Wetlands in the 21st Century

Altered Landscapes and Changing Climates

Wisconsin Wetlands Association

13th Annual Conference

January 31 & February 1, 2008

Oconomowoc, Wisconsin

ABOUT WISCONSIN WETLANDS ASSOCIATION

Wisconsin Wetlands Association (WWA) is dedicated to the protection, restoration and enjoyment of wetlands and associated ecosystems through science-based programs, education and advocacy. WWA is a 501(c)(3) non-profit organization. Established in 1969, WWA is the only statewide organization focused exclusively on wetland protection. Our members include wetland scientists, wetland professionals, educators, hunters and anglers, conservationists and concerned citizens.

Learn more about WWA online at www.wisconsinwetlands.org.

This artistic representation of this year's theme is the work of Wisconsin Wetlands Association member Birgit Bach. Birgit is a talented local artist who supports WWA in many ways. To learn about the artist, visit her website at www.underthesunarts.com.

WORLD WETLANDS DAY: FEBRUARY 2

February 2 each year is World Wetlands Day. It marks the date of the signing of the Convention on Wetlands of International Importance on February 2, 1971, in the Iranian city of Ramsar. Each year, government agencies, non-governmental organizations, and groups of citizens at all levels of the community have taken advantage of the opportunity to undertake actions aimed at raising public awareness of wetland values and benefits in general and the Ramsar Convention in particular. Our conference is held in celebration of World Wetlands Day 2008. For more information on World Wetlands Day, visit: www.ramsar.org.

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WELCOME TO WISCONSIN WETLANDS ASSOCIATION'S 13TH ANNUAL CONFERENCE

This event began as a small, local, one-day roundtable discussion known as our "Wetland Science Forum." Continuing in its second decade, this annual event has grown to a two-day, regional conference involving more than 300 wetland researchers, wetland professionals, students, conservationists and other wetland enthusiasts. Past WWA conference themes include riverine wetlands, biodiversity and threats, coastal wetlands, wooded wetlands, prairie wetlands, ephemeral wetlands and wetland restoration.

2008 THEME – *Wetlands in the 21st Century: Altered Landscapes and Changing Climates*

When it comes to the future of Wisconsin's wetlands, one thing is certain – change. Change is coming from all geographic scales, from local land use conversions and hydrologic alterations to global climate change. By 2030, our state's population is projected to reach nearly 6.5 million, 20% growth since 2000. Associated development will result in landscape alterations that will have direct and indirect impacts on wetlands.

At the global scale, climate change is expected to bring temperature increases of 4-9 °F as well as changes in many other climate-related factors that are important to wetlands including: growing season length; timing, duration and frequency of extreme weather events; precipitation patterns; and other hydrologic processes that will affect groundwater and surface waters. In the coming decades, threats resulting from anthropogenic alterations at all scales, from local to global, as well as interactions among these alterations, will present considerable challenges for the protection of wetlands and other treasured waters.

Wisconsin Wetlands Association convenes the regional community of wetland and water resource professionals for this conference to discuss many of the issues facing wetlands in the 21st century. This year's conference features a special session, ***Climate Change & Wetlands***, which will explore the predicted effects of climate change on various dimensions of wetland ecosystems. This session will conclude with **remarks by Governor Jim Doyle** on what the State of Wisconsin is doing to address climate change and its impacts.

We thank you all for being a part of this conference, which we anticipate will contribute to a growing collaboration for protecting and conserving wetlands of Wisconsin and the Great Lakes region.

ACKNOWLEDGMENTS

More than one hundred dedicated wetland experts and enthusiasts have contributed to the planning and content of this conference. We would like to thank all of the presenters, field trip leaders and working group leaders for sharing their expertise with the regional wetland and water resource professional community. While it is not feasible to acknowledge every contributor individually, we offer special thanks below to individuals who have made especially important contributions to this event.

CONFERENCE ADVISORY PANEL

Numerous partners assisted in developing, planning and reviewing the content of the conference program. ***We thank the following Advisory Panel participants for their contributions:***

Craig Anderson, Wisconsin Department of Natural Resources
Tim Asplund, Wisconsin Department of Natural Resources
Tom Bernthal, Wisconsin Department of Natural Resources
Matt Diebel, UW-Madison Center for Limnology
Gary Fewless, UW-Green Bay Cofrin Center for Biodiversity
R. Tod Highsmith, Wisconsin Wetlands Association Board of Directors
Randy Hunt, U.S. Geological Survey
Jenny Kao-Kniffen, UW-Madison Department of Soil Science
Val Klump, UW-Milwaukee Great Lakes Water Institute
Beth Lawrence, UW-Madison Department of Botany
Mary Linton, Wisconsin Wetlands Association Board of Directors
Mike Madritch, UW-Madison Department of Entomology
Jim Meeker, Northland College
Nick Miller, The Nature Conservancy
Bill Niedzwiedz, UW-Green Bay Department of Public & Environmental Affairs
Travis Olson, Wisconsin Coastal Management Program
Don Reed, Southeast Wisconsin Regional Planning Commission
Jim Ruwaldt, U.S. Fish & Wildlife Service
Dave Siebert, Wisconsin Department of Natural Resources
Pat Trochlell, Wisconsin Department of Natural Resources
Paul Zedler, UW-Madison Institute for Environmental Studies

WWA staff leading the Panel included Laura England, Becky Abel and Rachael Carlson.

MODERATORS

Thank you to the following partners for moderating conference sessions:

Craig Anderson, Wisconsin Department of Natural Resources
Tim Asplund, Wisconsin Department of Natural Resources
Tom Boos, Wisconsin Department of Natural Resources
Gail Epping Overholt, University of Wisconsin-Extension
Kelly Kearns, Wisconsin Department of Natural Resources
Beth Lawrence, UW-Madison Department of Botany
Mary Linton, Wisconsin Wetlands Association Board of Directors
Mike Madritch, UW-Madison Department of Entomology
Dave Siebert, Wisconsin Department of Natural Resources
Pat Trochlell, Wisconsin Department of Natural Resources

VOLUNTEERS

This growing conference requires the help of many. We thank the following volunteers, and others we may have left out, for assisting us with many and varied aspects of conference logistics:

Erin Adams
Laurel Alexander
Drew Ballantyne
Evangeline Behling
Jeff Bode
Joan Braune
Josh Brown
Jennifer Courtwright
Kathy Dutilly
Tim Eisele
Andrea Fountain
Sally Gallagher
Don Hammes
Michael Healy
Sarah Johnson
Rick Jones
Matt Krueger
Sara Lachner
Laurie Lawlor
Beth Lawrence
Lisa Lerch
Mary Linton
Mike Madritch
Kayla Miller
Bruce Moore
Stefanie Nadeau
Alex Palmer
Francesca Pascale
Brittany Roberts
Richard Russell
Amanda Strick
Alice Thompson
Julia Wilcox
Alex Wilson
Scott Wold
Aaron Wright

Special thanks to Richard Russell, who has contributed substantial expertise and time to assist us with development and maintenance of our conference database.

STUDENT SCHOLARSHIP SPONSORS AND RECIPIENTS

Generous contributions made by The Nature Conservancy and We Energies have allowed us to provide financial support to many students who are attending our conference:

Erin Adams, Northland College

Drew Ballantyne, Carthage College

Evangeline Behling, Northland College

Josh Brown, UW-Madison

Jennifer Courtwright, Northland College

Andrea Fountain, Northland College

Sally Gallagher, UW-Madison

Michael Healy, UW-Madison

Sarah Johnson, UW-Madison

Matt Krueger, UW-Madison

Sara Lachner, Carroll College

Beth Lawrence, UW-Madison

Lisa Lerch, Carroll College

Kayla Miller, Northland College

Alex Palmer, Northland College

Francesca Pascale, Northland College

Brittany Roberts, Northland College

Amanda Strick, Northland College

Scott Wold, Northland College

Aaron Wright, Northland College

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GENERAL SCHEDULE

DAY 1: Thursday, January 31

		Room
9:00 – 9:30	**Welcome and Opening Comments**: Becky Abel and Laura England, Wisconsin Wetlands Association	*Olympia A/B*
9:30 – 10:30	**Plenary Session –** *Sponsored by We Energies* **Theme Overview:** *The Perils of Prediction: Let Forecasters Beware,* Glenn Guntenspergen, U.S. Geological Survey *(details p. 3)*	*Olympia A/B*
10:30 – 10:50	**Break**	*Foyer & Ballroom*
10:50 – 12:00	**Plenary Session** (continued) **–** *Sponsored by We Energies* **Keynote Address :** *The Intersection of Wetland Science & Policy: A 30-Year Personal View*, Barbara Bedford, Cornell University *(details p. 3-4)*	*Olympia A/B*
12:00 – 1:00	**Lunch** – *Sponsored by American Transmission Company*	*Ballroom*
1:00 – 2:40	**Concurrent Sessions:** - Wetland Wildlife: Habitat Needs & Monitoring *(details p. 8)* - Monitoring Wetlands in Altered Landscapes *(details p.9)* - Wetland Conservation in Action *(details p. 10)*	*Olympia A/B* *Olympia C* *Bonaventure*
2:40 – 3:10	**Break**	*Foyer & Ballroom*
3:10 – 4:50	**Concurrent Sessions:** - Wetland Functions: Quantification, Monitoring & Protection *(details p. 11)* - Invasive Species in Wetlands *(details p. 12)* - Wetland Protection: Existing Programs & Needs *(details p. 13)*	*Olympia A/B* *Olympia C* *Bonaventure*
5:00 – 6:30	**Poster Session** *(details p.18)* **and Cash Bar Reception**	*Foyer & Ballroom*
6:30 – 9:00	**Banquet –** *Sponsored by U.S. Fish and Wildlife Service* **Introductory Remarks:** Matt Frank, Secretary of WDNR **Banquet Presentation:** *Confronting Amphibian Declines and Extinctions*, Kevin Zippel, Amphibian Ark *(details p. 4-5)*	*Ballroom*
9:00 – 9:30	Conclusion of **Silent Auction**	*Ballroom*

GENERAL SCHEDULE *(continued)*

DAY 2: Friday, February 1

		Room
8:30 – 8:40	**Morning announcements** – Becky Abel, Wisconsin Wetlands Association	*Olympia A/B*
8:40 – 10:50	**Special Session: Climate Change & Wetlands** *(details p. 14)* ***Closing remarks by Governor Jim Doyle & Tia Nelson***	*Olympia A/B*
10:50 – 11:10	**Break**	*Foyer & Ballroom*
11:10 – 12:30	**Concurrent Sessions:** - Altered Wetlands: Disturbance, Restoration & Management *(details p. 15)* - Wetland Plants: Habitat Needs & Monitoring *(details p. 16)* - Agency Efforts to Protect Wetlands *(details p. 17)*	*Olympia A/B* *Olympia C* *Bonaventure*
12:30 – 1:30	**Lunch and closing announcements**	*Ballroom*
1:30 – 4:30	**Working Group:** Proposed Invasive Species Classification Rules *(details p. 6)* **Field Trips** - Wetland Mitigation Tour *(details p. 6)* - Wetland Restoration Tour *(details p. 7)* - Wetlands in Winter *(details p. 7)*	*Bonaventure* *Buses board outside Olympia A/B/C Foyer*

PLENARY SESSION
Theme Overview & Keynote Address
Thursday, January 31, 9:00 AM – 12:00 noon
Location: Olympia Room A/B

THEME OVERVIEW
The Perils of Prediction: Let Forecasters Beware
Glenn Guntenspergen, U.S. Geological Survey Patuxent Wildlife Research Center

The maturity of a field of science can be measured by its ambitions and the types of questions that scientists ask. An increased emphasis on prediction dominates the questions that society asks of wetland scientists. Wetland ecosystem responses to global change, urbanization and other multiple stressors operating at different temporal and spatial scales are difficult to predict, and conveying uncertainty remains a major challenge. Prediction does have an important role in wetland research, but it is also important to emphasize that what we do not know is as important as what we do know. There are limits to ecological prediction, and how we go about recognizing these limits affects society's reactions to increasingly complex problems. Wetland scientists should strive to maintain a balance between knowledge application and expanding the frontiers of knowledge, which will result in new principles and concepts that can be used to address future unknown problems and mysteries yet to be tackled.

About the Speaker

Dr. Glenn R. Guntenspergen is a Landscape Ecologist with the U.S. Geological Survey's Patuxent Wildlife Research Center. He received B.S. and M.S. degrees from the University of Illinois in Biology/History and a Ph.D. in Plant Ecology from the University of Wisconsin-Milwaukee. His research interests include: climate change impacts on freshwater and coastal wetlands, the role of biotic and abiotic processes influencing ecosystem function, the regional and landscape implications of spatial heterogeneity on plant community organization and structure, and ecological threshold responses to stressors in plant and animal communities.

KEYNOTE ADDRESS
The Intersection of Wetland Science and Policy: A 30-Year Personal View
Barbara Bedford, Cornell University Department of Natural Resources

Based on her personal experience, Barbara will discuss how wetland science and wetland policy have evolved and intertwined over the past thirty years. She will emphasize the idea of the "Fair Witness," to which the late wetland ecologist Dan Willard first introduced her when she worked with him as an expert witness in Wisconsin wetland cases. This idea embodies what she perceives to be the legitimate role of the scientist in policy issues. She also will use the "Myth of Sisyphus" to temper the outrage she feels at the extent to which small thinking has undermined environmental protection and the education of environmental stewards capable of addressing the urgencies of the day.

About the Speaker

In Barbara's own words, she has been "obsessed with all aspects of wetland ecosystems" since the early 1970's when WWA founding member Jim Zimmerman "first turned her senses to their beauty and biological diversity." And after more than 30 years, she still feels drawn to that diversity, intellectually and personally. She teaches students about it, does research on it, and works with government agencies, conservation organizations, and other groups involved with issues related to wetland diversity locally, nationally and internationally.

