



**LAKE SUPERIOR
STATE UNIVERSITY
OFFICE OF THE PROVOST**

APPLICATION FOR SABBATICAL LEAVE
(Refer to Section 15.4 of the Faculty Association Agreement)

I. Name Ashley Moerke Date 11/1/13
 Department Biological Sciences Ext. No. 2153
 Home Address [REDACTED] Home Phone [REDACTED]

II. Application for leave during the following (*indicate semester and/or year*):

Fall Spring Full Year

III. Number of years of faculty service (*minimum of 5 years required*) 9

IV. Year your tenure at LSSU was earned (*tenure required*) 2008

V. Semester or year of last sabbatical (*if applicable*) NA
 (*minimum of 5 years since last sabbatical required*)

VI. I agree to return to the University and to provide a complete written report (electronic) to the Provost upon the completion of my sabbatical semester(s) as denoted in section 15.4 of the Faculty Associate Contract.

Ashley Moerke 11/13/13
 Signature of Faculty Applicant Date

Provost Office

NOV 14 2013

VII. Signature of your Dean indicating his/her awareness of the application: Lake Superior State University

Barb Keller 11-14-13
 Signature of Dean Date

- VIII. Attachments:
- Title and Description of Sabbatical Project (Required and described on the next page)
 - Support Documents (Optional but strongly suggested)
 - Curriculum Vitae (Required)

Title: Understanding Aquatic Ecosystem Linkages in the Great Lakes Basin: Enhancing LSSU's Research Capacity and Collaborations

I. Executive Summary

Over the past several years, I have been collaborating on two large research projects focusing on aquatic ecosystem linkages and integrity. Both projects will end in 2014/2015 and I would like to dedicate more time to collaborate with external scientists on data analysis and publication. Additionally, I would like to broaden my collaborations by spending part of my sabbatical at the University of Wisconsin's Center for Limnology where I will have the opportunity to engage in leading-edge research and develop proposals for future research. Thus, I am requesting a full year of sabbatical leave, which will allow me to contribute to the scientific field of aquatic ecology, develop new skills, and expand my professional network and research program. My sabbatical activities will benefit LSSU by: 1) strengthening the reputation of Biology faculty as scientists and teachers, 2) incorporating current research and statistical approaches into curricula, 3) creating professional networking opportunities for students, and 4) acquiring additional funding to create new student research experiences.

II. Project Description

Introduction

For nearly the past decade while I have been at LSSU, my research has focused on three areas: 1) aquatic ecosystem linkages, 2) biotic indicators of aquatic ecosystem health, and 3) restoration ecology. During this time, I have received >\$1 million in grant funding which has provided over 90 LSSU students with research experiences; 40 of which were undergraduate thesis projects.

Most recently, I have dedicated tremendous time and effort to understanding two questions:

- 1.) How do tributary streams contribute to productivity of fisheries in nearshore areas of the Great Lakes?, and
- 2.) Can we develop environmental indicators of health for Great Lakes wetlands?

The first question is being addressed by quantifying nutrient and energy contributions from tributary streams to nearshore areas of Whitefish Bay, Lake Superior. We are tracking these contributions over time and across multiple tributaries to further understand the extent and variation of influence. This research will help natural resource managers identify critical ecosystem linkages that "fuel" productivity in nearshore areas, including important commercial fisheries, and help prioritize habitat for protection. This project highlights that population and community-level processes are likely driven by environmental factors operating across a network of ecosystems, which requires managers to protect a complex suite of ecosystems as opposed to focusing on a single ecosystem.

The second question is being addressed by implementing a Great Lakes-wide wetland monitoring program. This program is the first ever basin-wide initiative that uses standardized protocols to collect data on fish, invertebrate, bird, amphibian, and plant communities, along with water quality parameters. Data are collected and analyzed by a consortium of U.S. and Canadian scientists from over eight universities and agencies across the Great Lakes; one of which is LSSU. The result of the large-scale standardized data collection will be a robust and

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sustainable long-term monitoring program that will produce indicators of wetland health. These indicators will allow Great Lakes managers to prioritize wetlands for protection and restoration that will ultimately improve the overall health of the Great Lakes.

Background

Since 2010, I have been working with collaborators, and am currently the lead Principal Investigator, on a three-year study (>\$300,000 in funding to LSSU) to evaluate the influence of river inputs on nearshore productivity in the Great Lakes. I also have been working on a 5-year project that is developing biological indicators of ecosystem health for Great Lakes coastal wetlands. This project is a Great Lakes-wide collaboration with scientists at over eight institutions and agencies, and is the largest Great Lakes Restoration Initiative project funded to date (\$10 million; ~\$300,000 to LSSU; see attachment). Fieldwork for both projects will be complete in 2014 and extensive data analysis and publication preparation will begin in fall 2014.

Data analysis for my multi-collaborator projects will require improved statistical skills. There have been many recent advances in data analysis and statistical programs related to my research areas of interest, but unfortunately I have not been able to keep up to date. Three areas that I would like to gain more knowledge and experience in include: ensemble modeling, indicator development, and the free-ware statistical program R. Ensemble modeling (*sensu* Gardmark et al. 2013) is a new technique that composites multiple species distribution models to explain changes in communities as a result of changing environmental conditions (e.g., climate change). Indicator development is an approach that uses biotic community data across a range of environmental conditions (e.g., degraded to healthy) to develop indices that reflect the range of conditions in unmeasured ecosystems. Indicators of healthy wetland communities have been developed for fish communities, but the indices require refinement and expansion (Uzarski et al. 2005). Finally, the statistical program R is an open source statistical package that is emerging as the data analysis software of choice by academic researchers (and their graduate students). All three of these approaches are receiving increased attention in the literature and are relevant to my research areas, and therefore I am planning to use the sabbatical leave to hone these skills so they can be applied to my current research projects and classes.

In addition to acquiring the knowledge of these analyses, it will be important for me to have time to meet with collaborators and explore ideas for data analysis and publication. I have strong working relationships with my existing collaborators, which include scientists at Central Michigan University, University of Notre Dame, Grand Valley State University, University of Minnesota-Duluth, and Bay Mills Indian Community, and I plan to meet in-person with these collaborators to maximize the strength of our final research products. Specifically, I will spend one to three weeks each working with researchers at the University of Notre Dame (Dr. Gary Lamberti and Matt Cooper) and Central Michigan University (Dr. Don Uzarski) on publications related to existing grants, as well as proposals for future research.

