



Linking Wetland Research and Education in the Great Lakes National Parks (2004-2012)



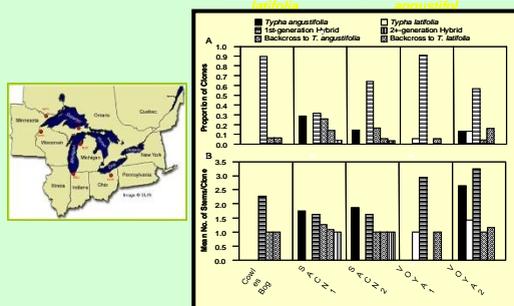
Joy E. Marburger, Great Lakes Research and Education Center, Indiana Dunes National Lakeshore, Porter, Indiana 46304

MISSION of the Great Lakes Research and Education Center: To facilitate research in 10 Great Lakes National Parks and adjacent waters of the Great Lakes; to provide park science research and education opportunities to the public; and to convey applied natural and cultural resources research to the network parks through education and outreach

Research: Role of Hybridization in Cattail (*Typha* spp.) Invasions of Freshwater Wetlands in 6 Great Lakes National Parks

Project Investigator: Steve Travis, Associate Professor, University of New England, Maine; various funding from USGS and NPS

Co-investigators: Joy Marburger, Indiana Dunes National Lakeshore and Steve Windels, Voyageurs National Park



Microsatellite DNA analysis of leaf material indicates mass hybridization between two species of cattail, native broadleaf cattail (*Typha latifolia*) and exotic narrow leaf cattail (*T. angustifolia*) in all three Great Lakes Parks investigated. These included Indiana Dunes National Lakeshore (INDU), St. Croix National Scenic Riverway (SACN), and Voyageurs National Park (VOYA). Level of hybridization decreased from INDU and SACN to VOYA. Some lakes in VOYA still have pure stands of *T. latifolia*. Seed bank studies at Cuyahoga National Park (CUVA), Pictured Rocks National Lakeshore (PIRO), and Sleeping Bear Dunes National Lakeshore (SLBE) indicate persistence of native, invasive and hybrid cattails in the soils, but also retained native forbs, rushes, and grasses in the seed bank.

Question: What implications does cattail hybridization have to wetland management?

Answer: Removal of cattail hybrids and *T. angustifolia* from source areas may allow an area to regain some native plants through the seed bank. Sedges were absent from the seed bank.

Education and Outreach: GLREC uses various media to inform the public and managers about the nature of cattail hybridization:

- Presentations several Western Great Lakes Research Conferences; 2005 North American Lake Management Society annual meeting; 2008 NPS Water Resources Meeting; 2012 INTECOL-SWS Wetland Conference
- NPS 2005 Year in Review article, local newspaper articles
- Three peer-reviewed journal articles (2010, 2011)
- Publication in the Midwest Invasive Plant Network website
- Webinar in 2011 for the StewardshipNetwork.org
- Wetlands in Parks (WIP) teacher training workshops that include current cattail research results and field trips
- Training student interns in survey methods
- See website: <http://nwrwebapps.cr.usgs.gov/cattail/>



Research: Determination of Genetic Diversity and Restoration Potential of the Pitcher Plant (*Sarracenia purpurea*) in the Lake Superior and Lake Michigan Watersheds

Project Investigator: Jennifer Karberg, Ph.D. Candidate, Michigan Technological University, Houghton, Michigan; funding from NPS and MTU



Leaf tip material was collected from plants in four U.S. National Parks and three Canadian National Parks for DNA RAPD analysis. Preliminary results from Isle Royale National Park (U.S.) and Sleeping Giant Provincial Park (Canada) suggest there is moderate genetic diversity within populations, but that even across large distances, the populations are genetically similar. The species appears to experience limited environmental pressure to develop genetically diverse populations. Populations at the isolated Pinhook Bog in Indiana Dunes National Lakeshore show more restricted genetic diversity like in the natural island population in Isle Royale National Park.

Question: How does this information affect restoration efforts?

Answer: If *Sarracenia purpurea* populations don't differ much over large geographic areas, individuals from any established population may be used for restoration of new populations where the species has been extirpated or becoming inbred due to geographic isolation.

Education and Outreach: Research was incorporated into presentations and workshops to educate teachers and managers about protecting genetic biodiversity and how genetic information can be used as a tool in restoration efforts:

Presentation at the 2003 Society of Wetland Scientists annual meeting; publication in Canadian Journal of Botany (2006)

- Wetlands in Parks (WIP) teacher training workshops that included general training in molecular techniques and a field trip to Pinhook Bog at INDU
- 2005 public workshops and day-long field trip of an Exploring Wetlands Teacher Workshop Series held in conjunction with the Notebaert Nature Museum in Chicago
- Genetic analysis of organisms living in pitcher plants in Pinhook Bog and other locations to determine animal diversity in plants located in various regions