Barbara has been at Cornell University since 1980, where she is currently a Senior Research Associate in Cornell's Department of Natural Resources, which she joined in 1989. She has received teaching awards from both her college and her university, and many forms of national recognition for her work at the interface between wetland science and policy including awards from the Society of Wetland Scientists and the National Association of State Wetland Managers. She holds an M.S. (1977) and Ph.D. (1980) from the Institute of Environmental Studies, University of Wisconsin-Madison, and an A.B. in Theology and Philosophy (1968) from Marquette University.

BANQUET PRESENTATION
Thursday, January 31, 7:30 – 9:00 PM
Location: Ballroom Room

Confronting Amphibian Declines and Extinctions
Kevin Zippel, Program Director for the Amphibian Ark

Amphibians include frogs and toads, newts and salamanders, and caecilians. Their value is immeasurable: they are indicators of environmental health, components of healthy ecosystems, and contributors to human medicine and culture. But the world's amphibians are disappearing, and wetland habitat loss is one of the key factors contributing to amphibian declines. With more than one hundred species likely already extinct and thousands more threatened with extinction, their predicament represents the greatest species conservation challenge in the history of humanity. In fact, it is the greatest extinction event in the 360-million-year history of amphibians, and the planet has not seen anything similar since the extinction of the dinosaurs. The causes of the amphibian declines and extinctions are diverse, and their synergies are poorly understood. But it is clear that for hundreds of species, their threats cannot be mitigated in the wild and captive management is required if they are to persist.

The Amphibian Ark (AArk) draws together diverse stakeholders to save prioritized species until a future time when *in-situ* threats can be mitigated. AArk work includes species prioritization, husbandry training, capacity building, fostering partnerships, fundraising, and education. A campaign entitled *2008 Year of the Frog* is helping raise awareness among governments, media, educators and the general public, and support a campaign to fund amphibian conservation programs worldwide. The outcome of Amphibian Ark will be that we will have saved hundreds of species from extinction, developed capacity both within our institutions and globally to

continue to provide amphibian species with care and protection when needed, formed a true partnership between *ex-situ* and *in-situ* components of conservation, established a model framework for responding to future species conservation crises, and demonstrated to the world that zoos and aquariums are essential conservation organizations. This presentation will provide an overview of the amphibian decline crisis and global conservation efforts.

About the Speaker

Kevin Zippel is Program Director for the Amphibian Ark. He received his B.S. in 1994 from Cornell University, and his Ph.D. in 2000 from the University of Florida. He worked for one year (1999) as a curatorial intern in the Department of Herpetology at the Wildlife Conservation Society/Bronx Zoo while he finished his doctorate. Kevin then went on to work five years as Curator of Amphibians at the Detroit Zoo. During his years in Detroit, he developed adjunct associate professor status at Michigan State University and George Mason University.

In 2005, Kevin joined the World Conservation Union's (IUCN) Conservation Breeding Specialist Group (CBSG) to help the ex situ community develop and implement plans to stem the amphibian extinction crisis. These efforts evolved into the Amphibian Ark.

Wisconsin Wetlands Association thanks U.S. Fish & Wildlife Service Partners for Fish and Wildlife, whose generous sponsorship makes this banquet program possible.

WORKING GROUP
Friday, February 1, 1:30 – 4:30 PM
Location: Bonaventure Room

Proposed Invasive Species Classification Rules: What Regulations & Species Should be Included?
Facilitators: Kelly Kearns & Tom Boos, Wisconsin Department of Natural Resources

The Wisconsin Department of Natural Resources (WDNR) is in the process of developing administrative rules to classify and regulate invasive species. The rules will address invasive plants, animals and non-agricultural plant pests. WDNR staff members have been working with the Wisconsin Council on Invasive Species over the last three years to develop the criteria and process for this classification. WDNR staff will be seeking public input into the process in the coming months.

The participants will be able to learn and ask questions about the draft rules as well as provide input to inform development of the rules and the proposed species to be listed. Some of the wetland species to be discussed, such as reed canary grass and phragmites, are particularly problematic because of the existence of native and non-native ecotypes and/or important commercial uses that must be considered.

WETLAND FIELD TRIPS
Friday, February 1, 1:30 – 4:30 PM
Please dress warmly and wear sturdy shoes. Field trips will depart by bus at 1:30 PM. Please arrive 10 minutes early to board the appropriate bus outside the Olympia Center.

Wetland Restoration Tour
Leaders: Art Kitchen, U.S. Fish & Wildlife Service and Jason Dare, Waukesha Land Conservancy

We plan to visit two sites in western Waukesha County to view wetland and prairie restorations completed in 2005 and 2006. The first site is a private landowner restoration on the Jeff Senglaub property involving sediment removal, berm removal and installation of a water control structure into an existing drain tile line. Art Kitchen, USFWS Partners for Fish and Wildlife Program biologist, will lead a discussion of wetland restoration techniques and the site challenges that had to be overcome, along with future vegetation management issues.

The second site is a wetland and upland restoration on the Ottawa Wildlife Refuge, owned by the Waukesha County Land Conservancy. Land manager Jason Dare will give an overview of the long-term goals of the Conservancy as well as specific site management objectives for the refuge. Weather permitting, we will take a short hike to view a restored wetland and adjacent prairie restoration and discuss treatment practices and future management needs such as invasive species control and prescribed fire.

WETLAND FIELD TRIPS *(continued)*

Wetland Mitigation Tour

Leaders: Alice Thompson, Thompson & Associates Wetland Services and Pat Trochlell, Wisconsin Department of Natural Resources

Wetland mitigation laws for some private wetland fill projects in Wisconsin were adopted in 2002. Since then, dozens of local mitigation sites and a few large scale bank projects have been constructed. How are small on-site mitigation sites faring? We plan to visit a local on-site mitigation project that is in its third year of monitoring and maintenance with the wetland consultant who planned and restored the wetland: Alice Thompson, and the Wisconsin Department of Natural Resources wetland ecologist who reviewed and regulated this project: Pat Trochlell. Each will present her own view of the project, its successes and challenges, and how this site compares to other on-site mitigation projects they have both been involved with.

This site was restored by bulldozing up to 18 inches of sediment that buried the original wetland soil. The challenges in the first three years have included drought and invasive species, both reed canary grass and purple loosestrife. Leaders will show photos and diagrams to give you a sense of the site in the growing season.

Wetlands in Winter - Scuppernong River Habitat Area

Leaders: Don Reed, Southeastern Wisconsin Regional Planning Commission and Ron Kurowski, Wisconsin Department of Natural Resources

Explore the wonder of wetlands in winter. Join field trip leaders Don Reed, Chief Biologist of South Eastern Wisconsin Regional Planning Commission and Ron Kurowski, Educator and Naturalist with Wisconsin Department of Natural Resources, as we explore local wetlands of the Scuppernong River Habitat Area in winter. Within the last several years, intense management practices at this site, such as brush and tree removal and large landscape fires, have helped to produce the largest native wet prairie remaining east of the Mississippi River. Today this 3,500 acre area supports large areas of several rare native plant communities, such as wet to wet mesic prairies, sedge meadows and fens. In addition, the area supports more than 45 plants, animals and insects that are either state-threatened, -endangered or "of special concern."

We will tour areas that are presently being cleared of dense brush and trees, as well as other areas that are further along in the restoration process. Participants are encouraged to bring their cameras as this site will offer excellent opportunities to capture the beauty of wetlands in winter!

SESSION DETAILS

Wetland Wildlife: Habitat Needs & Monitoring

Thursday, January 31, 1:00 - 2:40 PM, Olympia A/B

Moderator: Mary Linton, Wisconsin Wetlands Association Board of Directors

TIME	AUTHORS	TITLE
1:00 - 1:20	Tracy Rittenhouse, University of Missouri Raymond D. Semlitsch, University of Missouri Frank R. Thompson III, USDA Forest Service	Predation and desiccation risks for wood frogs migrating from wetlands into oak-hickory forest
1:20 - 1:40	Joshua M. Kapfer, Natural Resources Consulting, Inc. Sarah A. Orlofske, Virginia Polytechnic Institute & State Univ. Leonardo Neitzel, Jr., Concordia University- Wisconsin Robert Hay, WDNR Bureau of Endangered Resources	Use of wetland vs. upland habitat by Butler's gartersnakes (*Thamnophis butleri*) in southeastern Wisconsin
1:40 - 2:00	Gary S. Casper, University of Wisconsin-Milwaukee Stefanie Nadeau, Ozaukee Washington Land Trust *(presenter)* Shawn Graff, Ozaukee Washington Land Trust	How to find snakes and frogs: testing herp monitoring methods in the Milwaukee River Basin
2:00 - 2:20	Brian Wilm, Illinois Natural History Survey Greg Spyreas, Illinois Natural History Survey Allen Plocher, Illinois Natural History Survey Dave Ketzner, Illinois Natural History Survey Jeff Matthews, Illinois Natural History Survey Jamie Ellis, Illinois Natural History Survey Ed Heske, Illinois Natural History Survey	Impacts of invasive reed canary grass (*Phalaris arundinacea*) on native plants, arthropods and small mammals
2:20 - 2:40	Jill Hapner, University of Wisconsin-Milwaukee Glen Fredlund, University of Wisconsin-Milwaukee Jim Reinartz, University of Wisconsin-Milwaukee Karla Leithoff, Wisconsin Department of Transportation Noel Cutright, Wisconsin Society for Ornithology William Mueller, Wisconsin Society for Ornithology	Avian response to restored wetland plant community succession in southeastern Wisconsin

Monitoring Wetlands in Altered Landscapes
Thursday, January 31, 1:00 - 2:40 PM, Olympia C
Moderator: Patricia Trochlell, WDNR Lakes and Wetlands Section

TIME	AUTHORS	TITLE
1:00 - 1:20	Tom Bernthal, WDNR Lakes and Wetlands Section Brynda Hatch, WDNR Lakes and Wetlands Section	Wetland activities in Wisconsin: 2006 status report on gains, losses and acre neutral activities: Part 1
1:20 - 1:40	Tom Bernthal, WDNR Lakes and Wetlands Section Brynda Hatch, WDNR Lakes and Wetlands Section	Wetland activities in Wisconsin: 2006 status report on gains, losses and acre neutral activities: Part 2
1:40 - 2:00	Donald M. Reed, SE WI Regional Planning Commission	Wetland changes in southeastern Wisconsin: 1963 to present
2:00 - 2:20	Robert W. Howe, University of Wisconsin-Green Bay Gerald J. Niemi, University of Minnesota-Duluth Ronald R. Regal, University of Minnesota-Duluth Nicholas P. Danz, University of Minnesota-Duluth JoAnn Hanowski, University of Minnesota-Duluth	Using animals and plants to monitor landscape integrity: Part 1
2:20 - 2:40	Robert W. Howe, University of Wisconsin-Green Bay Gerald J. Niemi, University of Minnesota-Duluth Ronald R. Regal, University of Minnesota-Duluth Nicholas P. Danz, University of Minnesota-Duluth JoAnn Hanowski, University of Minnesota-Duluth	Using animals and plants to monitor landscape integrity: Part 2

Wetland Conservation in Action
Thursday, January 31, 1:00 - 2:40 PM, Bonaventure
Moderator: Mike Madritch, University of Wisconsin-Madison

TIME	AUTHORS	TITLE
1:00 - 1:20	Elizabeth Nixon, Emmons & Olivier Resources, Inc. Melissa Arikian, Emmons & Olivier Resources, Inc. Meredith Cornett, The Nature Conservancy Jason Ekstein, The Nature Conservancy	Testing a mid-season inventory method at the 35,000-acre Glacial Ridge Reserve in northwest Minnesota
1:20 - 1:40	Nicole Kalkbrenner, JFNew	Ecological assessment and restoration planning for an urbanized kettle pond: Tiedeman Pond, Middleton, Wisconsin
1:40 - 2:00	Scott Wold, Sigurd Olson Environmental Institute Jennifer Courtwright, Sigurd Olson Environmental Institute Amanda Strick, Sigurd Olson Environmental Institute Mike Gardner, Sigurd Olson Environmental Institute Alexandra Zelles, Sigurd Olson Environmental Institute	South shore solutions: Protecting wetlands and watershed health in a rapidly developing region
2:00 - 2:20	John L. Larson, Applied Ecological Services, Inc.	Mitigating wetland impacts of inevitable landfill expansion projects: New York case study as a national model
2:20 - 2:40	Aimee M. Kay, Kay Environmental & Associates	Comparative study of local and state wetland protection efforts for two southeastern Michigan communities

Wetland Functions: Quantification, Monitoring & Protection
Thursday, January 31, 3:10 - 4:50 PM, Olympia A/B
Moderator: Dave Siebert, WDNR Office of Energy & Environmental Assessment

TIME	AUTHORS	TITLE
3:10 - 3:40	Kenneth Potter, University of Wisconsin-Madison Justin S. Rogers, HDR Engineering	Hydrologic and water quality functions of a small degraded wetland in southern Wisconsin
3:40 - 4:10	Steve Eggers, U.S. Army Corps of Engineers	MnRAM 3.1: A routine method for evaluating wetland functions in Minnesota and Wisconsin
4:10 - 4:30	Patricia Ann Trochlell, WDNR Lakes and Wetlands Section	Beyond floristic quality: How Wisconsin law protects other wetland functions and values
4:30 - 4:50	Beth Lawrence, University of Wisconsin-Madison Joy B. Zedler, University of Wisconsin-Madison	*Carex stricta* tussock formation: The influence of hydroperiod and nutrient addition