I also would like to increase my professional network by building new collaborations and avenues for future research. To do this, Dr. Pete McIntyre and his colleagues at the Center for Limnology (UW-Madison) have agreed to host me for a 2-3 month visit. Dr. McIntyre is not currently a collaborator on a funded project, but our research interests align closely and we are interested in developing proposals for future research. While at UW-Madison, Dr. McIntyre and I will explore opportunities to integrate our data that addresses aquatic ecosystem linkages questions. Specifically, we will propose further research on linkages between Great Lakes tributaries and

nearshore areas/bays and the importance of these linkages for maintaining diversity and productivity in both ecosystems, as well as being an avenue for non-native species and contaminant dispersal. This research has implications for management, particularly prioritizing barrier removals on Great Lakes tributaries and river restoration projects. Additionally, I have been very interested in using landscape characteristics to predict patterns in stream fish communities in changing landscapes. For the past few years, I have been working with a state dataset of Michigan fishes trying to understand future water withdrawal impacts on life history characteristics of fishes. Dr. McIntyre and I also have discussed putting together a publication or two in collaboration with him and other Center for Limnology researchers. My stay at the Center for Limnology will also introduce me to other world-renown limnologists that will hopefully serve as future collaborators and graduate advisors to our LSSU students.

Outcomes

1. Update and strengthen skills in new statistical programming and data analysis approaches
 - a. Learn R programming via an on-line course or a short course available at UW-Madison (*Outcome: new skill acquired to incorporate into Biology curriculum and apply to current research projects*)
 - b. Learn and apply ensemble model approaches and indicator development analyses through readings and collaborations with Central Michigan University and UW-Madison researchers (*Outcome: new skill acquired to incorporate into Biology curriculum and apply to current research projects*)
2. Exchange ideas and data to enhance scientific understanding on ecosystem linkages in the Great Lakes basin through continued collaborations with University of Notre Dame (UND) researchers and new collaborations with UW Madison's Center for Limnology (CFL) researchers
 - a. Analyze and publish findings on a GLRI-funded project ending in 2014 evaluating the role of Great Lakes tributary inputs on lake whitefish production in nearshore areas of Lake Superior (in collaboration with Bay Mills Indian Community and USGS researchers) (*Outcome: 1-2 peer-reviewed publications with 1-2 LSSU student co-authors*)
 - b. Analyze and publish findings on a second GLRI-funded project ending in 2014 evaluating the role of coastal wetlands to maintaining biodiversity in the Great Lakes basin (in collaboration with Central Michigan University and University of Notre Dame) (*Outcome: 1-2 peer-reviewed publications with two LSSU student co-authors*)
3. Expand collaborations and build additional avenues for research in aquatic ecology, while creating more LSSU student research opportunities and enhancing the ARL's reputation as a productive research facility
 - a. Collaborate with CFL researchers to improve models used to prioritize barrier removals on Great Lake streams by integrating data on salmon as vectors of contaminants (from GLFT-Notre Dame project) into CFL's landscape models (*Outcome: publication*)
 - b. Collaborate with UND and CFL researchers on additional proposals to understand fish movement and energy transfer between Great Lakes tributaries and nearshore areas (*Outcome: proposal submitted to NSF*)
 - c. Work with McIntyre to revise and submit a proposal to enhance the region's capacity to study stream-Great Lakes linkages (proposal titled "GLASS: Great Lakes and Small Streams") (*Outcome: proposal submitted to USGS or USFWS*)

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Timeline

September – October 2014

1. Present preliminary research findings on coastal wetlands research at American Fisheries Society meeting in Quebec City, Quebec
2. Complete an on-line course on R or enroll in short course at UW-Madison
3. Begin preliminary data analysis on Whitefish Bay and Coastal Wetlands projects; Visit Central Michigan University (host-Dr. Don Uzarski)

November – February 2015

1. Collaborate with UW-Madison's Center for Limnology researchers–Dr. Pete McIntyre (host)
2. Complete Whitefish Bay analyses and submit publication(s)
3. Submit 1-2 collaborative proposals on ecological linkages
4. Participate in CFL seminars and McIntyre lab meetings
5. Give a CFL seminar
6. Guest lecture in Limnology or Fish Ecology course

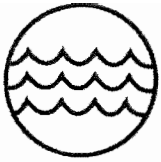
March 2015 – May 2015

1. Visit University of Notre Dame (host-Dr. Gary Lamberti) and complete Coastal Wetlands analyses and submit publication (s)
2. Present Coastal Wetlands research at Society for Freshwater Science meeting in Milwaukee, WI

Literature Cited

Gardmark, A., M. Lindegren, S. Neuenfeldt, T. Blenckner, O. Heikinehimo, B. Muller-Karulis, S. Niiranen, M. Tomczak, E. Aro, A. Wikstrom, and C. Mollmann. 2013. Biological ensemble modeling to evaluate potential future of living marine resources. *Ecological Applications* 23:742-754.

Uzarski, D.G., T.M. Burton, M.J. Cooper, J.W. Ingram, and S.T. Timmermans. 2005. Fish habitat use within and across wetland classes in coastal wetlands of the five Great Lakes: Development of a fish-based index of biotic integrity. *Journal of Great Lakes Research* 31:171-187.



Center for Limnology
University of Wisconsin

14 November 2013

Provost Morrie Walworth
Office of the Provost
Lake Superior State University
650 W. Easterday Ave.
Sault Sainte Marie, MI 49783

Dear Provost Walworth and LSSU Sabbatical Committee:

I am writing in support of Dr. Ashley Moerke's application for sabbatical leave for the next academic year (2014-2015). If Ashley is awarded sabbatical, I have agreed to host her at the University of Wisconsin's Center for Limnology (CFL). The CFL is a world-renowned facility providing leading research on freshwater ecosystems. The CFL has five principal investigators and over 40 affiliated staff and graduate students, which will provide a highly engaging environment for Ashley.

For many years, Ashley and I have been working on parallel research assessing linkages between tributaries and nearshore areas of the Great Lakes. Her visit will provide more formal opportunities to exchange ideas, integrate data, and develop research proposals. Ashley's visit to the CFL is tentatively scheduled to last approximately 3 months from December to February. During her visit, Ashley will have assigned desk space at the CFL and she will be involved in my lab meetings, give a research seminar, and provide guest lectures in courses at UW-Madison.