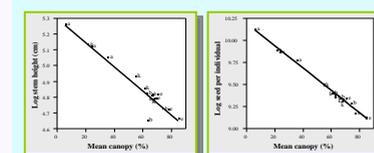
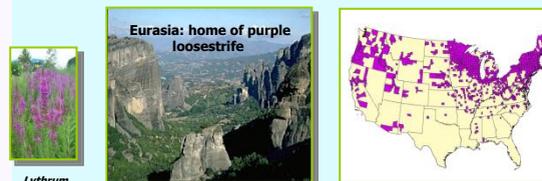


Teachers viewing pitcher plant habitat, bog ecology, and learning DNA plant and soil analysis during WIP workshop



Research: Purple Loosestrife Research in the U.S. and Eurasia

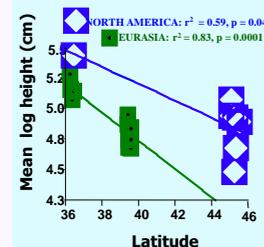
Project Investigator: Beth Middleton, Research Ecologist, USGS National Wetlands Research Center, Lafayette, Louisiana; funding from USGS, GLREC, and Volunteers



In Eurasia plants show reduced growth and seed production in shade.

Plants are shorter in shade.

Plants produce less seed in shade.



Purple loosestrife (*Lythrum salicaria*) has a different physiological ability to grow in various climates associated with latitude. Follow-up studies of the growth of ecotypes of purple loosestrife under simulated climates are planned.

Question: How is this information useful to managers?

Answer: Purple loosestrife may not have the ability to invade all portions of North America (e.g., southern United States). Studies of latitudinal variation helps managers decide how to focus their efforts before invasion occurs and how to conduct restoration efforts.

Education and Outreach: Volunteers all over the world are collecting data that can advance research questions. The GLREC staff, as cooperators in this project, train local volunteers in survey methods and data collection. The collected data is sent to the principle investigator for further analysis. GLREC exotic plant control outreach includes:

- National Park Service Year in Review 2003 article about collaboration with USGS on Purple Loosestrife Volunteer Monitoring Program
- 2003, 2004, 2005 Purple Loosestrife Workshops to train volunteers and managers in Wisconsin, Minnesota, and Indiana
- 2012 Cornell University Lab of Ornithology incorporates project into Citizen Science Central volunteer research program



Network park staff



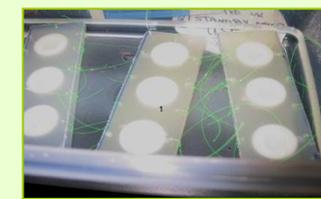
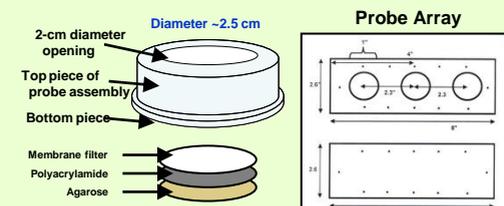
Volunteers in action



Research: Methylmercury (MeHg) in Wetlands of Indiana Dunes National Lakeshore: A Pilot Test of Diffusive Gradients in Thin Films for Monitoring Bioavailable MeHg

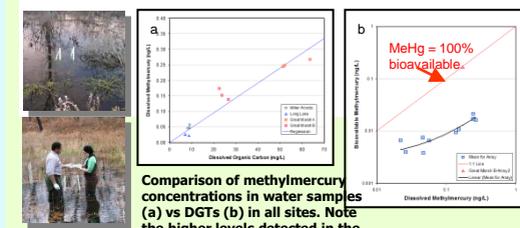
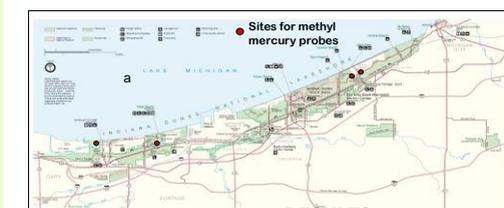
Project Investigator: Robert J.M. Hudson, University of Illinois Urbana Champaign, Illinois; funding from University of Illinois and GLREC; research internship

Thin layer probes consist of one polyacrylamide (0.45 mm) and agarose (0.50 mm) gels and a 0.45 μm membrane filter.



DGT probes* were assembled in the GLREC Field Research Station and installed using PVC poles to support them vertically in four wetland locations, west to east at Indiana Dunes NL in October 2007. They were removed for methyl mercury analysis in November 2007.

*Davison, W. and H. Zhang. 1994. Nature 367:546-548.



Question: What value is the DGT probe for monitoring methyl mercury in wetlands of the Great Lakes region?

Answer: If a non-destructive, easily deployed method can be used as a research tool, then managers can readily collect data on concentrations of bioavailable meHg in the water column. With minimum training managers can assess the environmental condition of wetlands in a region, which may correlate with health of biota. The latter idea needs further investigation.

Education Through Internships:

- This research contributed to training an undergraduate research intern and the development of a M.S. student thesis. The undergraduate research intern produced the diffusive gradient thin films for the M.S. student project.
- Since 2005 the GLREC has supported and funded 40 research internships to provide undergraduate and graduate students in the Great Lakes region the opportunity to obtain experience and help find resource management solutions.