**** NOTE: The first two speakers in this session each have 30 minute timeslots due to a cancellation in this session. If you plan to migrate between sessions during this time period, please be aware that sessions are not on the same schedule and be as courteous as possible as you leave and enter session rooms.***

Invasive Species in Wetlands
Thursday, January 31, 3:10 - 4:50 PM, Olympia C
Moderator: Kelly Kearns, WDNR Bureau of Endangered Resources

TIME	AUTHORS	TITLE
3:10 - 3:30	Sally Gallagher, Smithsonian Environmental Research Center Karin Kettenring, Smithsonian Environmental Research Center	Effects of small disturbances on the emergence of *Phragmites australis* in native wetland plant communities
3:30 - 3:50	Sean Wheelock, Minnesota State University-Mankato Bradley J. Cook, Minnesota State University-Mankato Timothy E. Secott, Minnesota State University-Mankato	Plant/soil feedback as a mechanism for the invasive success of *Phalaris arundinacea*
3:50 - 4:10	Jason Mills, University of Wisconsin-Milwaukee James Reinartz, University of Wisconsin-Milwaukee Gretchen Meyer, University of Wisconsin-Milwaukee Erica Young, University of Wisconsin-Milwaukee	Glossy buckthorn (*Rhamnus frangula*) invasion at Cedarburg Bog: 1991 to 2006
4:10 - 4:30	James Reinartz, University of Wisconsin-Milwaukee Danielle Sippel, University of Wisconsin-Milwaukee Jason Mills, University of Wisconsin-Milwaukee Erica Young, University of Wisconsin-Milwaukee Gretchen Meyer, University of Wisconsin-Milwaukee	Growth patterns of glossy buckthorn (*Rhamnus frangula*) and tamarack (*Larix laricina*) in Cedarburg Bog
4:30 - 4:50	Jessica S. Kurylo, Illinois Natural History Survey	Common buckthorn has a fondness for wetlands: Flood tolerance and extent in northeastern Illinois wetlands

Wetland Protection: Existing Programs & Needs
Thursday, January 31, 3:10 - 4:50 PM, Bonaventure
Moderator: Gail Epping Overholt, UW Extension

TIME	AUTHORS	TITLE
3:10 - 3:30	Michael Murray, National Wildlife Federation Jane Reyer, National Wildlife Federation Coral Wolf, University of Michigan	An assessment of wetlands programs in four Great Lakes states
3:30 - 3:50	David C. Fowler, Association of State Floodplain Managers Larry Larson, Association of State Floodplain Managers	Managing floodplains and floodways: More than just conveyance channels
3:50 - 4:10	David Grusznski, The Conservation Fund	Wetland protection in the Greater Milwaukee Area through the Greenseams Program
4:10 - 4:30	Gregg Breese, WDNR Lakes and Wetlands Section	Shoreland & wetland zoning in Wisconsin: Setting the standards
4:30 - 4:50	Daniel P. Bach, Lawton & Cates, S.C.	High capacity wells: The danger posed to wetlands

Special Session: Climate Change & Wetlands
Friday, February 1, 8:30 - 10:50 AM, Olympia A/B
Moderator: Tim Asplund, WDNR Lakes and Wetlands Section

TIME	AUTHORS	TITLE
8:30 - 8:40	Becky Abel, Wisconsin Wetlands Association	*Morning announcements*
8:40 – 9:20	John J. Magnuson, University of Wisconsin-Madison	Climate change and waters of Wisconsin
9:20 - 9:40	Jenny Kao-Kniffen, University of Wisconsin-Madison T.C. Balser, University of Wisconsin-Madison	The link between elevated CO_2 and methane emissions from wetlands: Does plant or microbial composition matter?
9:40 - 10:00	Janeen Laatsch, WDNR Bureau of Endangered Resources Bill Smith, WDNR Bureau of Endangered Resources Craig Anderson, WDNR Bureau of Endangered Resources Loren Ayers, WDNR Bureau of Endangered Resources Tara Bergeson, WDNR Bureau of Endangered Resources	Biodiversity in selected natural communities related to global climate change
10:00 - 10:20	Gary S. Casper, University of Wisconsin-Milwaukee	Vulnerability to climate change in amphibians and reptiles
10:20 - 10:50	**Governor Jim Doyle & Tia Nelson**	Update on the State of Wisconsin's efforts to address climate change

Altered Wetlands: Disturbance, Restoration & Management
Friday, February 1, 11:10 AM - 12:30 PM, Olympia A/B
Moderator: Beth Lawrence, University of Wisconsin-Madison

TIME	AUTHORS	TITLE
11:10 - 11:30	Deborah Konkel, WDNR Bureau of Fisheries Management Reesa Evans, Adams Co. Land & Water Conservation Dept.	Comparison of impacts of disturbed vs. natural shoreline on the aquatic plant community in west central Wisconsin lakes
11:30 - 11:50	Stephen L. Thomforde, University of Wisconsin-Madison	Restoring wetland resilience via cross-scale diversity
11:50 - 12:10	Michael Healy, University of Wisconsin-Madison Joy B. Zedler, University of Wisconsin-Madison	Restoring wetlands invaded by *Phalaris arundinacea*: can a grass-specific herbicide facilitate native plant establishment?
12:10 - 12:30	Craig A. Annen, Integrated Restorations, LLC	When to spray? A literature review of herbicide timing windows for reed canary grass management

Wetland Plants: Habitat Needs & Monitoring
Friday, February 1, 11:10 AM - 12:30 PM, Olympia C
Moderator: Craig Anderson, WDNR Bureau of Endangered Resources

TIME	AUTHORS	TITLE
11:10 - 11:30	Erica B. Young, University of Wisconsin-Milwaukee Terry Bott, University of Wisconsin-Milwaukee Gretchen Meyer, University of Wisconsin-Milwaukee	Morphological diversity of the northern pitcher plant
11:30 - 11:50	Eric X. Tarman-Ramcheck, University of Wisconsin-Whitewater Peter Jacobs, University of Wisconsin-Whitewater	A biogeographic study of the natural vegetation on Lake Beulah
11:50 - 12:10	Ursula Petersen, WI Dept. of Ag., Trade & Consumer Protection	What have we learned from monitoring the Eastern prairie fringed orchid 1997-2007
12:10 - 12:30	Anne H. Reis, University of Wisconsin-Milwaukee James A. Reinartz, University of Wisconsin-Milwaukee	Comparing the distributions of pre-settlement and present day tamarack swamp in southeastern Wisconsin

Agency Efforts to Protect Wetlands
Friday, February 1, 11:10 AM - 12:30 PM, Bonaventure
Moderator: Tom Boos, WDNR Office of Energy & Environmental Assessment

TIME	AUTHORS	TITLE
11:10 - 11:30	Jeff Bode, WDNR Lakes and Wetlands Section Wisconsin Wetland Team	*Reversing the Loss*: Part 1- The first six years
11:30 - 11:50	Cherie Hagen, WDNR Lakes and Wetlands Section Wisconsin Wetland Team	*Reversing the Loss*: Part 2- The next six year strategy for Wisconsin's wetland resources
11:50 - 12:10	Brick Fevold, WDNR Bureau of Integrated Science Services Tom Bernthal, WDNR Bureau of Watershed Management Joanne Kline, WDNR Bureau of Integrated Science Services	Wisconsin's Ephemeral Ponds Project (WEPP): Enhancing the state's knowledge on ephemeral pond distribution and ecology
12:10 - 12:30	Ben Callan, WDNR Office of Energy Dave Siebert, WDNR Office of Energy Tom Boos, Office of Energy	Reaching beyond state wetland regulations for linear utility projects

Poster Session
Thursday, January 31, 5:00 - 6:30 PM, Ballroom

AUTHORS	TITLE
Drew Ballantyne, Carthage College Scott Hegrenes, Carthage College Tracy Gartner, Carthage College	Do artificial wetlands on golf courses have as much biodiversity as natural wetlands?
Kevin D. Clement, Minnesota State University-Mankato Bradley J. Cook, Minnesota State University-Mankato Fei Yuan, Minnesota State University-Mankato	Assessment of adjacent land-cover alterations on the structure and function of peatlands
Brick M. Fevold, WDNR Bureau of Integrated Science Services Tom Bernthal, WDNR Bureau of Watershed Management Joanne Kline, WDNR Bureau of Integrated Science Services	Wisconsin's Ephemeral Ponds Project (WEPP): Enhancing the state's knowledge on ephemeral pond distribution and ecology
Sara Lachner, Carroll College Eric Thobaben, Carroll College	Seasonal herbicide treatment of *Phragmites australis* in Waukesha County, Wisconsin: When is treatment most effective?
Dolly Ledin, University of Wisconsin-Madison Terry Daulton, University of Wisconsin Trout Lake Field Station	Paradise Lost? Climate change in the North Woods: Using art in climate change education
Lisa Lerch, Carroll College Eric Thobaben, Carroll College	Plant community survey results two years following buckthorn removal in a riparian swamp
Jason Schroeder, University of Wisconsin-Milwaukee Erica Young, University of Wisconsin-Milwaukee Jason Mills, University of Wisconsin-Milwaukee James Reinartz, , University of Wisconsin-Milwaukee	Land cover change over 60 years on landscape surrounding Cedarburg Bog

KEY TO COMMON AGENCY ABBREVIATIONS USED IN ABSTRACTS

NRCS	Natural Resources Conservation Service
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
USFWS	U.S. Fish and Wildlife Service
UW	University of Wisconsin
WDNR	Wisconsin Department of Natural Resources

WHEN TO SPRAY? A LITERATURE REVIEW OF HERBICIDE TIMING WINDOWS FOR REED CANARY GRASS MANAGEMENT

Craig A. Annen, Integrated Restorations, LLC

Reed canary grass (*Phalaris arundinacea* L.) is an aggressive perennial grass that invades and dominates wetlands that have been disturbed by erosion, sedimentation, nutrient enrichment, hydrological alteration, or restoration activities that give rise to bareground area with high light availability. Herbicide application, alone or in combination with other treatments, is the method most commonly employed for management of reed canary grass. Despite the widespread use of herbicides (typically glyphosate, sethoxydim or imazapyr) for reed canary grass suppression, few empirical experiments have directly evaluated herbicide performance and treatment success along a series of different timing windows, and our knowledge of timing applications for optimum herbicide performance is incomplete. Treatment windows reported in the reed canary grass literature can be partitioned into two categories: Spring – early summer applications (early season applications) and late summer – early autumn applications (late season applications). In a recent study, late season application resulted in only 15% greater suppression than early season application. In addition, reed canary grass recovered (resurged) from treatments during the post-treatment regrowth years regardless of which timing window was used. Although there have only been a limited number of investigations directly related to timing, several lines of indirect evidence suggest that early season applications are preferred over late season applications, such as patterns in rhizome development and tillering, seasonal patterns in leaf morphology and development, seasonal patterns in productivity, native species release and establishment requirements, and also safety and practical considerations.

HIGH CAPACITY WELLS: THE DANGER POSED TO WETLANDS

Daniel P. Bach, Lawton & Cates, S.C.

Communities throughout Wisconsin are increasingly looking to supplant or augment existing sources of water to satisfy both current and future commercial and residential demands. In Southeastern Wisconsin, the need for more water has become particularly acute and contentious, as development pressures increase demand while communities search for the most economical means to furnish water. The solution they are turning to is high capacity wells drawing on shallower aquifers, which also feed many of the area's lakes, streams and wetlands. There is question as to whether WDNR, which is responsible for approving high cap wells, has authority to consider the environmental impact of any new municipal well drawing less than 2 million gallons of water per day. Yet WDNR clearly has an obligation to protect wetlands and surface waters. This dichotomy results in the installation of high cap wells without a determination that protected wetlands and public waters won't be harmed. Legal efforts are underway to seek a judicial decision as to whether existing statutes and the state constitution require consideration of the environmental impact of proposed high cap wells and thus allow for denial of applications for wells that would impair wetlands or the public's rights in surface waters. Shallow aquifers contribute not only to surface water levels, but affect surface water temperatures and chemical composition, thus impacting entire ecosystems. The resolution of this issue will affect efforts to protect vital water resources throughout the state.

DO ARTIFICIAL WETLANDS ON GOLF COURSES HAVE AS MUCH BIODIVERSITY AS NATURAL WETLANDS? *(POSTER)*

Drew Ballantyne, Carthage College
Scott Hegrenes, Carthage College
Tracy Gartner, Carthage College

The number of natural wetlands in Wisconsin is decreasing due to increased development, however by government definition, man-made residential ponds and golf course water hazards are considered wetlands. If this is the case, we would expect that these artificial wetlands would have similar communities of aquatic life relative to natural wetlands. Three golf courses that contained both natural and anthropogenic water hazards were chosen for the study. The aquatic macroinvertebrate community was sampled over a period of two months. Based on the Shannon index of biodiversity, natural wetlands tended to have a more diverse macroinvertebrate community relative to the artificial wetlands. However, artificial wetlands may exhibit characteristics of natural wetlands with age. Adjacent land use may also be a contributing factor to the diversity of artificial wetlands. Although the government definition of wetlands may be misleading, carefully designed artificial wetlands may provide some of the habitat functions of natural wetlands.