Ashley's request for a sabbatical stay was discussed by all of the principal investigators in the CFL, and we are enthusiastic about hosting her. I look forward to future collaborations with Ashley, which will be greatly facilitated by her sabbatical stay in Madison.

Sincerely,

Peter McIntyre
Assistant Professor of Zoology

ASHLEY H. MOERKE

School of Biological Sciences
Lake Superior State University
Sault Sainte Marie, MI 49783

Phone: (906) 635-2153
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Education

- Ph.D. 2004 Department of Biological Sciences, University of Notre Dame
Dissertation: Landscape influences on stream ecosystems: Implications for restoration and management
Advisor: Dr. Gary A. Lamberti
- M.S. 2000 Department of Biological Sciences, University of Notre Dame
Thesis: Physical and biological responses to restoration of two Indiana streams
Advisor: Dr. Gary A. Lamberti
- B.S. 1996 Department of Biology, University of Minnesota-Duluth, cum laude

Research Interests

Stream and river ecology; coastal wetland ecology, fisheries and macroinvertebrate ecology; restoration ecology; aquatic ecosystem linkages; watershed ecology and management

Professional Experience

- 2008 – present *Associate Professor & Co-Director of the Aquatic Research Laboratory, Lake Superior State University*
- 2004 – 2008 *Assistant Professor & Co-Director of the Aquatic Research Laboratory, Lake Superior State University*
- 2001 – 2004 *Life Scientist, U.S. Environmental Protection Agency, Region 5*
- 2000 – 2004 *Graduate Research Fellow, Department of Biological Sciences, University of Notre Dame*

Courses Taught

Limnology	Principles of Watersheds
Aquatic Entomology	Junior Seminar (Senior Thesis sequence)
Animal Behavior	Introduction to Fisheries & Wildlife
Careers in Natural Resources	Restoration of Aquatic Ecosystems
Restoration Ecology	
Ecology and Management of Sub-Saharan Africa (Study abroad)	
Great Lakes Ecology and Sustainability (Honors; tall ship sail in Lake Michigan)	

Grants & Contracts

National Oceanic and Atmospheric Administration, Great Lakes Restoration Initiative.
Ecological responses to restoration of flow to the Little Rapids area. 2014-2015, \$81,500.

- Great Lakes Commission. St. Marys River Remedial Action Plan: Establishing a biological baseline for the Little Rapids restoration. 2013-2014, \$13,861.
- Great Lakes Fishery Trust. Conservation of native fish communities in tributaries to the Great Lakes: Predicting the impacts of contaminants delivered by spawning Pacific salmon. Co-PIs: D.Chaloner (lead), G. Lamberti, D. Janetski, and R. Rediske; 2013-2015, \$220,842.
- US Fish and Wildlife Service. Sea lamprey control efforts in the St. Marys River. 2005-present. \$6300-6500 annually.
- Bay Mills Indian Community. Benthic macroinvertebrate processing. 2007-present. Contract ~\$4000 annually.
- The Nature Conservancy, Great Lakes. Effects of culvert replacement on stream connectivity in the South Branch of the Two Hearted River. 2012-2013, \$3012
- NOAA Great Lakes Habitat Restoration Program. 2011-2012. Little Rapids engineering and design study. Co-PI: Jeff Hagan (lead) and 6 others; \$347,568 (\$28,000 to Moerke).
- US Bureau of Indian Affairs, Great Lakes Restoration Initiative. Linkages between tributaries and Whitefish Bay and their significance for whitefish management. Co-PIs: Paul Ripple, K. Arend, N. Kirkpatrick, G. Steinhart, P. Varnakovida; 2011-2014; \$211,297.
- US Environmental Protection Agency, Great Lakes Restoration Initiative. GLIC Implementing Great Lakes coastal wetland monitoring. Co-PIs: Don Uzarski (lead) and 9 others; 2011-2015, \$10,000,000 (\$248,730 to Moerke).
- US Environmental Protection Agency. St. Marys River monitoring for TMDL development. Co-PIs: G. Steinhart, B. Keller, and J. Westrick; 2010-2011, \$201,500.
- Michigan Department of Natural Resources and Environment. Exploratory freshwater mussel surveys in streams of the central and western Upper Peninsula; 2010-2011, \$26,750.
- Michigan Department of Natural Resources. Effects of temperature on functional relationships among Michigan's fluvial fish assemblages: identifying management opportunities in the face of environmental changes. Co-PIs: D. Infante (lead), C. Huckin, and T. Brenden; 2009-2011, \$46,900.
- US Army Corp of Engineers Research Cooperative Agreement. St. Marys River Coordinator and Working Group for the International Upper Great Lakes Study. Co-PIs: Mark Bain (lead), K. Arend, and G. Steinhart; 2009-2010, \$33,600.
- Great Lakes Fishery Commission. Publication of a guide titled "Identification of Michigan Fishes Using Cleithra". Co-PIs: D. Traynor, R. Greil. 2009. Approx. \$16,000 (paid for directly by the GLFC).
- Great Lakes Fishery Trust. Impacts of introduced Pacific salmon on ecological communities of Great Lakes tributaries. Co-PIs: G. Lamberti (lead) and D. Chaloner; 2007-2009, \$150,635.
- WE Mitigation and Enhancement Fund. A legacy of logging in the Iron River watershed? An evaluation of long-term sediment deposition in the Iron River. Co-PIs: A. Selle (lead), M. Mylchreest; 2009-2010, \$28,000.
- Northbrook Energy Research Grant. Distribution and habitat requirements of freshwater mussels within the Little Quinnesec Hydroelectric Project and adjoining waters. Co-PIs: A. Selle, J. Mistak, R. Piette; 2009-2013, \$27,470.
- WE Mitigation and Enhancement Fund. Distribution and habitat requirements of freshwater mussels in wadeable streams of the Upper Menominee River Basin. Co-PIs: A. Selle, P. Badra, J. Mistak; 2008-2010, \$107,585.
- USDA Wildlife Services. Diet analysis of double-crested cormorants. 2006-2007. \$23,300.
- National Fish and Wildlife Foundation. Lake sturgeon tracking in the St. Marys River, MI. Co-

- PIs: S. Koproski (lead), R. Greil, P. Ripple; 2005-2007, \$36,000.
Huron Mountain Wildlife Foundation. Headwater stream food webs in the Huron Mountain region. Co-PIs: S. Eggert (lead) and R. Stelzer; 2006-2007, \$13,000.
U.S. Environmental Protection Agency-Great Lakes National Program Office. Biotic integrity and habitat assessment within the St. Marys River AOC. Co-PIs: M. Werner (lead), B. Evans, B. Keller, J. Westrick, and G. Zimmerman; 2004-2006, \$713,000.
Indiana Water Resources Research Center. Restoration of Indiana streams: A comparison of restoration strategies at a statewide level. Co-PI: G. Lamberti; 2000-2001, \$14,000.

