconsin. Pp. 1-7.