WETLAND ACTIVITIES IN WISCONSIN: 2006 STATUS REPORT ON GAINS, LOSSES AND ACRE-NEUTRAL ACTIVITIES

Tom Bernthal, WDNR Lakes and Wetlands Section
Brynda Hatch, WDNR Lakes and Wetlands Section

Wisconsin has lost 47% of our estimated original 10 million acres of wetland. In 2001, the WDNR Wetland Team and the Wisconsin Natural Resources Board articulated *Reversing the Loss* of wetland acreage and function as a comprehensive strategy for Wisconsin wetlands. Protecting remaining wetlands and restoring former wetlands are two major goals of the Wetland Team, in order to regain lost wetland functions. Assessing wetland function as well as acreage at a statewide scale would be the ultimate measure of progress. Because this is not yet feasible, the Team set out to take the first step of tracking location and acreage of wetland gains and losses each year. We have collected data on permitted losses from regulatory databases, but are unable to report on illegal wetland destruction or negative activities that do not require a permit. We have created a new data collection system for voluntary restorations that helps eliminate double- and triple- counting of restoration accomplishments reported by cooperating agencies. We also track activities that affect wetland quality, for better or worse, but do not result in an outright loss or gain of acreage. We describe these activities as "acre-neutral." They range from generally positive impacts, such as enhancements and rehabilitation of degraded wetlands, to generally negative impacts, such as disturbance from roadway and utility construction through wetlands. With the first annual report for 2006, WDNR reports the best available data on the type, location and expected impact of wetland activities. In future reports we will summarize recent trends as we accumulate data.

REVERSING THE LOSS: PART 1- THE FIRST SIX YEARS *(see Hagen abstract for Part 2)*

Jeff Bode, WDNR Lakes and Wetlands Section
Wisconsin Wetland Team

In December 2001, the Wisconsin Natural Resources Board endorsed *Reversing the Loss: A Strategy for Protecting & Restoring Wetlands in Wisconsin*, charting a course for WDNR in wetland education, protection and restoration. This initial six-year strategy guided Wisconsin to many achievements – partnerships were strengthened, wetlands were restored and enhanced, regulations were streamlined, and wetlands were mapped and monitored using modern technology. While we accomplished much together, some goals remain unmet. We were unable to establish incentives for wetland stewardship and effective enforcement of regulations remains difficult. This presentation will provide a summary of progress towards goals outlined in the first six years of the state's commitment to *Reversing the Loss.*

SHORELAND & WETLAND ZONING IN WISCONSIN: SETTING THE STANDARDS

Gregg Breese, WDNR Lakes and Wetlands Section

Shoreland and wetland zoning came into being in Wisconsin in the 1960s. The current law, NR 115 has remained essentially unchanged since its inception. WDNR began the process to revise the law to afford better protection and flexibility using technology developed since the 1960s. This effort has been underway for several years and a few fundamental principles are being proposed. This presentation will focus in particular on the proposed impervious surface regulations and mitigation standards. It will also provide an in-depth look at the current and proposed standards, including the anticipated improvements to the level of protection of our resources. Finally, I will discuss a case study to demonstrate the vision for shoreland wetland zoning.

REACHING BEYOND STATE WETLAND REGULATIONS FOR LINEAR UTILITY PROJECTS

Ben Callan, WDNR Office of Energy
Dave Siebert, WDNR Office of Energy
Tom Boos, WDNR Office of Energy

The WDNR Office of Energy (OE) was created in 2003 to centralize the review and permitting of major energy projects. Under 2003 WI Act 89, OE works directly with the Public Service Commission of Wisconsin (PSC) on utility projects that require a PSC Certificate. OE is responsible for regulating linear utility projects that involve waterway and wetland impacts. Often, the regulated wetland activity is rather limited, but the potential landscape impacts can be broad. OE has consistently taken the approach that potential wetland impacts exist beyond the direct filling that is regulated by state law, under NR 103 and 299 (Wis. Adm. Code). As such, OE has required additional measures to further reduce secondary wetland impacts, including construction timing and methods, access locations, construction footprint, and tree clearing. OE has had some success minimizing wetland impacts that are not directly regulated by state law. OE will provide examples from specific utility projects demonstrating success minimizing wetland impacts and will discuss areas where work is still needed to improve wetland construction and restoration. OE intends to continue to work with applicants to minimize wetland impacts associated with non-regulated activities.

HOW TO FIND SNAKES AND FROGS: TESTING HERP MONITORING METHODS IN THE MILWAUKEE RIVER BASIN

Gary S. Casper, University of Wisconsin-Milwaukee
Stefanie Nadeau, Ozaukee Washington Land Trust *(presenter)*
Shawn Graff, Ozaukee Washington Land Trust

Ever search for something, not find it, but wonder if you simply overlooked it? We investigated this problem for amphibian and reptile surveying. Declines in amphibians and reptiles (herps) have been reported from many regions of the world. Effective monitoring programs are of fundamental importance in determining the status of species, documenting changes in their geographic distribution, and in addressing rapid climate change. Many agencies and programs are interested in monitoring these species, but investigations into the effectiveness of various methods are scarce. Under a Great Lakes Watershed Restoration Program grant from the National Fish and Wildlife Foundation, we tested the effectiveness of several herp monitoring methods in the Milwaukee River Basin. We performed intensive surveys for turtles, snakes, frogs and salamanders; we over-sampled to develop detection probability statistics for each method and species for use in proportion of area occupied modeling. This methodology allows the use of data from existing, less robust, monitoring programs for a basin-wide analysis (such as calling frog surveys), and identifies overlaps in methods for detecting species to guide monitoring program development. We will present results and discuss applications for inventory, monitoring and research programs.

VULNERABILITY TO CLIMATE CHANGE IN AMPHIBIANS AND REPTILES

Gary S. Casper, University of Wisconsin-Milwaukee

The amphibians and reptiles occupying the Upper Midwest have responded to periodic episodes of climate change with range retractions, expansions, and evolutionary responses such as allopatric speciation. The most recent such event was the retreat of the Pleistocene ice sheets ca. 10,000 YBP. Prior to this retreat, glaciated regions of the Upper Midwest were essentially free of amphibians and reptiles, and the species present today are the result of recolonization of these glaciated regions from southerly refugia. Recolonization pathways are beginning to be reconstructed from molecular phylogeography studies. These studies illustrate the importance of refugia, changing climate and barriers to movement such as the prairie peninsula and the glacial lakes, including in modern times the Great Lakes. I examine a suite of Upper Midwest, wetland-dependent amphibians and reptiles from a climate change perspective. Most climate models suggest that Wisconsin will become warmer and drier. A number of species variables are relevant to this predicted climate change, such as range limits, reproductive potential, ecological specializations, and mobility; as well as sensitivity to variables related to a warmer and drier climate, such as reduced summer soil moisture, lower summer water tables, lower summer stream flows, increased temperatures, and reduced snow and ice cover. This analysis suggests both negative and positive responses, depending on whether conditions favor or disfavor a particular species' ecological requirements, and how movements may be constrained where species must migrate with changing conditions in order to maintain occupation of favorable habitats.

ASSESSMENT OF ADJACENT LAND-COVER ALTERATIONS ON THE STRUCTURE AND FUNCTION OF PEATLANDS *(POSTER)*

Kevin D. Clement, Minnesota State University-Mankato
Bradley J. Cook, Minnesota State University-Mankato
Fei Yuan, Minnesota State University-Mankato

Anthropogenic activities within and surrounding wetlands affect wetland structure and function both directly and indirectly. Direct impacts from filling, ditching and peat mining may appear obvious and are commonly regulated, but are not often fully quantified. Indirect impacts, including land-cover changes within a wetland's catchment and ground water withdrawal are less apparent, unregulated and difficult to quantify. Peatlands cover ~3 million ha in the Upper Midwest. Peatland structure and function are sensitive to small changes in hydrology and water chemistry. This study will use both field methods and remote sensing to determine the effects of indirect impacts on peatlands resulting from catchment land cover alterations. Medium resolution satellite data are being used for the first stage site selection and sampling. High resolution aerial photography and other GIS layers will be used for impact assessment. Sites with a range of adjacent land cover alterations will be selected to calculate land cover change indices. Combined with remote sensing parameters, critical impact levels and factors that alter peatland structure and function will be determined using vegetation composition and productivity, basic water chemistry, and nutrient availability data collected in the field from within wetlands and at the wetland/upland edge. Currently, little has been done to determine the effects of adjacent land cover alterations on the structure and function within peatlands. Peatlands contribute a key role in the global carbon cycle and contribute significantly to the maintenance of biodiversity and water quality. The results of this study may provide insight into peatland management and future land use planning.

MNRAM 3.1: A ROUTINE METHOD FOR EVALUATING WETLAND FUNCTIONS IN MINNESOTA AND WISCONSIN

Steve Eggers, U.S. Army Corps of Engineers

The Minnesota Routine Assessment Method for Evaluating Wetland Function (MnRAM) used the Wisconsin Rapid Assessment Method as a starting point. From the 1990s to present day, MnRAM evolved through Versions 1.0 to the current 3.1. MnRAM uses qualitative (as opposed to quantitative) data to determine functional ratings for each of 11 principal wetland functions. Each function is rated using a numeric index from 0.001 (low) to 2.0 (exceptional). The numeric ratings are based on standardized formulas to achieve consistency between users and are, in effect, placeholders for the general ratings of exceptional, high, medium and low. The ratings are not summed or averaged across different functions; thus, there is no single "score" given for each wetland. Rather, proper use of MnRAM provides a function-by-function rating. Additionally, comparisons of MnRAM ratings are best limited to wetlands of the same type (apples to apples, e.g., sedge meadow A to sedge meadow B). MnRAM requires a site visit by a wetland specialist and about two hours of time to fill in the data inputs. Users have the option of either an Excel spreadsheet or an Access database to input data. All calculations of the formulas are done automatically. A companion to MnRAM is a classification system that employs MnRAM functional ratings to designate wetlands for preservation or three management classifications.

*** CANCELLED ****

EVALUATION AND APPLICATION OF METHODS FOR WETLAND MONITORING: PART 1- TESTING RAPID METHODS

Siobhan Fennessy, Kenyon College
Amy D. Jacobs, Delaware Department of Natural Resources
Mary E. Kentula, USEPA Western Ecology Division

We analyzed 40 existing wetland rapid assessment methods that were developed for a variety of purposes including informing regulatory decisions and local land use planning and reviewed them for their ability to assess ecosystem condition. Four criteria were used to screen methods: 1. the method can be used to measure condition, 2. it is truly rapid, 3. it is a site-level assessment, and 4. the method provides a score that is verifiable using other biological data. Based on these criteria, we selected six methods for evaluation relative to a conceptual model describing the core elements of wetland assessment methods, including indicators of soil, hydrology and biotic communities, as well as landscape and regional indicators. We identified five general areas that need to be addressed when adapting existing methods or developing new methods to assess condition: definition of the assessment area, classification of wetlands, scoring, inclusion of "value added metrics," and validation with comprehensive ecological data. An effective rapid assessment method could assist states in incorporating condition assessment into their programs by reducing the time needed to sample a site and increasing the number of sites that can be monitored.

*** CANCELLED ****

EVALUATION AND APPLICATION OF METHODS FOR WETLAND MONITORING: PART 2- ASSESSING CONDITION AT THE WATERSHED SCALE

Siobhan Fennessy, Kenyon College
Mary E. Kentula, USEPA Western Ecology Division

Decisions about wetland conservation and restoration have traditionally been conducted at the site scale, however there is a long-standing need to assess the ambient condition of wetlands over large spatial scales. We used an assessment approach combining the USEPA Environmental Monitoring & Assessment Program probabilistic sampling design with the Ohio Rapid Assessment Method (ORAM) and a landscape analysis (the Landscape Development Index or LDI) to evaluate the condition of wetlands in the 1,300 km^2 Cuyahoga River watershed. We visited 366 mapped wetland sites and evaluated 243 wetlands to determine condition and report on their response to land use change. Across the watershed, 9.1% of wetlands were in poor condition, 13.2% in fair condition, 51.0% in good condition and 26.7% in very good condition. We evaluated the scale at which the effects of land use are strongest over six buffer widths: 100, 250, 500, 1000, 2000 and 4000 m. ORAM scores were negatively correlated with increasing intensity of land use (high LDI scores) for depressional, riverine and slope wetlands for each buffer width to a distance of 1000 m. The ability of the LDI to predict ecological condition as measured by ORAM was strongest for the 100 and 250 m buffer distances with R^2 values of 35% for depressional and 17% for riverine sites, suggesting that a protective buffer around a wetland is crucial to maintaining its ecological health, even in urban environments. Classification and regression tree analysis indicates that wetland size is also a strong predictor of wetland condition.

WISCONSIN'S EPHEMERAL PONDS PROJECT (WEPP): ENHANCING THE STATE'S KNOWLEDGE ON EPHEMERAL POND DISTRIBUTION AND ECOLOGY
(PRESENTATION & POSTER)

Brick Fevold, WDNR Bureau of Integrated Science Services
Tom Bernthal, WDNR Bureau of Watershed Management
Joanne Kline, WDNR Bureau of Integrated Science Services

In the eastern U.S., knowledge of ephemeral pond ecology draws primarily from research conducted on sites situated in woodland environments of the northeast and Mid-Atlantic states. In Wisconsin, we know that ephemeral ponds exist on our landscapes, but we have yet to develop a comprehensive understanding of the variability in land cover types in which ephemeral ponds occur and how they differ both physically and biologically across regions. This lack of knowledge is complicated by the state's historical land use change, which has resulted in a tapestry of ephemeral pond-like wetlands that occur in both wooded and non-wooded environments. This talk presents a brief synopsis of regional efforts to improve public awareness of the functional and biotic importance of ephemeral ponds, and will identify initiatives currently in place to promote the protection of ephemeral pond wetlands shadowed by anthropogenic pressures. We will also introduce the Wisconsin Ephemeral Ponds Project (WEPP), a state-agency effort focused on mapping and characterizing ephemeral pond wetlands for Southeast Wisconsin, a region burdened with a long history of habitat alteration. By this introduction, we will highlight the challenges associated with creating an operative 'ephemeral pond' definition for Wisconsin, and will describe an approach in which we combine local expert and citizen-monitor efforts with GIS landscape analysis to advance our understanding of how to map and classify Wisconsin's ephemeral pond wetlands.