Honors

- LSSU Distinguished Teaching Award (2012)
Michigan Distinguished Professor of the Year, Nominee (2012)
Excellence in Academic Advising Award (2011); awarded to one professor each year by an LSSU Committee based on student, faculty, and alumni nominations (award began in 2010).
COSEE Scientist, selected for Lake Guardian workshop on Lake Superior, Aug 2011
Profiled in *The Siscowette*, Aug 2010 issue.
Golden Anchor Award, LSSU (2004-2005, 2009-2010, 2011-2012).
Water Guardian Award, East Mackinaw/Chippewa County Conservation District (2007).
Dissertation Initiative for the Advancement of Limnology and Oceanography (DIALOG) Symposium, selected participant (2005).
Graduate Teaching Achievement Award, Department of Biological Sciences, University of Notre Dame (2004)
North American Benthological Society Presidents' Award (2004).
Superior Accomplishment Recognition Award, USEPA (2004).
Warner-Lambert Fellowship (2003-2004).
Bayer Doctoral Research Fellowship (2002-2003).
Associate Fisheries Professional Certification, American Fisheries Society (2003).
Special Accomplishment Recognition Award, USEPA (2003).
John A. Kaneb Outstanding Teaching Assistant Award (2001).
National Science Foundation Graduate Research Traineeship (2000-2001).

Publications (*undergraduate student)

- Janetski, D., D. Chaloner, A. Moerke, P. Levi, and G. Lamberti. In revision. Novel environmental conditions alter subsidy and engineering effects by introduced Pacific salmon. *Canadian Journal of Fisheries and Aquatic Sciences*.
- Janetski, D., D. Chaloner, A. Moerke, R. Rediske, J. O'Keefe, and G. Lamberti. 2012. Resident fishes display elevated organic pollutants in salmon spawning streams of the Great Lakes. *Environmental Science & Technology*. Doi:10.1021/es301864k
- Lauer, T.E., and A.H. Moerke. 2012. Converting your dissertation to a journal manuscript: Guidance to students and mentors for removing impediments and promoting success. Pages 111-119 in C.A. Jennings, T.E. Lauer, and B. Vondracek, editors. *Scientific Communication for Natural Resource Professionals*. American Fisheries Society, Bethesda, MD.
- Marklevitz, S., B. Fryer, D. Gonder, Z. Yang, J. Johnson, A. Moerke, and Y. Morbey. 2011. Use of otolith chemistry to discriminate juvenile Chinook salmon (*Oncorhynchus tshawytscha*) from different wild populations and hatcheries in Lake Huron. *Journal of Great Lakes Research* 37(4):698-706.

- Bauman, J.*, A. Moerke, R. Greil, B. Gerig*, E. Baker, and J. Chiotti. 2011. Population assessment of lake sturgeon in the St. Marys River, MI. *Journal of Great Lakes Research* 37(Suppl. 2):47-53. (Top 25 cited article in JGLR 2011)
- Collins, S.*, A. Moerke, D. Chaloner, D. Janetski, and G. Lamberti. 2011. Response of dissolved nutrients and periphyton to spawning Pacific salmon in three northern Michigan streams. *Journal of the North American Benthological Society* 30(3):831-839.
- Gerig, B.*, A. Moerke, R. Greil, and S. Koproski. 2011. Movement patterns and habitat characteristics of lake sturgeon (*Acipenser fulvescens*) in the St. Marys River. *Journal of Great Lakes Research* 37(Suppl. 2):54-60.
- Keller, B., R. Back, J. Westrick, M. Werner, B. Evans, A. Moerke, G. Zimmerman, D. Wright, E. Grenfell*, and J. Courneya*. 2011. Sediment quality at selected sites in the St. Marys River. *Journal of Great Lakes Research* 37(Suppl. 2):12-20. (Top 25 cited article in JGLR 2011)
- Moerke, A.H. and R. M. Werner. 2011. Ecological status of the St. Marys River: Foreword. *Journal of Great Lakes Research*. <http://dx.doi.org/10.1016/j.jglr.2011.03.018>
- Turschak, B.*, A. Moerke, and B. Evans. 2011. Spatial and seasonal changes in the zooplankton community of the St. Marys River. *Journal of Great Lakes Research* 37(Suppl. 2):21-27. (Top 25 cited article in JGLR 2011)
- Janetski, D.J., A.H. Moerke, D.T. Chaloner, and G.A. Lamberti. 2011. Spawning salmon increase brook trout movements in a Lake Michigan tributary. *Ecology of Freshwater Fish*. doi: 10.1111/j.1600-0633.2010.00479.x
- Aumen, N.G., M.E. Gurtz, M.T. Barbour, and A.H. Moerke. 2010. BRIDGES: Evolution of basic and applied linkages in benthic science. *Journal of the North American Benthological Society* 29(1):359-371.
- Dorr, B.S., A. Moerke, M. Bur, C. Bassett, T. Aderman, D. Traynor, R. Singleton, P. Butchko, J. Taylor. 2010. Evaluation of harassment of migrating Double-Crested Cormorants to limit depredation on selected sport fisheries in Michigan. *Journal of Great Lakes Research* 36:215-223.
- Traynor, D., A. Moerke, and R. Greil. 2010. Identification of Michigan fishes using cleithra. *Great Lakes Fish. Comm. Misc. Publ.* 2010-02.
- Harrison, J., J.H. Cohen, E. Hinchey, A. Moerke, and P. vonDassow. 2009. Getting the word out and making a difference: Maximizing outreach efforts from the perspective of early-career scientists. *Eos (AGU)* 90(38):333-334.
- Harriger, K.*, A. Moerke, and P. Badra. 2009. Distribution and demographics of freshwater mussels (Unionidae) in a 1st-order Michigan stream. *Michigan Academician* XXXIX:149-162.
- Moerke, A.H. and A. Roy. 2009. Editorial: The future of BRIDGES. *Journal of the North American Benthological Society* 28: 271–272.
- Moerke, A. and G. A. Lamberti. 2006. Scale-dependent controls of water quality, habitat, and fish communities in Michigan (USA) streams. *Aquatic Sciences* 68(2):193-205.
- Rosi-Marshall, E., A. Moerke, and G. Lamberti. 2006. Ecological responses to rehabilitation of a northern Michigan trout stream. *Environmental Management* 38(1):99-107.
- Moerke, A.H. and G.A. Lamberti. 2006. Effects of watershed land use on stream ecosystems: A multi-stream assessment in the midwestern U.S. Pages 323-338 in R. M. Hughes, L. Wang, and P. W. Seelbach, editors. *Landscape influences on stream habitats and biological assemblages*. American Fisheries Society Symposium 48, Bethesda, Maryland.
- Moerke, A.H., K.J. Gerard, J.A. Latimore, R.A. Hellenthal, and G.A. Lamberti. 2004.

- Restoration of an Indiana, USA, stream: Bridging the gap between applied and basic lotic ecology. *Journal of the North American Benthological Society* 23:647-660.
- Moerke, A.H. and G.A. Lamberti. 2004. Restoring stream ecosystems: Lessons from a midwestern state. *Restoration Ecology* 12:327-334. (Ranked in the top 3 of most accessed *Restoration Ecology* articles in 2004).
- Tillman, D.C., A.H. Moerke, C.L. Ziehl, and G.A. Lamberti. 2003. Subsurface hydrology and degree of burial affect mass loss and invertebrate colonization of leaves in a woodland stream. *Freshwater Biology* 48:98-107.
- Moerke, A.H. and G.A. Lamberti. 2003. Responses in fish community structure to restoration of two Indiana streams. *North American Journal of Fisheries Management*. 23:748-759

Professional Presentations (past 5 years; *undergraduate student)

- Mockler, D.*, K. Arend, A. Moerke, G. Steinhart, and P. Ripple. Determining if tributaries contribute energy and nutrient inputs to lake whitefish in nearshore areas of Whitefish Bay, Lake Superior, MI. International Association of Great Lakes Research, May 2013, West Lafayette, IN. (Poster)
- Osga, J.*, C. Holbrook, and A. Moerke. Changes in the spatial distribution of spawning sea lamprey (*Petromyzon marinus*) in the St. Marys River. International Association of Great Lakes Research, May 2013, West Lafayette, IN. (Poster)
- Tucker, S.*, T. Pine*, and A. Moerke. Evidence of natural reproduction of lake sturgeon in the St. Marys River and its tributaries. International Sturgeon Coordination Meeting, Dec. 2012, MI. (Poster)
- Dumke, J., V. Brady, R. Hell, A. Moerke, C. Ruetz, D. Uzarski, J. Gathman, and J. Ciborowski. A Comparison of St. Louis estuary and upper Great Lakes fish communities. MN American Fisheries Society annual meeting, 2013. (Poster)
- Elya, M.*, A. Moerke, and M. Brueseke. Comparison of nutrient excretion rates of native and non-native migratory fishes in Great Lakes tributaries. MI American Fisheries Society annual meeting, Feb. 2013, Gaylord, MI. (Poster)
- Kirby, F.*, T. Wills, and A. Moerke. Colonization of a brook trout (*Salvelinus fontinalis*) stream by introduced brown trout (*Salmo trutta*). MI American Fisheries Society annual meeting, Feb. 2013, Gaylord, MI. (Poster)
- Osga, J.*, C. Holbrook, and A. Moerke. Changes in the spatial distribution of adult sea lamprey (*Petromyzon marinus*) in the St. Marys River before, during, and after spawning. MI American Fisheries Society annual meeting, Feb. 2013, Gaylord, MI. (Poster – awarded **Best Student Poster**)
- Ransom, J.T.* and A. Moerke. Impacts of non-native salmonids on resident stream fish communities after barrier removal. American Fisheries Society, August 2012, Minneapolis, MN. (Poster)
- Chaloner, D., D. Janetski, A. Moerke, R. Rediske, J. O’Keefe, and G. Lamberti. The bad along with the good: Contaminant transport to stream ecosystems by Pacific salmon. Society for Freshwater Sciences, May 2012, Louisville, KY. (Oral)
- Riley, J.*, A. Moerke, and T. Zorn. Relationships between hydrological regime and life history traits of stream fishes. Society of Freshwater Sciences annual conference, May 2012, Louisville, KY. (Poster)
- Marshall, B.* and A.H. Moerke. Effects of spawning salmon on the emergence of aquatic insects.