MANAGING FLOODPLAINS AND FLOODWAYS: MORE THAN JUST CONVEYANCE CHANNELS

David C. Fowler, Association of State Floodplain Managers
Larry Larson, Association of State Floodplain Managers

Until recently, projects that considered the natural and beneficial uses of floodplains, floodways, and the associated wetlands therein were usually an afterthought or part of a regulatory requirement for another project (usually a flood management project). Restoration or rehabilitation of a water resource was rarely considered as a free-standing project on its own merits. At a time when we have significantly altered our major waterways for both commercial benefits and "flood control", flood damage losses continue to rise each year. Loss of wetlands in floodplain corridors and throughout watersheds is a contributing factor in increasing the risk of flood damages. ASFPM is concerned that now is the critical timeframe for the protection of our water resources and particularly the functionality of floodways and floodplains as part of a more comprehensive flood management program. Growing populations will increase the pressure to fence in the flood threat from rivers and to reclaim as much space as possible for development from the floodways and floodplains of our over burdened waterways. As a leading advocate for floodplain management, ASFPM is helping in the effort for consideration of the floodplain and floodway as not just a conveyance channel for unwanted flood water, but also as a naturally functioning system that is vital for economic and environmental sustainability. This presentation will discuss a new paradigm for flood management that focuses on the natural and beneficial uses of floodplains and floodways, and the functional roles that wetlands play within these systems.

EFFECTS OF SMALL DISTURBANCES ON THE EMERGENCE OF *PHRAGMITES AUSTRALIS* IN NATIVE WETLAND PLANT COMMUNITIES

Sally Gallagher, Smithsonian Environmental Research Center
Karin Kettenring, Smithsonian Environmental Research Center

Phragmites australis is invading wetland communities across the United States and has resulted in declines of native plant and animal diversity and alterations to nutrient cycling. Our objective was to understand how small disturbances allow for the invasion of the non-native strain of *Phragmites*. A survey of disturbances across four native plant communities (consisting of forbs, reeds, grasses and cattails) showed that the majority were caused by deer, muskrats and humans. An experiment tested the emergence of *Phragmites* seeds and rhizomes in artificially created disturbances, imitating those most commonly found in the survey, across these same plant communities. We planted seeds and rhizomes in one of three disturbance types within each plant community: a control, an above ground disturbance (minor disturbance), or a below ground disturbance (severe disturbance). We found that *Phragmites* seed germination increased significantly (3.7 X) in the less inundated plant communities with an increase in disturbance severity. We attribute this to higher light levels, higher temperatures and less flooding. There was low *Phragmites* seed germination in the more inundated plant community where light levels and temperatures were lower and flooding was more frequent. Rhizome emergence was consistently low (8.6%) across all plant communities and disturbance treatments. We predict that *Phragmites* is most likely to invade in disturbed, less flooded marsh communities.

WETLAND PROTECTION IN THE GREATER MILWAUKEE AREA THROUGH THE GREENSEAMS PROGRAM

David Grusznski, The Conservation Fund

Milwaukee experienced substantial flooding in the late 1990s. In response, the Milwaukee Metropolitan Sewerage District (MMSD) developed a comprehensive stormwater management plan that included a natural approach to manage future flooding risks. The Conservation Fund, a national non-profit conservation organization, was contracted to design and implement the flood management program called Greenseams. The Greenseams Program identified three types of properties: the first and highest priority is hydric soils, followed by river corridors and mature forested areas. A total of 29,000 acres of wetland soils and forested areas within four counties and four watersheds were identified as properties that meet the program guidelines. Since Greenseams' inception in 2001, 42 properties have been acquired totaling 1,464 acres of protected land within four urbanizing watersheds. Of the 1,464 acres of purchased properties, 1,118 acres are considered hydric soils, which can hold an estimated 728,602,838 gallons of water. Whenever physically feasible, the Greenseams Program partners with the U.S. Fish & Wildlife Service to restore wetland hydrology and wet mesic prairies on the purchased sites. After restoration, the Greenseams sites are transferred to local communities for long-term ownership. MMSD retains a conservation easement on the sites allowing passive recreation, and facilitates any future hydrologic and native vegetation restorations while restricting new buildings, turning of the soil and mowed parks. The Greenseams Program thus ensures long-term protection of these wetland landscapes, allowing natural stormwater storage in the outlying Greater Milwaukee area.

REVERSING THE LOSS: PART 2 – THE NEXT SIX-YEAR STRATEGY FOR WISCONSIN'S WETLAND RESOURCES *(see Bode abstract for Part 1)*

Cherie Hagen, WDNR Lakes and Wetlands Section
Wisconsin Wetland Team

What should Wisconsin's wetland priorities and goals be for the next six-year wetland strategy? This is exactly what the Wisconsin Wetland Team, a group of federal, state and wetland-affiliated organizations, gathered to discuss throughout 2007. The team looked at issues currently facing wetlands and those issues on the horizon, as well as revisiting the original goals and priorities set in the state's original *Reversing the Loss* wetland strategy. The 2008-2013 Wetland Strategy is scheduled for completion within the first half of 2008. While development of the updated wetland strategy is still a work in progress, the team has approached the strategy with a belief that no one organization can possibly fulfill all the work and efforts necessary to properly protect and restore Wisconsin's wetland resources. Wetland partnerships are critical to accomplishing our mission of reversing Wisconsin's wetland loss. Therefore, the team's goal is to create a strategy that can be used by any person or organization wishing to assist in *Reversing the Loss* of Wisconsin's wetlands. We will present the draft strategy and will identify opportunities for organizations to participate in strategy implementation. What role would you like to play?

AVIAN RESPONSE TO RESTORED WETLAND PLANT COMMUNITY SUCCESSION IN SOUTHEASTERN WISCONSIN

Jill Hapner, University of Wisconsin-Milwaukee
Glen Fredlund, University of Wisconsin-Milwaukee
Jim Reinartz, University of Wisconsin-Milwaukee
Karla Leithoff, Wisconsin Department of Transportation
Noel Cutright, Wisconsin Society for Ornithology
William Mueller, Wisconsin Society for Ornithology

We described the change in avian use over time in small created and restored wetlands in southeastern Wisconsin. We conducted quantitative avian surveys in 30 sites ranging in age from 11-15 years and compared the results to data collected in the same sites in 1994, 2-6 years after the restorations were constructed. Avian species were categorized into ruderal, wetland and old field habitat guilds. We tested for significant effects of wetland age, design and landscape variables on avian use and plant community composition using multivariate analysis. The total number of bird species using the restorations in 2004 was very similar to the 1994 census. However, our follow-up survey revealed a dramatic shift in old field and wetland-dependent habitat guilds. Wetland-dependent species decreased by more than 50%, while the number of old field-dependent species more than doubled. Use of the wetlands by ruderal species was similar in both surveys. Mean number of individual birds/wetland/visit increased from 5.47 in 1994 to 20.95 in 2004. The increase in bird numbers was distributed evenly across the habitat guilds. For both survey dates, wetland size was positively correlated with overall richness and individuals per visit, the number of wetland-dependent species, and wetland and old field-dependent individuals per visit. In 2004, percent open water was positively correlated with overall richness and individuals per visit, and the number of wetland-dependent species. Our results indicate that bird use of the wetlands is associated with the structure and cover pattern of the vegetation in and proximal to the wetland. Appropriate management of restored wetlands may be critical to conservation of avian communities in altered landscapes.

RESTORING WETLANDS INVADED BY *PHALARIS ARUNDINACEA*: CAN A GRASS-SPECIFIC HERBICIDE FACILITATE NATIVE PLANT ESTABLISHMENT?

Michael Healy, University of Wisconsin-Madison
Joy B. Zedler, University of Wisconsin-Madison

Reed canary grass (*Phalaris arundinacea)*, Wisconsin's most widespread wetland invader, is notoriously difficult to control in restoration sites and natural areas. Grass-specific herbicides show promise for reducing *Phalaris* abundance. We tested the ability of sethoxydim, followed by seeding of up to 16 native species, to restore diversity to wetlands dominated by *Phalaris*. After treating more than 160 plots with sethoxydim once annually in late May or early June 2005-2007, we observed a shift in the wet meadow vegetation. Sethoxydim facilitated establishment of native species in our three seed mixes, as well as other native and non-native plants. Compared to untreated plots, sethoxydim reduced *Phalaris* height and cover and increased native species richness and cover. Despite these effects, *Phalaris* persisted through year three in nearly all plots sampled in fall 2007. Still, the number of native species present in sethoxydim-treated plots increased progressively, indicating the need for long-term treatment of *Phalaris* and patience in judging native vegetation recovery.

USING ANIMALS AND PLANTS TO MONITOR LANDSCAPE INTEGRITY

Robert W. Howe, University of Wisconsin-Green Bay
Gerald J. Niemi, University Minnesota-Duluth
Ronald R. Regal, University Minnesota-Duluth
Nicholas P. Danz, University Minnesota-Duluth
JoAnn Hanowski, University Minnesota-Duluth

We describe a new, rigorous method for assessing the quality of wetland landscapes that is based on the probabilities of finding certain plant and animal indicator species. Background research is needed to quantify the response of different species to a (0-10) gradient of land use intensity or human ecological “footprint. ” Once these species responses have been quantified, the ecological condition of new sites can be determined by finding the value of condition (between 0 and 10) that best fits the observed data. We will illustrate this method with data from a five-year analysis of coastal wetlands along the U.S. shores of the Great Lakes. A spreadsheet for calculating condition of coastal wetlands will be provided and a related “ biotic condition calculator” will eventually be available online.

ECOLOGICAL ASSESSMENT AND RESTORATION PLANNING FOR AN URBANIZED KETTLE POND: TIEDEMAN POND, MIDDLETON, WISCONSIN

Nicole Kalkbrenner, JFNew

In 2006, JFNew undertook the ecological assessment of a 22-acre kettle pond located in Middleton, Wisconsin. This study incorporated historic research, community input, literature review, existing data and field research to identify the ecological impacts affecting the pond today including changes in surrounding land use, altered hydrology, increased stormwater, and sedimentation and colonization of exotic invasive species. Analyses of these impacts lead to the development of restoration goals and the outline of steps taken to improve the ecological health of Tiedeman Pond. These steps incorporate multiple approaches with participation by local government, contractors and community volunteers. The City of Middleton is working to educate the public about the goals of the plan and beginning to implement aspects of the plan including stormwater improvements, invasive species control and supplemental native species introduction. The Tiedeman Pond Ecological Assessment and its restoration recommendations provide an example of a community-based initiative to address ecological improvements on a local level.

THE LINK BETWEEN ELEVATED CO_2 AND METHANE EMISSIONS FROM WETLANDS: DOES PLANT OR MICROBIAL COMPOSITION MATTER?

Jenny Kao-Kniffen, University of Wisconsin-Madison
T.C. Balser, University of Wisconsin-Madison

Many recent studies suggest that rising atmospheric CO_2 levels increase methane emissions from rice paddies and wetlands. We examined the underlying mechanisms between the two greenhouse gases by growing nine plant species in replicated greenhouse rooms that received either ambient CO_2 (365 ppm) or elevated CO_2 (700 ppm) and analyzed changes in plant biomass and microbial relative abundance. We found that elevated CO_2 stimulated methane emissions from two weedy species that are dominant in many wetlands across North America, the introduced *Typha angustifolia* (narrow leaf cattail) and the native *Scirpus cyperinus* (woolgrass). Root biomass of the exotic *T. angustifolia* was correlated with methane flux, which suggests that an increase in belowground biomass will lead to higher methane emissions from *Typha*-dominated wetlands. However, not all species exhibited the same trends. The root biomass of *Glyceria striata* increased with elevated CO_2, but no associated increases in methane flux occurred, while *S. cyperinus* showed an increase in aboveground biomass, but only a weak correlation with methane flux. Although we found that plant species had a significant impact on the structure of the soil methanogen and methanotroph communities, as revealed by 16S T-RFLP and microbial lipid analysis, CO_2 level did not have any impact. Nevertheless, the biomass of the invasive cattail was correlated with the relative abundance of a methanogenic fragment. This study indicates that as higher atmospheric concentrations of CO_2 alter plant physical traits, such as increasing above- or below-ground biomass, net methane emissions are likely to rise with particular plant species.

USE OF WETLAND VS. UPLAND HABITAT BY BUTLER'S GARTERSNAKES (*THAMNOPHIS BUTLERI*) IN SOUTHEASTERN WISCONSIN

Joshua M. Kapfer, Natural Resources Consulting, Inc.
Sarah A. Orlofske, Virginia Polytechnic Institute & State University
Leonardo Neitzel, Jr., Concordia University- Wisconsin
Robert Hay, WDNR Bureau of Endangered Resources

The Butler's gartersnake (*Thamnophis butleri*) is found in the southeastern part of Wisconsin. It is listed as a threatened species, in part due to habitat loss from encroaching development, although little research has been conducted on it. This species is reported to prefer wetlands, but information regarding the specific wetland and upland habitat types preferred, or comparison of wetland vs. upland habitat use, does not exist. To obtain this information, we placed 10 paired drift fence complements in desired habitat patches (i.e. two drift fences per paired complement; one in the upland and one in the adjacent wetland). Fences were surveyed every 24 h, four d/week from spring through fall 2006 and 2007. A total of 161-200 surveys of the three study sites were conducted in 2006 and 2007. In 2006, 176 adult *T. butleri* were captured at all sites. A comparison of captures in wetland vs. upland habitat revealed no difference (upland $N = 101$, wetland $N = 75$). In 2007, a total of 89 adults were captured, with more captures occurring in upland habitats (upland $N = 66$, wetland $N = 23$). During this time, snakes were more frequently captured in open canopy grasslands with little woody vegetation. A greater number of wetland captures occurred in habitats without reed canary grass. Based on our findings, the protection of both wetlands and uplands on known *T. butleri* sites may be important to the persistence of this species. Also, reduction of woody vegetation and aggressive management of reed canary grass at known *T. butleri* sites may be important to this snake's preservation.