- MI-WI American Fisheries Society annual meeting, Feb. 2012, Menominee, MI. (Poster)
- Riley, J.*, *A. Moerke*, and T. Zorn. Does the physical environment of a stream favor certain life history attributes of fishes? MI-WI American Fisheries Society annual meeting, Feb. 2012, Menominee, MI. (Poster)
- Chambers, A.* and *A. Moerke*. Status, distribution, and environmental factors limiting brook trout in Cheney Creek, MI. MI-WI American Fisheries Society annual meeting, Feb. 2012, Menominee, MI. (Poster)
- Crane, J.*, *A. Moerke*, and G. Zimmerman. Relationship between nutrients and dominance of *Typha* spp. in restored Iowa wetlands. Midwest Fish and Wildlife Conference, Dec. 2011, Ames, IA. (Poster)
- Marshall, B.* and *A. Moerke*. Effects of spawning salmon on the emergence of aquatic insects in a Michigan stream. Midwest Fish and Wildlife Conference, Dec. 2011, Ames, IA. (Poster)
- Zellinger, J.* and *A. Moerke*. Habitat use by brook and brown trout in a small Michigan stream. Midwest Fish and Wildlife Conference, Dec. 2011, Ames, IA. (Poster)
- Moerke, A.* Influence of Pacific salmon on Great Lakes streams: Potential ecological costs to restoring connectivity. Aquatic Connectivity Workshop, Dec. 2011, Menominee, MI. (Oral)
- Turschak, B.*, *A. Moerke*, and B. Evans. Spatial and seasonal patterns in the crustacean zooplankton community of the St. Marys River. International Association of Great Lakes Research, June 2011, Duluth, MN. (Oral)
- Lamberti, G., D. Janetski, D. Chaloner, *A. Moerke*, S. Tiegs, E. Campbell, J. Ruegg, and R. Merritt. Biodiversity of Pacific salmon streams in native and introduced ranges. North American Benthological Society, May 2011, Providence, Rhode Island. (Oral)
- Kosiara, J.*, *A. Moerke*, D. Janetski, D. Chaloner, and G. Lamberti. Introduced Pacific salmon spawners disturb benthic algae in a Michigan stream. North American Benthological Society, May 2011, Providence, Rhode Island. (Oral)
- Moerke, A.* and R. Cross*. Barriers preserve upstream fish communities from non-native salmonid invasions in Great Lakes tributaries. North American Benthological Society, May 2011, Providence, Rhode Island. (Poster)
- Cross, R.*, and *A. Moerke*. The role of barriers in protecting native fish communities from upstream invasions. MI American Fisheries Society, April 2011, Petoskey, MI. (Poster – awarded **Best Student Poster**)
- Kosiara, J.*, *A.H. Moerke*, R. Gay*, D.J. Janetski, D.T. Chaloner, and G.A. Lamberti. Disturbance effects of Pacific salmon on benthic communities in Great Lakes tributaries. MI American Fisheries Society, April 2011, Petoskey, MI. (Oral)
- Marshall, B.*, and *A. Moerke*. Effects of spawning salmon on the emergence of aquatic insects in a Michigan stream. MI American Fisheries Society, April 2011, Petoskey, MI. (Poster)
- Zellinger, J.*, and *A. Moerke*. Habitat use by brook and brown trout in a small Michigan stream. MI American Fisheries Society, April 2011, Petoskey, MI. (Poster)
- Kosiara, J.*, *A.H. Moerke*, D.J. Janetski, D.T. Chaloner, and G.A. Lamberti. Disturbance of benthic algae by spawning Pacific salmon in Thompson Creek, Michigan. Midwest Fish and Wildlife Conference, Dec. 2010, Minneapolis, MN. (Oral)
- Janetski, D.J., D.T. Chaloner, *A.H. Moerke*, and G.A. Lamberti. Ecosystem effects of Pacific salmon spawners in a Great Lake tributary. American Fisheries Society annual meeting, Sept. 2010, Pittsburg, PA. (Oral)
- Moerke, A.H.*, J. Kosiara*, R.A. Gay*, E.M. Kratschmeyer, D.J. Janetski, D.T. Chaloner, and G.A. Lamberti. Disturbance effects of introduced salmon on biofilm and macroinvertebrates

- in Great Lakes tributaries. North American Benthological Society annual meeting, June 2010, Santa Fe, NM. (Oral)
- Janetski, D.J., D.T. Chaloner, *A.H. Moerke*, and G.A. Lamberti. Ecosystem effects of Pacific salmon spawners in a Great Lake tributary. North American Benthological Society annual meeting, June 2010, Santa Fe, NM. (Oral)
- Eggert, S.L., *A.H. Moerke*, R.S. Stelzer, and R.K. Kolka. Invertebrate communities associated with wood in headwater streams of the Huron Mountains, MI. North American Benthological Society annual meeting, June 2010, Santa Fe, NM. (Poster)
- Chaloner, D.T., D.J. Janetski, *A.H. Moerke*, and G.A. Lamberti. Ecological effects of Pacific salmon spawners on Great Lakes ecosystems. International Association of Great Lakes Research conference, May 2010, Toronto, ONT. (Oral)
- Gay, R.A.* , *A.H. Moerke*, D.J. Janetski, D.T. Chaloner, and G.A. Lamberti. Effect of Pacific salmon on aquatic macroinvertebrate drift in Great Lakes tributaries. Michigan American Fisheries Society annual meeting, March 2010, Gaylord, MI. (Poster)
- Chambers, A.* , *A. Moerke*, J. Mistak, R. Piette, and A. Selle. A comparison of freshwater mussel communities above and below the Little Quinnesec Dam on the Menominee River. Michigan American Fisheries Society annual meeting, March 2010, Gaylord, MI. (Poster)
- Kosiara, J.* , *A.H. Moerke*, D.J. Janetski, D.T. Chaloner, and G.A. Lamberti. Disturbance of benthic algae by spawning Pacific salmon in Thompson Creek, Michigan. Michigan American Fisheries Society annual meeting, March 2010, Gaylord, MI. (Poster – awarded **Best Student Poster**)
- Kratschmer, E.M.* , D.J. Janetski, D.T. Chaloner, *A.H. Moerke*, and G.A. Lamberti. Disturbance effects of Pacific salmon spawning on benthic communities in Upper Great Lakes tributaries. Michigan American Fisheries Society annual meeting, March 2010, Gaylord, MI. (Oral)
- Moerke, A.H.* Effects of spawning Pacific salmon on Great Lakes tributaries. Invited Speaker, Great Lakes Forestry Centre, January 19, 2010, Sault Sainte Marie, Ontario.
- Harriger, K.* , J. Johnson* , *A. Moerke*, and P. Badra. Freshwater mussel distribution in Michigan Upper Peninsula watersheds. Freshwater Mollusk Conservation Society meeting, April 2009, Baltimore, MD. (Poster)
- Moerke, A.* Pacific salmon influences on Great Lakes tributaries. Department of Wildlife and Department of Conservation Biology Seminar Series, Oct 2009, University of Maine, Orono, ME, October 2009. (Invited oral)
- Moerke, A.* River restoration in the United States: Current practices and case studies. University of Shiga International Seminar, University of Shiga Prefecture, August 2009, Hikone, Japan. (Invited oral)
- Moerke, A.* Restoring and conserving freshwater ecosystems in the Midwestern United States: from populations to watersheds. Aug 2009, Aqua Restoration Research Centre, Gifu Prefecture, Japan (Invited oral).
- Janetski D.J., D.T. Chaloner, *A.H. Moerke*, and G.A. Lamberti. The role of environmental context on salmon-benthos interactions in Great Lakes tributaries. North American Benthological Society annual meeting, Grand Rapids, MI, May 2009.
- Kratchmer, T.* , T. Spear, D.J. Janetski, D.T. Chaloner, *A.H. Moerke*, and G.A. Lamberti. Salmon spawning reduces benthic macroinvertebrate density and diversity in Great Lakes tributaries. North American Benthological Society annual meeting, Grand Rapids, MI, May 2009. (Poster)
- Zomer, F.* and *A. Moerke*. Use of artificial habitat structures by benthic algae,

- macroinvertebrates and fishes. Midwest Fish and Wildlife Conference, Dec 2008, Columbus, OH. (Oral)
- Harriger, K.* and *A. Moerke*. Freshwater mussel distribution and demographics in relation to microhabitat in a Michigan stream. Midwest Fish and Wildlife Conference, Dec 2008, Columbus, OH. (Poster)
- Traynor, D.J.*, *A. Moerke*, R. Greil, M. Bur, and J. Jones. Improved diet analyses through the use of fish cleithra. Midwest Fish and Wildlife Conference, Dec 2008, Columbus, OH. (Poster)
- Janetski, D.J., D.T. Chaloner, *A.H. Moerke*, S.F. Collins*, and G.A. Lamberti. Impacts of introduced Pacific salmon on ecological communities in Great Lakes tributaries. Great Lakes Fishery Trust special event, 10 Oct 2008, Traverse City, MI. (Poster)
- Moerke, A.H.* Incorporating service learning into higher education to address water resource issues. North American Benthological Society annual conference, May 2008, Salt Lake City, UT. (Oral)
- Collins, S.F.* , *A.H. Moerke*, D.J. Janetski, D.T. Chaloner, and G.A. Lamberti. Effects of spawning Pacific salmon on water chemistry and algal biomass in three Upper Peninsula streams. Michigan American Fisheries Society annual meeting, Sault Sainte Marie, MI, March 2008. (Oral – awarded **Best Student Paper**)
- Johnson, J.* , P. Badra, and *A. Moerke*. Relationships between freshwater mussel distribution and landscape variables in northern Michigan streams. Michigan American Fisheries Society annual meeting, Sault Sainte Marie, MI, March 2008. (Oral)
- Gerig, B.* , *A. Moerke*, R. Greil, and S. Koproski. Current status of the St. Marys River lake sturgeon: Where do we go from here? Michigan American Fisheries Society annual meeting, Sault Sainte Marie, MI, March 2008. (Poster)
- Jerome, C.* , J. Chiotti, and *A. Moerke*. The effect of panfish predation on the milfoil weevil in two Michigan lakes. Michigan American Fisheries Society annual meeting, Sault Sainte Marie, MI, March 2008. (Poster)
- Pumfery, M.* , D. Traynor, *A. Moerke*, R. Greil, C. Bassett, and T. Aderman. Diet analysis of double-crested cormorants on Brevoort Lake, MI. Michigan American Fisheries Society annual meeting, Sault Sainte Marie, MI, March 2008. (Poster)
- Traynor, D. J., *A. Moerke*, R. Greil, M. Bur, and J. Jones. Improved diet analyses through the use of fish cleithra. Michigan American Fisheries Society annual meeting, Sault Sainte Marie, MI, March 2008. (Poster)
- Janetski, D.J., D.T. Chaloner, *A.H. Moerke*, S.D. Tiegs, and G.A. Lamberti. Assessing the influence of introduced Pacific salmon on Great Lakes tributaries: Implications from a quantitative review. Michigan American Fisheries Society annual meeting, Sault Sainte Marie, MI, March 2008. (Oral)

Professional Affiliations

American Fisheries Society

Society for Freshwater Science (formerly known as the North American Benthological Society)

Service

Member, 2015 Society for Freshwater Science Annual Meeting Planning Committee (2013-present)

Associate Editor (Co-editor of BRIDGES), Freshwater Science (formerly Journal of the North

American Benthological Society) (2006-present)
Mentor, AFS Hutton Junior Fisheries Biology Program (2005, 2013).
Search Committee, Michigan Department of Natural Resources Marquette Research Station
Manager (2012-2013)
Member, 2016 Midwest Fish and Wildlife Conference Steering Committee (2012-present)
Board Member, Little Traverse Conservancy (2010-present)
Advisor, LSSU Fisheries and Wildlife Student Organization (Student Chapter of AFS) (2005-
2009, 2013-present). Group awarded AFS Outstanding Student Sub-unit award, 2009 and
2013; and regional awards, 2007, 2008.
Guest Editor, special issue on the St. Marys River in Journal of Great Lakes Research (2009-
2011)
University Committees, Scholastic Standards (2011-present), Senior Thesis Seminar Committee
(2005-present), Departmental Website Committee (2010-present), Foundation Director
Search Committee (2008-2009), Provost and VPAA Search Committee (2007-2008), New
Faculty Development (2007-2008), Institutional Animal Care and Use (2005-2009), Fisheries
and Wildlife Curriculum Review (2006-present), Dean Search Committee (2007), Faculty
Search Committees (2004-2005, 2008-2009, 2013-present).
Executive Committee, North American Benthological Society (2001-2002, 2004-2007).
Graduate Committee member— M.S. student, Oakland University (2012-present); M.S. student,
Northern Michigan University (2010-present); Ph.D. student, Laurentian University (2006-
2009).
Reviewer, Janice Fenske Memorial Award Committee (2008-2010, 2012)
Reviewer for NSF grants, Freshwater Biology, North American Journal of Fisheries
Management, Restoration Ecology, Environmental Management, Frontiers of Ecology, River
Research and Applications, Landscape Ecology, Aquatic Sciences, and Ecology journals
(1999-present).
Outreach Activities - Sault High National Ocean Science Bowl Coach (2010-present), EUP
College Fair (2012), Envirothon Resource Professional (2008, 2012), Shiga Japanese
program (2005-2012), USFWS Children in Nature Speaker (2010), Occupation Education
Day volunteer (2008-2010), Gear Up program (2009), LSSU High School Ecology Camp
(2005-2008, 2010), LSSU High School Fisheries Camp (2013), YMCA Science Camp
(2005-2007).

Senior Thesis Students Advised (*presented at scientific conference, ^submitted for
publication/published)

Curell, B. Current. – Effects of disturbance frequency on macroinvertebrate communities in
coastal wetlands. *Received LSSU Undergraduate Research Award*
Baldwin, R. Current. – Resistance and resilience of macroinvertebrate communities to wave
disturbances in coastal wetlands. *Received LSSU Undergraduate Research Award*
Price, G. Current. Contaminant loads in semi-aquatic mammals in relation to salmon spawning
runs. – *Received LSSU Undergraduate Research Award; Received USEPA GRO Fellowship*
Dutton, Addie. Current. Effects of a wildfire on terrestrial subsidies and resident fish in the Two
Hearted River, MI. – *Received USEPA GRO Fellowship*
Bishop, Rebecca. Current. Landscape characterization of three Lake Superior watersheds using
GIS.
Berry, Zach. Current. Larval and adult fish use of the Little Rapids area prior to restoration.