COMPARATIVE STUDY OF LOCAL AND STATE WETLAND PROTECTION EFFORTS FOR TWO SOUTHEASTERN MICHIGAN COMMUNITIES

Aimee M. Kay, Kay Environmental & Associates

Wetland losses continue to alter Michigan's landscapes and cause further fragmentation, degradation and conversion of natural habitat. Oakland Co. has the highest percentage of wetland loss to new development for the entire Southern Lower Peninsula of Michigan. It also has the highest percentage of communities with local wetland protection ordinances. Why do wetlands continue to be lost, when there are many communities with wetland protection laws in this region? Do communities that have wetland protection ordinances preserve more wetlands than those that do not? I compared two municipalities – West Bloomfield Township and Commerce Township – in terms of regulatory and non-regulatory techniques for wetland protection efforts, and their individual relationship to State agency efforts. I evaluated the following key criteria – wetland inventory mapping, impact types, and impact amount data – for two communities. I created a "Wetland Profile" for each community and collected data for a five-year study period for the years 2001-2005. Commerce Township did not employ a wetland ordinance and lost 9.46 acres of wetlands permanently within the study period. Over half of the wetlands lost were a direct result of no local ordinance protection. Conversely, West Bloomfield Township experienced a net increase in wetland acreage as a direct result of stringent local ordinance protection. Communities continue to lose wetlands at a disproportionate rate without ordinance support. The site by site approach of planning does not consider the cumulative effects of wetland loss over time. Consistent recordkeeping and standardized mapping needs to be utilized to identify trends and assist primary land planning decision makers in making informed decisions.

COMPARISON OF IMPACTS OF DISTURBED VS. NATURAL SHORELINE ON THE AQUATIC PLANT COMMUNITY IN WEST CENTRAL WISCONSIN LAKES

Deborah Konkel, WDNR Bureau of Fisheries Management
Reesa Evans, Adams Co. Land & Water Conservation Dept.

This study of 84 lakes and impoundments in west central Wisconsin analyzed the impact of shoreline disturbance on the composition, quality and habitat value of the aquatic plant communities. Aquatic plant data were collected by the rake-sampling method, using stratified random placement of transects. Transects at natural and disturbed shoreline areas were separated and analyzed as separate lakes on 55 lakes. The mean number of plant species, average coefficients of conservatism, cover of emergent species, Floristic Quality Indices and Simpson's Diversity Indices were significantly higher at natural shoreline than disturbed shoreline transects. The occurrence of exotic species was significantly higher at disturbed shoreline than natural shoreline transects. Also, species richness, quality of the plant community (AMCI), percent of littoral zone vegetated, percent cover of rooted floating-leaf species and occurrence of sensitive species were higher at natural shoreline than disturbed shoreline transects. We ran linear regression on 84 lakes to express the relationship between percent of disturbed shoreline and parameters that characterize the aquatic plant community. Results of this study indicate that shoreline disturbance may a) risk valuable fish and wildlife habitat by reducing cover of valuable habitat structure and reducing diversity; b) reduce the water quality protection provided by diverse plant beds; and c) make lakes more vulnerable to invasion by exotic species.

COMMON BUCKTHORN HAS A FONDNESS FOR WETLANDS: FLOOD TOLERANCE AND EXTENT IN NORTHEASTERN ILLINOIS WETLANDS

Jessica S. Kurylo, Illinois Natural History Survey

Common buckthorn (*Rhamnus cathartica* L.) is an aggressive, prolific invader of urban natural areas, especially in the Midwest. Since its introduction to North America, the species has become naturalized from Maine to Montana and south to Delaware and Kentucky. Worldwide reported habitats include steep mountain sides to oak savannas and fens. Wisconsin, Illinois and Minnesota are the only U.S. states to have reports in the literature of *R. cathartica* in wetlands. *Rhamnus cathartica* is not considered a hydrophyte, and, based on its "facultative upland" wetland indicator status, should not be found across the hydrologic landscape in wetlands more than 33% of the time. A survey of wetland determination reports from northeastern Illinois showed an estimate of 36.7% of surveyed wetlands containing *R. cathartica* and the species was a co-dominant in 21.6% of those wetlands where it occurred. Preliminary results from a 2006 greenhouse study show 17-20 month old and 4-8 month old *R. cathartica* seedlings could be flooded up to two inches above the soil surface for three to four weeks before measurable growth stopped. A few yellow leaves appeared at two weeks within the flooded and fluctuating water level treatments (16% of plants overall). By the end of 11 weeks, most (86%) of flooded plants appeared dead, while only 43% of plants subjected to a fluctuating level appeared dead. The high incidence of *R. cathartica* in wetlands coupled with an unreported apparent flooding tolerance calls into question the accuracy of the facultative upland rating and warrants further study.

BIODIVERSITY IN SELECTED NATURAL COMMUNITIES RELATED TO GLOBAL CLIMATE CHANGE

Janeen Laatsch, WDNR Bureau of Endangered Resources
Bill Smith, WDNR Bureau of Endangered Resources
Craig Anderson, WDNR Bureau of Endangered Resources
Loren Ayers, WDNR Bureau of Endangered Resources
Tara Bergeson, WDNR Bureau of Endangered Resources

We can assess the impacts of global climate change in Wisconsin by conducting baseline inventories in a set of natural communities that are most likely to be affected by climate change. The goal of this project is to collect baseline data on rare vascular plants and invertebrates, small mammals, birds, reptiles and amphibians in peatland natural communities. Intensive surveys are being used to identify relationships between species and a suite of environmental variables. Extensive surveys will determine if observed relationships are consistent among Ecological Landscapes in Wisconsin. To date, we have evaluated over 200 sites in the field, documenting 25 types of natural communities. We documented 293 occurrences of 57 rare plant species. We will present data from 2004-2007 for all taxa groups. Data will include numbers of species documented, most common species for each taxa group, distribution maps for selected taxa, and potential status changes. We completed the bulk of our field work for the project in September 2007, and will be analyzing data for a final report in 2008. The data from this project for rare species will be available in the Natural Heritage Inventory Database http://dnr.wi.gov/org/land/er/nhi/. Data on non-rare species will be used to update distribution maps; some will be published. Any data resulting from this study can be made available upon request. The results will serve as a baseline to compare with future surveys and identify potential changes in species distributions, abundance and phenology resulting from climate change.

SEASONAL HERBICIDE TREATMENT OF *PHRAGMITES AUSTRALIS* IN WAUKESHA COUNTY, WISCONSIN: WHEN IS TREATMENT MOST EFFECTIVE? *(POSTER)*

Sara Lachner, Carroll College
Eric Thobaben, Carroll College

Phragmites australis, or common reed, is a grass species that can grow up to six meters tall. In the U.S., *Phragmites* is often found in ditches along the roadside due to the collection of water. *Phragmites* strongly impacts the wetland community surrounding it; *Phragmites* grows dense roots that inhibit the growth of roots around it, and it also significantly lowers the water table. Herbicides such as Habitat (active ingredient: imazapyr) and AquaNeat (active ingredient: glyphosate) have been shown to be effective in controlling *Phragmites* and are not harmful to the surrounding environment. Yet, it is not known during which season (mid-summer, late summer or early fall) herbicide application is most effective in reducing *Phragmites* growth. It is also not known if cutting the *Phragmites* at different heights, prior to herbicide application, will change the effectiveness of the herbicide. We conducted an experiment that tested the timing of herbicide application, two herbicides, and two heights at which the plant was cut in order to determine the most effective means of chemically controlling *Phragmites*. Preliminary results showed an unexpected response by plants to cutting: cut plants did not regrow in any treatments. Consequently, there were no differences in regrowth of cut plants in the control or herbicide treatments. Only the mid-summer treatment exhibited any regrowth of *Phragmites* and only in plants that were cut at chest height. Observations will be made in May 2008 to evaluate if chemically treated plants do not regerminate at the beginning of the next growing season.

MITIGATING WETLAND IMPACTS OF INEVITABLE LANDFILL EXPANSION PROJECTS: NEW YORK CASE STUDY AS A NATIONAL MODEL

John L. Larson, Applied Ecological Services, Inc.

Siting new green field landfills has become increasingly difficult in many states. Expansion of large regional landfills is one approach taken by some states to avoid the siting of highly contentious new landfills. Most of these large regional landfills were initially sited and constructed prior to the adoption of the Clean Water Act that protected U.S. water ways and wetlands. Because the prevailing attitude was that wetlands were waste lands, many of the early landfill sites were sited in wetlands. Thus wetland impacts are typically unavoidable when expansion of these landfills is required. Development of a wetland strategy that provides for large-scale restoration, creation and enhancement of wetlands as mitigation for these impacts can serve as a valuable model for how mitigation can be a win-win scenario for providing the appropriate space for the disposal of waste *and* providing for an ecological solution for replacing, and possibly even *increasing* wetland functions and values. This presentation will explore a case study of a New York landfill expansion project in which we managed to leverage the taking of 71 acres of wetlands into the creation of 575 acres of high-quality wetlands (an eight-fold increase). Mitigation plans that provide for large-scale restoration, stringent performance standards, conservation easements on remaining wetlands, and a long-term financial commitment will ensure that such mitigation efforts are successful.

CAREX STRICTA TUSSOCK FORMATION: THE INFLUENCE OF HYDROPERIOD AND NUTRIENT ADDITION

Beth Lawrence, University of Wisconsin-Madison
Joy B. Zedler, University of Wisconsin-Madison

Sedge meadows have been disproportionately lost from the Midwestern landscape relative to deeper-water wetlands, and those that remain have been subjected to altered hydrology and increased nutrient loading from agricultural and urban development. Considered an ecological engineer, *Carex stricta* modifies its physical environment through the creation of tussocks, and thereby increasing carbon storage, environmental heterogeneity, and plant diversity in sedge meadows. We initiated a mesocosm experiment in 2006 to investigate how five different hydroperiods (LLLL, SSSS, HHHH, HLHL, HHLL; where L= -18 cm, S= 0 cm, and H= +18 cm relative to the soil surface) and nutrient addition (16.5 g N + 0.41 g P) influence *Carex stricta* tussock formation and biomass allocation. After two growing seasons, we observed tussocks up to 19 cm tall, which is two-thirds the average height of tussocks in native sedge meadows. Tussock height varied significantly among hydroperiods, but was not responsive to nutrient addition. Average tussock heights from the stable, high water HHHH hydroperiod (12.6cm ± 1.35) and from the drawdown HHLL hydroperiod (10.5 cm ± 0.83) were significantly greater than the other hydroperiods tested. Nutrient addition influenced *Carex stricta* biomass, significantly increasing both above and below-ground biomass relative to controls. Our preliminary findings suggest that hydrology is the primary driver of *Carex stricta* tussock formation, though nutrient addition increased total plant biomass and may influence tussock building processes. Managing water levels may be a promising tool for wetland managers interested in restoring the microtopography of *Carex stricta* dominated sedge meadows.

PARADISE LOST? CLIMATE CHANGE IN THE NORTH WOODS: USING ART IN CLIMATE CHANGE EDUCATION *(POSTER)*

Dolly Ledin, University of Wisconsin-Madison
Terry Daulton, University of Wisconsin Trout Lake Field Station

This unique outreach and education project brings together the compelling evidence of science, interpretive talents of professional artists, and the skills of educators to engage communities in learning about climate change in the "northwoods." Focusing on the impacts of climate change in the Lake Superior region, 20 artists collaborated with scientists and educators to create a traveling multi-media exhibit with three themes: 1. An overview of climate, global changes, causes, scientific consensus and uncertainties, 2. Current and predicted impacts of climate change on terrestrial and aquatic ecosystems, wildlife and fisheries in the Lake Superior region and greater northwoods, and 3. Actions we can take to reduce greenhouse gas emissions and preserve natural resources. Exhibit pieces include a variety of media and natural subjects, including some wetland-focused pieces. This exhibit is currently traveling in the Upper Midwest, hosted by museums, art galleries and environmental education centers. The project includes educational events and programs for schools, involving students in science and art activities. This project is a model for engaging communities in environmental issues through the arts and provides insights into effective ways to integrate art, science and education.

PLANT COMMUNITY SURVEY RESULTS TWO YEARS FOLLOWING BUCKTHORN REMOVAL IN A RIPARIAN SWAMP *(POSTER)*

Lisa Lerch, Carroll College
Eric Thobaben, Carroll College

Common and glossy buckthorn (*Rhamnus cathartica* and *R. frangula*) were introduced into the U.S. in the 1800s and are now well established in disturbed areas. These fast-growing species can outcompete native plants and alter ecosystem processes. Both of these shrubs now dominate the canopy layer of a riparian swamp on the Carroll College Greene Field Station. A long-term buckthorn removal experiment has begun to determine the best means of eradicating these invasive species. This research represents the second year of plant community surveys following phase one of the experiment, which compared chemical treatment and mechanical removal of adult buckthorn shrubs and trees to an untreated control. Plant surveys were conducted in 16 - 2 x 2 meter subplots that were located within the 10 x 10 meter treatment plots described above. In addition, four 2 x 2 meter subplots were surveyed in each of two reference communities: sedge meadow and wet woods. These reference communities serve as goals for the restoration project. All subplots were surveyed for vascular plants in August and September 2007 and compared to the plant community survey results from August and September 2006. Ordination results demonstrate very little change from year one to year two, but a slightly larger shift in plant community composition in one of the chemical treatments. The results of year two of the experiment indicate that further treatment of buckthorn will be necessary in order to restore these communities.

CLIMATE CHANGE AND WATERS OF WISCONSIN

John J. Magnuson, University of Wisconsin-Madison

Climate change is more than warming. While global in its extent, climate change is realized locally in conditions and impact. I will discuss the changes occurring in waters of the Midwest that are already affecting us and will continue to do so at greater intensities. Lake ice has become a miner's canary providing a strong local and global indication of change. The hydrologic cycle is already changing and will continue to do so with a wide range of impacts on all aquatic ecosystems, especially wetland ecosystems.

GLOSSY BUCKTHORN (*RHAMNUS FRANGULA*) INVASION AT CEDARBURG BOG: 1991 TO 2006

Jason Mills, University of Wisconsin-Milwaukee
James Reinartz, University of Wisconsin-Milwaukee
Gretchen Meyer, University of Wisconsin-Milwaukee
Erica Young, University of Wisconsin-Milwaukee

The vegetation of Cedarburg Bog, a relatively undisturbed 1000-hectare forested wetland in SE Wisconsin, includes species more common further north. This protected wetland provides refuge to a wide variety of plants and animals in a region that was largely converted to agricultural use in the nineteenth century and now faces suburban development. As part of ongoing research on long-term ecological change in Cedarburg Bog, we resampled herb, shrub and tree strata in 2006 using 165 sampling units established and initially surveyed in 1991. A single exotic species, glossy buckthorn (*Rhamnus frangula*), caused the most apparent change in the vegetation. In the 15 years between sample dates, the number of plots in which it occurred increased by more than 60%. By 2006, adults grew in nearly two thirds of sampling units, and seedlings grew in more than 75% of sampling units. Despite dramatic increases in buckthorn abundance, the effects of this invasion on other plant species in the wetland have been slight. We expected buckthorn to displace other species by reducing light and nutrient availability, but changes in herb richness and cover showed no relationship with increases in buckthorn cover or seedling number. Similarly, compositional shifts in the herb stratum seemed unrelated to increases in buckthorn cover. Change in shrub species richness was also unrelated to increasing buckthorn cover, but the cover of other shrubs decreased as buckthorn cover increased. This long-term study has yielded unexpected results that improve our understanding of invasion biology and the wetland plant community response to invasion.

AN ASSESSMENT OF WETLANDS PROGRAMS IN FOUR GREAT LAKES STATES

Michael Murray, National Wildlife Federation
Jane Reyer, National Wildlife Federation
Coral Wolf, University of Michigan

The National Wildlife Federation (NWF) conducted an assessment of wetland protection programs in Michigan, Minnesota, Ohio and Wisconsin. The assessment built on other recent efforts, and included an examination of statutes and regulations, permitting records, and phone interviews with agency staff and nongovernmental organization (NGO) representatives in each state. In addition to identifying the level of protection for wetlands in each state, the research aimed to identify significant legal and procedural barriers to adequate protection of wetlands, and solicit recommendations on approaches to improve wetlands protection programs. Several overarching issues were identified through the process, including a) the general assumption that wetland values can be replaced (including, for example, in cases where a mitigation action occurs in a different subwatershed or watershed); b) the observation of a relatively low success rate in created wetlands (in particular in achieving the biodiversity, functional, or other attributes observed at reference wetlands); and c) uncertainties concerning protection of isolated wetlands (in part in light of federal decisions). Other themes emerging through the process common to the four states were the lack of funding for regulatory agencies, lack of recordkeeping for exempt activities, and barriers to restoration projects undertaken for purely ecological purposes. Additional state-specific findings and recommendations to improve programs will be discussed.

TESTING A MID-SEASON INVENTORY METHOD AT THE 35,000-ACRE GLACIAL RIDGE RESERVE IN NORTHWEST MINNESOTA

Elizabeth Nixon, Emmons & Olivier Resources, Inc.
Melissa Arikian, Emmons & Olivier Resources, Inc.
Meredith Cornett, The Nature Conservancy
Jason Ekstein, The Nature Conservancy

We tested methods for use in long-term evaluation of ecosystem recovery of the 35,000-acre Glacial Ridge Preserve. We conducted a transect method of recording essential, invasive and native species, along with their respective Braun-Blanquet cover classes on a whole-plot basis (160 acres) in a 2400-acre ridge and swale unit. We made cover assignments per plant group for all plots and per species or by general observation of cover dominants for certain species in certain plots. The method is sufficient for its intended purpose of evaluating the goal of establishing at least 25% of all possible essential species in a given management unit after 15 years and at least 75% dominance by natives. Adding a minimal increase in sampling effort by GPS-locating monotypic stands of invasive species will enhance near-term management decisions intended for long-term essential species recovery. For nonessential natives, recording plot-level cover class and transects was considered sufficient, but recording essentials cover class by species could add to understanding recovery dynamics. These findings will be useful for striking a balance between sampling effort and value of additional data deemed critical for management efforts and understanding the dynamics of recovery. ATV travel was used and considered essential to efficiency of this effort and future species identification or management work.

WHAT HAVE WE LEARNED FROM MONITORING THE EASTERN PRAIRIE FRINGED ORCHID 1997 – 2007

Ursula Petersen, Wisconsin Department of Agriculture, Trade & Consumer Protection

The federally listed eastern prairie fringed orchid, *Platanthera leucophaea*, inhabits a variety of wetland habitats in Wisconsin as well as the Midwest and northeast. The annual average number of these orchids recorded at 13 known locations in the state was 86 (range 28-169) from 1990-1996. Our agency obligation for protection of this species, in particular from pesticide harm, led to a statewide monitoring project of the species and its habitats beginning in 1997. We coordinated monitoring, and monitored or assisted with monitoring, at as many sites as possible each early July. We conducted fruitset checks some years in some settings to determine the status of the pollinators. We learned to find the orchid in its early stages, and tagged, GPS-located and mapped sites that include site management. The statewide annual count for the eastern prairie fringed orchid has ranged from 650-1200 orchids between 1997 and 2007, depending on weather, site management and count participation. In 2007, one well-managed site had more than 900 plants while another very good site had only a handful due to a nearby three-year lake project, which dried out the orchid area. Our volunteers rediscovered old orchid sites and searched for new ones while owners and managers moved into high gear with habitat restoration and management of threats such as predation and invasive species with help from agency staff and others. The overall number of orchids likely increased due to more consistent monitoring as well as subsequent protection and habitat management. In terms of recovery of the species, we currently have five potentially viable populations, with one to two populations being highly viable.

HYDROLOGIC AND WATER QUALITY FUNCTIONS OF A SMALL DEGRADED WETLAND IN SOUTHERN WISCONSIN

Kenneth Potter, University of Wisconsin-Madison
Justin S. Rogers, HDR Engineering

Wetlands are reputed to reduce peak flows and improve water quality by trapping sediment and phosphorus. However, there are relatively few studies that quantify these wetland functions. This presentation reports on a study of a 45-hectare wetland in southern Wisconsin. The wetland is traversed by a stream channel that drains a predominantly agricultural 17.4 km^2 watershed. During the spring and summer of 2006, stage data and water samples were collected at stations upstream and downstream of the wetland. During storm events, water samples were taken at 2-hour intervals for the first 12 samples and 8-hour intervals for the next 12 samples. Samples were analyzed for total suspended solids, total phosphorus, and dissolved reactive phosphorus. When normalized for flow volume, all peak flows were attenuated by the wetland, with the maximum attenuation occurring in the intermediate sized flood events. In the case of sediment, the amount leaving the wetland in the two largest storms, which accounted for 96% of the exported sediment during the study period, was twice the amount entering the wetland. The failure of the wetland to trap sediment is apparently due to the role of drainage ditches, which trap sediment during the wetland-filling phase and release it during drainage. The export of sediment during the largest flood events appears to result from remobilization of sediment deposited in the low-gradient stream channel during smaller flood events. In the case of total phosphorus, the inflow to the wetland about equaled the outflow, although the wetland sequestered 40% of the incoming dissolved reactive phosphorus.

WETLAND CHANGES IN SOUTHEASTERN WISCONSIN: 1963 TO PRESENT

Donald M. Reed, Southeast Wisconsin Regional Planning Commission

From the years 1963 through 1980, the Regional Land Use data documented a net wetland loss for southeastern Wisconsin. However, in 1990, a slight net increase (2.1 square miles) was recorded. And, by the year 2000 the net wetland area had increased an additional 7.0 square miles. A preliminary review of the draft 2005 Wisconsin Wetland Inventory maps for the southeastern Wisconsin region suggests that the latter trend is continuing. At the same time, during the years 1963 through 2000, the amount of lands allocated to agricultural use have declined by nearly 378 square miles. However, only an additional approximately 307 square miles have been converted to urban land uses. That suggests that the 71 square mile increment may be allocated to abandoned agricultural lands. Accordingly, much of the net increase in the region's wetland area can be allocated to abandoned agricultural lands. Unfortunately, that net increase has largely resulted in wetland habitat of lower floristic values – predominantly as reed canary grass (*Phalaris arundinacea*) monotypes. However, other wetland functional values such as those related to water quality protection and stormwater/floodwater management may be expected to have increased.

GROWTH PATTERNS OF GLOSSY BUCKTHORN (*RHAMNUS FRANGULA*) AND TAMARACK (*LARIX LARICINA*) IN CEDARBURG BOG

James Reinartz, University of Wisconsin-Milwaukee
Danielle Sippel, University of Wisconsin-Milwaukee
Jason Mills, University of Wisconsin-Milwaukee
Erica Young, University of Wisconsin-Milwaukee
Gretchen Meyer, University of Wisconsin-Milwaukee

Glossy buckthorn (*Rhamnus frangula*) is a small tree that has invaded much of the Cedarburg Bog State Natural Area where it has been naturalized since at least 1955. Even in parts of the wetland characterized by nutrient-poor, water-logged soils and by low primary productivity, buckthorn has spread rapidly and has growth rates that exceed those of native woody species in the same community. Tamarack (*Larix laricina*), a native coniferous tree, dominates much of the forest canopy and grows with buckthorn in the Bog. To compare the growth patterns of an invader and a relatively conservative native species, we collected stem sections or cores from individuals growing in close proximity at sample points throughout the wetland. We measured diameter of each stem and counted annual rings, from which we estimated mean annual rates of radial growth. Tamarack had a remarkably wide range of growth rates ranging from very small trees over 225 years old to much larger trees in their 30s. While we found a positive correlation between the tamarack and buckthorn growth rates in samples, buckthorn maintained a relatively more constant growth rate across a wide range of habitats than did tamarack (coefficient of variation of tamarack growth rate = 69% versus buckthorn 33%). Stem diameter was a much better predictor of age in buckthorn than it was in tamarack. In both species, the oldest stems had relatively slow growth rates. We also relate buckthorn and tamarack growth rates to vegetation composition and abiotic conditions.

COMPARING THE DISTRIBUTIONS OF PRE-SETTLEMENT AND PRESENT DAY TAMARACK SWAMP IN SOUTHEASTERN WISCONSIN

Anne H. Reis, University of Wisconsin-Milwaukee
James A. Reinartz, University of Wisconsin-Milwaukee

According to the original land surveyors' records of the 19th century, tamarack (*Larix laricina*) was one of the most common and dominant trees in the swamps of southern Wisconsin. Today it is considered to be an indicator, with a coefficient of conservatism of 8, of some of the highest quality and least disturbed wetland communities remaining in southeastern Wisconsin. Unfortunately, tamarack has been lost from many of the southern swamps that it formerly dominated. Many factors have contributed to this loss of tamarack, including changes in land use, sensitivity to hydrologic disturbances, outbreaks of insect pests and unusual and severe climatic events. In this study, we develop a map of the pre-settlement distribution of tamarack swamps in the Southeast Glacial Plains (SGP) Ecological Landscape of Wisconsin using data from the original land survey records. Comparison of the original distribution of tamarack swamps with the present distribution of tamarack mapped by the Wisconsin Wetland Inventory (WDNR) and the hydric soil data from the Soil Survey Geographic Database (SSURGO) allows us to estimate the extent of tamarack loss. Based on preliminary estimates, tamarack communities covered between 145,000 and 190,000 acres in the SGP Landscape prior to Euro-American settlement. Approximately 16,000 acres of tamarack communities remain today. A GIS analysis comparing landscape factors of wetlands that have lost tamarack with those in which tamarack survives, points to some of the major risk factors to tamarack survival in southeastern Wisconsin. This analysis will help us prioritize conservation and restoration practices in the region.

PREDATION AND DESICCATION RISKS FOR WOOD FROGS MIGRATING FROM WETLANDS INTO OAK-HICKORY FOREST

Tracy Rittenhouse, University of Missouri
Raymond D. Semlitsch, University of Missouri
Frank R. Thompson III, USDA Forest Service

Migration between two spatially separate habitats presents a trade-off between costs of migration and fitness benefits of reaching high quality breeding and non-breeding habitat. To determine the survival cost of migration, we identified sources of mortality for frogs migrating through the LEAP (Land-use Effects on Amphibian Populations) experimental timber harvest arrays in Missouri and during the 2005 drought. We used radio-transmitters to track 114 adult wood frogs (*Rana sylvatica*) from breeding ponds on ridgetops to non-breeding habitat. We examined predation and desiccation risks using an information theoretic approach with Cox proportional hazard models. In 2004 prior to timber harvest, survival inside the array (0.75, SE = 0.078) did not differ from survival outside the array (0.73, SE = 0.235). Survival inside the array was 0.22 (SE = 0.065) in 2005 and 0.42 (SE = 0.139) in 2006; therefore, survival decreased following timber harvest and was lowest during the drought year. Sources of mortality included 29 predation events, 13 desiccation events, and 8 unknown mortality events. Predation risk increased when frogs made frequent daily movements or were located near ponds. Desiccation only occurred during the drought year and risk increased when frogs were located near ponds. Candidate models based on weather ranked lower than models that reflected behavior. Optimal behaviors for survival were consistent in all three years. However, survival consequences for not adopting these behaviors were more severe following timber harvest and during drought. Our results provide empirical evidence for explaining why frogs migrate relatively long distances away from wetlands.