- Kirby, Fred. Current. Displacement of Brook Trout (*Salvelinus fontinalis*) by introduced Brown Trout (*Salmo trutta*) in Hunt Creek, MI.
- *Pine, Troy. Current. Larval drift and spawning activity of Lake Sturgeon (*Acipenser fulvescens*) in Garden River, Ontario.
- *Elya, Matt. 2013. The comparison of nitrogen, phosphorus, and carbon excretions by native and non-native migratory fishes in Great Lakes tributaries. – *Received LSSU Undergraduate Research Award; Awarded Best Student Poster at LSSU Research Symposium (fall)*
- *Osga, Jimmy. 2013. Identifying movement patterns of sea lamprey in the St. Marys River using acoustic telemetry. – *Received LSSU Undergraduate Research Award; Received MI AFS Travel Grant; Awarded Best Student Poster at MI AFS annual meeting*
- *Ransom, John. 2012. Impacts of non-native salmonids on stream resident fish communities after barrier removal in Great Lakes tributaries. – *Received LSSU Undergraduate Research Award; Received AFS EOS Travel Award*
- *^Tucker, Stefan. 2012. Verification of lake sturgeon (*Acipenser fulvescens*) reproduction in the St. Marys River, Michigan. – *Received LSSU Undergraduate Research Award; Awarded Best Student Poster at LSSU Research Symposium (fall)*
- *Chambers, Amanda. 2012. Status, distribution, and environmental factors limiting brook trout in Cheney Creek, MI. – *Received LSSU Undergraduate Research Award*
- *Crane, Josh. 2012. Relationships between dissolved nutrients and *Typha sp.* dominance in Iowa wetlands. – *Awarded Best Student Poster at LSSU Research Symposium (spring)*
- Ingersoll, Alexander. 2012. Temporal and spatial distribution of larval fishes in Black Lake, MI.
- *Marshall, Brian. 2012. Patterns of aquatic insects emerge in the presence of introduced spawning salmon. – *Received LSSU Undergraduate Research Award*
- *Riley, Jacob. 2012. Does the physical environment of a stream favor certain life history attributes of fishes?
- *Zellinger, James. 2012. Size-specific habitat use by brown and brook trout in Hunt Creek, MI.
- *Cross, Robert. 2011. The role of barriers in protecting native fish communities from upstream migrations. – *Awarded Best Student Poster at MI American Fisheries Society Meeting; Awarded Best Student Poster at LSSU Research Symposium*
- Truax, Andrew. 2011. Biological and economic surveys of aquatic invasive species in tributaries to the St. Marys River.
- *Gay, Ross. 2011. Effects of spawning Pacific salmon on aquatic macroinvertebrate drift.
- *Kosiara, Jessica. 2011. Experimental evaluation of spawning salmon effects on algal biomass. – *Awarded Best Student Poster at MI American Fisheries Society Meeting; Received LSSU Undergraduate Research Award*
- Montgomery, Dave. 2010. Status and condition of siscowet (*Salvelinus namaycush*) in Canadian waters of Lake Superior.
- *^Turschak, Ben. 2009. Seasonal and spatial changes in zooplankton of the St. Marys River.
- Ward, Nate. 2009. Effects of large woody debris additions on fish communities in low gradient Upper Peninsula streams.
- Wils, Joel. 2009. Does artificial stream habitat improve trout populations?
- McManus, Luke. 2009. The effects of pasture land on a small headwater stream.
- *^Gerig, Brandon. 2009. Population characteristics, movement patterns, and habitat use of lake sturgeon in the St. Marys River.
- *^Harriger, Kathryn. 2009. Freshwater mussel distribution and demographics in relation to microhabitat in a 1st order stream in the eastern Upper Peninsula of Michigan.

- *Jerome, Corey. 2009. Sunfish predation on milfoil weevil (*Euhrychiopsis lecontei*) in two inland lakes.
- Olds, Christopher. 2009. Fin and micropore morphometrics of two lake trout (*Salvelinus namaycush*) strains
- *Zomer, Frank. 2008. Differences in benthic algae, macroinvertebrates, and fish use of log cribs of varying ages.
- *Collins, Scott. 2008. Response of algal biomass and water chemistry to spawning Pacific salmon in three Northern Michigan streams. – *Awarded Best Student Paper at MI American Fisheries Society Meeting*
- *Harjala, Kurt. 2008. Can landscape characteristics predict steelhead spawning sites?
- *Johnson, Jennifer. 2008. Freshwater mussel distribution and relationships with landscape variables in northern Michigan streams.
- *Pumfery, Matt. 2008. Diet composition of double-crested cormorants on Brevoort Lake.
- *Kline, Meghan. 2007. Population characteristics and movement patterns of lake sturgeon, *Acipenser fulvescens*, in the St. Marys River.
- Michael Jones. 2007. Biological and chemical assessment of Kinross and Duke's Lakes, MI.
- Brian Narwocki. 2007. Size, species, and duration-related initial mortality of black bass on Lake St. Clair due to tournament angling.
- Traylor, Katy. 2007. Bioassessment of Pearson's Creek.
- Wrzesinski, Jeri. 2007. Habitat preferences of burbot in Lower Peninsula Michigan streams.
- *Pinkerton, Jeramy. 2007. Diet and morphology of four coregonid species in Lake Superior.
- *Adams, Chris. 2006. Influence of spawning salmonids on diets of pre-smolt steelhead.
- *Johnson, Jeremiah. 2006. Egg-thiamine concentration and the occurrence of Early Mortality Syndrome in larval lake trout from Yankee Reef, Lake Huron.
- Kelly, Jacob. 2006. Comparison of three aging techniques for yellow perch in Baei de Wassai, St. Marys River, MI.
- Lipps, Matt. 2006. Seasonal distribution of walleye and muskellunge in the Tahquamenon River.
- *Potter, Haley. 2006. Assessment of fish communities in coastal wetlands of the St. Marys River.
- Rinkus, Rachel. 2006. A comparison of macroinvertebrate communities in nine coastal wetlands of the St. Marys River, MI.
- Axtell, Kyle. 2005. The effects of hydroelectric impoundments on aquatic invertebrate assemblages in the Boardman River, MI.
- *Bauman, John. 2005. Evaluation of a stream-side rearing facility by measuring growth dynamics of young-of-year lake sturgeon (*Acipenser fulvescens*).
- Smith, Rob. 2004. Effectiveness of different aquatic macroinvertebrate samplers within riffle and run habitats.