LAND COVER CHANGE OVER 60 YEARS ON LANDSCAPE SURROUNDING CEDARBURG BOG *(POSTER)*

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Erica Young, University of Wisconsin-Milwaukee
Jason Mills, University of Wisconsin-Milwaukee
James Reinartz, , University of Wisconsin-Milwaukee

Cedarburg Bog, a large forested wetland that includes diverse species existing near their southerly limits, provides a unique setting in which to study long-term ecological changes in response to land use and climate changes. Land cover changes can alter the amount and distribution of habitat available to organisms and in turn influence the movement of organisms and their ability to respond to a changing climate. We used GIS to quantify patterns of land cover change by comparing a 1941 land cover map to a recent land cover map in order to explore patterns of land cover change within recent history. To create a historical land cover map, we scanned 1941 aerial photos to create digital images that were then georeferenced and joined into a photo mosaic. A simple land cover classification scheme was manually applied to the historical and recent imagery. Our preliminary results suggest two main changes on this landscape over the last 60 years. Suburban developments now occur on patches of former agricultural land, and roads associated with development have increased fragmentation. It also appears that forest cover has increased due to reduced logging and abandonment of agricultural lands. Cedarburg Bog remains a large, undisturbed wetland in an otherwise changing landscape. Changes in the surrounding landscape could increase the abundance of non-native species and favor the movement of organisms, native and non-native, within forested cover types.

***** CANCELLED *****

QUANTIFYING THE WATER QUALITY SERVICES OF WETLANDS

Joseph Schubauer-Berigan, U.S. Environmental Protection Agency

Wetlands are well recognized for their potential for providing a wide range of important ecological services including their ability to provide water quality protection. Watershed-scale water quality trading could create market driven incentives to restore and construct wetlands while improving water quality. An important first step to evaluating the feasibility of including wetlands in water quality trading programs is to quantify the water quality services provided by wetlands. In this study we present a case study of the Halfway Creek Wetland Complex (HCWC) in Holmen, WI, managed by the USFWS primarily for waterfowl feeding and located adjacent to the Mississippi River (MSR). We used both a watershed approach and process level studies in an effort to quantify the water quality services provided by a restored wetland (RW) that was reclaimed from agricultural use and a degraded but native wetland (NW). In this paper, we present results of four years of work quantifying suspended sediment (SS), nitrogen (N) and phosphorus (P) loads from two suburbanizing watersheds associated with the HCWC and the role of the wetlands in attenuating these loads to the MSR**.** Estimates of sediment and nutrient loads will be described by season and annually. Overall the wetland complex attenuated ~ 66%, 24% and 10% of the annual loads of SS, TP and TN respectively. The water quality services provided by the degraded native wetland were likely "short circuited" due to past channelization activities. During late summer of 2005, ~2500 cubic yards of sediment were removed from the restored wetland, at no cost, by a landscape company. Approximately 6741 kg of N and 2667 kg P were removed and recycled with the sediment. Removing and recycling the sediment may be one way of avoiding diminished rates of P removal over the life of the wetland, while providing a beneficial use of the material.

A BIOGEOGRAPHIC STUDY OF THE NATURAL VEGETATION ON LAKE BEULAH

Eric X. Tarman-Ramcheck, University of Wisconsin-Whitewater
Peter Jacobs, University of Wisconsin-Whitewater

The vegetation of Wisconsin since European settlement has experienced significant changes. Anthropogenic land uses such as agriculture, development, and fire suppression have permanently altered the diverse natural prairies, savannas, bogs, sedge meadows and woodlands. Invasives have suppressed native vegetation at sites like Beulah Bog State Natural Area and adjacent properties in East Troy, Wisconsin where I collected data on species dominance of the lowland tamarack swamps and upland oak woodlands. We used a complete plant species inventory to determine the floristic quality index values as evidence of the ecological health of the bogs, sedge meadows, prairies and woodlands. Species dominance determined from plotless vegetation sampling showed dominance of old white oak (*Quercus alba*) in the uplands and tamarack (*Larix laricina*) in the lowlands with two buckthorns (*Frangula alnus, Rhamnus cathartica*) as the dominant shrub layers in the uplands and lowlands. The floristic quality index was determined by using the coefficient of conservatism values for each plant species that showed a strong association between high floristic index quality in undamaged, diverse ecosystems with low index values in those damaged by development, fire suppression and invasive species. The species dominance data of each wooded area and the floristic quality index values demonstrated that activities like dredging a former bog and fire suppression have strongly altered the ecosystem health and balance by decreasing biodiversity and altering the processes that maintained diversity on Lake Beulah.

RESTORING WETLAND RESILIENCE VIA CROSS-SCALE DIVERSITY

Stephen L. Thomforde, University of Wisconsin-Madison

This presentation challenges the current outcome-based restoration design and promotes a process-oriented design. Ecological restoration offers the potential to enhance and restore degraded wetlands, but efforts are constrained by the increasing frequency and intensity of climate change, chemical contamination, altered nutrient/hydrological cycling, and the spread of exotic species. Wetland restorations often lack heterogeneity and resilience of the analog and eventually homogenize to a less desirable state. The undesirable trajectory is often the result of inadequate planning and project designs based on outcomes instead of processes. This presentation questions the current restoration paradigm focus on climax community as the desired outcome, and offers a theoretical and procedural restoration alternative to enhance system resilience via cross-scale diversity. Holling's figure eight model suggests the current focus on climax neglects alternative stable configurations and post disturbance repair-loops that give a system resilience. Climax-based restorations are not resilient to disturbance and often fail post-perturbation. Comparisons between current "average" restoration assemblage and actual wetland assemblage reveal several missing functional and redundant assemblage components, including early and mid-successional groups, pioneering groups, and repair-feedback groups that enhance system resilience via cross-scale diversity. I will offer a theoretical platform for species assemblages in restorations, discuss practical procedures for incorporating cross-scale diversity into wetland restorations, and review several experiments designed to test these ideas.

BEYOND FLORISTIC QUALITY: HOW WISCONSIN LAW PROTECTS OTHER WETLAND FUNCTIONS AND VALUES

Patricia Ann Trochlell, WDNR Lakes and Wetlands Section

Wetland quality goes beyond plant community integrity, but there is a perception that degraded wetlands should receive less protection. Almost half of Wisconsin's wetlands were lost as agriculture and urbanization expanded. Because of continued wetland losses, Administrative Code NR 103 was adopted in 1991. NR 103 protects wetlands from impacts to their functional values (ecosystem services). A major aspect of NR 103 is a review process that avoids and minimizes wetland impacts, then assesses potential impacts to wetland functional values before determining whether an action can be permitted. NR 103 recognizes that all wetland functions and values need to be protected. Although plant community integrity correlates with past and present disturbance, it is not the only measure of quality. Furthermore, wetland plant community condition does not fully reflect a wetland's potential to provide ecosystem services. Though dominance by invasive species indicates poor plant community condition, even monotypic stands of reed canary grass may provide important ecosystem services such as wildlife habitat, flood storage and sediment trapping functions – examples will be provided. NR 103 also requires consideration of cumulative impacts both at the site and watershed scale. As wetlands are lost on the landscape, the remaining wetlands become more significant.

PLANT/SOIL FEEDBACK AS A MECHANISM FOR THE INVASIVE SUCCESS OF *PHALARIS ARUNDINACEA*

Sean Wheelock, Minnesota State University-Mankato
Bradley J. Cook, Minnesota State University-Mankato
Timothy E. Secott, Minnesota State University-Mankato

Invasive species are one of the greatest threats to global biodiversity. The most commonly cited mechanism for plant invasions is the Enemy Release Hypothesis, which until recently focused primarily on aboveground interactions. However escape from belowground natural enemies, such as soil-borne pathogens, are now being investigated by researchers. Invasive plants may take advantage of novel plant-soil interactions and exploit feedback relationships that native species do not. Two greenhouse studies were conducted to test for plant-soil feedbacks for the invasive grass *Phalaris arundinacea*. The results of a reciprocal transplant experiment showed that *P. arundinacea* and the native sedge *Carex stricta* produced more biomass when grown in their own soil than when grown in the soil of the other species. The results of a feedback experiment, which had *P. arundinacea* or *C. stricta* grown in one of three soil treatments (*P. arundinacea* trained soil, *C. stricta* trained soil, and sterilized soil/control) indicated that the effects of a plant-soil feedback may be dependent on time. Biomass of *P. arundinacea* plants grown in *P. arundinacea* trained soil was not different than *P. arundinacea* plants grown in the control soil. However, *C. stricta* plants grown in the *C. stricta* trained soil produced less biomass than *C. stricta* plants grown in the control soil. These results suggested that *C. stricta* is inhibited by its own soil microbes, whereas *P. arundinacea* is not. Overall, *P. arundinacea* does appear to benefit from a plant-soil feedback, which may contribute to its success as an invader in North America.

IMPACTS OF INVASIVE REED CANARY GRASS (*PHALARIS ARUNDINACEA*) ON NATIVE PLANTS, ARTHROPODS, AND SMALL MAMMALS

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Greg Spyreas, Illinois Natural History Survey
Allen Plocher, Illinois Natural History Survey
Dave Ketzner, Illinois Natural History Survey
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Ed Heske, Illinois Natural History Survey

Reed canary grass (*Phalaris arundinacea*) has become a pervasive and dominant plant in many Illinois wetlands, often forming near monocultures in herbaceous wetlands once dominated by native plants. The negative effects of this invader on the native flora are well known and were readily apparent in this study. However, the effects on other taxa, such as arthropods/insects and small mammals are not well known. Our small-scale pilot study compared plant species richness and prevalence of reed canary grass to species richness and abundance of arthropods/insects and small mammals in two restored, floodplain wetlands along the Rock River in northwest Illinois. Both wetlands were former crop fields; one was allowed to revegetate naturally, while the other was managed experimentally with differing methods for tree reestablishment. As expected, reed canary grass had strong negative effects on plant species richness in our study. Arthropods/insects were more abundant and diverse in plots with greater plant species richness, showing a strong negative correlation with the amount of reed canary grass present. The two most prevalent small mammal groups, white-footed mice (*Peromyscus leucopus*) and voles (*Microtus ochrogaster* and *M. pennsylvanicus*) showed differing patterns of abundance. White-footed mice were more abundant in plots with diverse, native vegetation, but voles were more abundant in plots dominated by reed canary grass. Results from this study demonstrate the need for further research, particularly a large-scale, multi-trophic level project, which also includes investigation of the potential impacts of reed canary grass on bird species.

SOUTH SHORE SOLUTIONS: PROTECTING WETLANDS AND WATERSHED HEALTH IN A RAPIDLY DEVELOPING REGION

Scott Wold, Sigurd Olson Environmental Institute
Jennifer Courtwright, Sigurd Olson Environmental Institute
Amanda Strick, Sigurd Olson Environmental Institute
Mike Gardner, Sigurd Olson Environmental Institute
Alexandra Zelles, Sigurd Olson Environmental Institute

Increased growth and development along the south shore of Lake Superior threaten remaining wetlands and watershed functions. The Sigurd Olson Environmental Institute works with communities, businesses and individuals to protect and restore natural wetland systems, mitigate unavoidable impacts, and implement stormwater best practices in the region. The Institute encourages land owners and managers in the surrounding area to "slow the flow" of water by creating natural and ecologically engineered solutions to aid runoff and water filtration. Private land owners and businesses are working collaboratively towards finding solutions to stormwater runoff and wetland issues that result from development. This presentation will include an overview of the wetland-related partnerships and projects that have been implemented and continue to be monitored by Northland College students. These projects serve as learning opportunities for students and the community alike, and help to protect the Lake Superior watershed.

A TALE OF TWO WETLANDS: MORPHOLOGICAL DIVERSITY OF THE NORTHERN PITCHER PLANT

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Terry Bott, University of Wisconsin-Milwaukee
Gretchen Meyer, University of Wisconsin-Milwaukee

The northern pitcher plant, *Sarracenia purpurea* subsp. *Purpurea*, is an obligate wetland plant found in two nearby contrasting wetland environments in southeast Wisconsin - a minerotrophic neutral pH fen and an ombrotrophic acidic black spruce bog. We examined plant nutrient content and morphological diversity of *S. purpurea* in relation to wetland environment and dissolved nutrient availability using a reciprocal transplant experiment, monitored over two years. All plants were N-limited but maintained high photosynthetic quantum yield (F_v/F_m >0.79). Dissolved N and P were higher in the bog than the fen and leaf N and P concentrations were higher in bog than fen plants; leaf N content was correlated with nitrate (r^2 = 0.344). Bog and fen *S. purpurea* plants showed morphological differences in leaf length, plant diameter, wing width and pitcher aperture. Between-wetland transplants changed these morphological traits along with N and P content within two years to become similar to the plants in the new environment. Fen-to-bog transplants changed faster than bog-to-fen transplants, suggesting that the acidic and shady conditions of the bog may impose greater stress on *S. purpurea*. Plants acclimated photosynthetic light harvesting to the irradiance differences between the wetlands, but only leaf length of the leaf morphology traits was significantly correlated with site irradiance. Nutrient regimes of wetlands can change in response to anthropogenic disturbance, atmospheric deposition and hydrological changes. *S. purpurea* may respond to minor changes in nutrient availability by acclimating leaf morphology, but preservation of pitcher plants depends on conservation of wetland environments.

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