

Dr. Marcus William Beck

USEPA NHEERL Gulf Ecology Division
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INTERESTS

Environmental indicators • water quality analysis • data synthesis, visualization, and interpretation • reproducible research and open-source analysis • multivariate statistics • aquatic ecology • water quality policy

EDUCATION

Ph.D., Conservation Biology, Fisheries and Aquatic Biology track **Jun. 2013**
Statistics minor

University of Minnesota, Twin Cities, MN
Advisors: Drs. Bruce Vondracek, Lorin Hatch; GPA 3.94

M.Sc., Conservation Biology, Fisheries and Aquatic Biology track **Jun. 2009**

University of Minnesota, Twin Cities, MN
Advisor: Dr. Lorin Hatch; GPA 4.00

B.Sc., Zoology *summa cum laude* **Dec. 2006**

University of Florida, Gainesville, FL
Advisor: Dr. Krista McCoy; GPA 3.81

A.A., Zoology **Apr. 2004**

Santa Fe Community College, Gainesville, FL
GPA 3.87

EXPERIENCE

Post-Doctorate Research Fellow, USEPA **Jul. 2013 - Present**

Supervisor: Dr. Jim Hagy

Held post-doctorate research fellowship position in Oak Ridge Institute for Science and Education at USEPA Gulf Ecology Division, Ecosystem Dynamics and Effects Branch • Developed and applied statistical models of water quality measurements in coastal waters to investigate eutrophication indicators

Workshop Co-Instructor, NOAA **Jul. 2014 - Present**

Developed data analysis tools for the System-Wide Monitoring Program (SWMP) of the National Estuarine Research Reserve System to be co-taught at the annual training meeting • Developed software package for SWMP data to support workshop content

Research Fellow, University of Minnesota

Sep. 2012 - Jun. 2013

Supervisor: Dr. Bruce Wilson

Developed and analyzed biological indices with agency and citizen monitoring datasets for the assessment of lake condition in support of resource management • Prepared progress reports and public presentations to communicate results and provide management recommendations

Short Course Co-Instructor, University of Minnesota

May 2013

Supervisor: Dr. Susan Galatowitsch

Co-instructed two short courses on basic data analysis that were part of a larger workshop focused on ecosystem restoration • Provided instruction using interactive lectures and take-home material as an introduction to software R

Research Assistant, University of Minnesota

Sep. 2007 - Sep. 2012

Supervisor: Dr. Bruce Vondracek

Developed an index of biotic integrity using aquatic macrophytes to determine the ecological health of Minnesota lakes • Developed remote sensing and image analysis techniques to quantify land use stressors • Assisted researchers at the Minnesota Department of Natural Resources to develop methods for long-term lake monitoring program

Primary Instructor, University of Minnesota

Jan. 2012 - May 2012

Instructed graduate and undergraduate students on fundamental topics in fisheries ecology and management (FW 5604, spring 2012)

Undergraduate Advisor, University of Minnesota

Mar. 2009 - May 2011

Advised undergraduate projects that examined survey designs for biological assessment of aquatic plants and use of fish indices to assess lake condition

Intern, Minnesota Department of Natural Resources

Jun. 2009 - Aug. 2009

Supervisor: Timothy Cross

Assisted in collection, preparation, and analysis of data in support of lake monitoring research

Teaching Assistant, University of Minnesota

Sep. 2008 - Dec. 2008

Supervisor: Dr. Joseph Magner

Held teaching assistant position for ESPM 4061/5061 (Water Quality and Natural Resources, 3cr.)

Creel Clerk, Florida Fish and Wildlife Commission

Jan. 2007 - May 2007

Supervisor: Eric Nagid

Conducted creel surveys of anglers for catch and effort of black crappie (*Pomoxis nigromaculatus*) • Conducted laboratory analyses to support fisheries monitoring program

Undergraduate Researcher, University of Florida

Jan. 2006 - Dec. 2006

Supervisors: Dr. Krista McCoy, Dr. Colette St. Mary

Investigated effects of pesticides on green tree frogs (*Hyla cinerea*) • Performed slide histology and tissue staining

Biological Technician, US Geological Survey

summer 2006

Supervisor: Noel Burkhead

Assisted with investigation of red shiner (*Cyprinella lutrensis*) invasion • Collected mortality data on lab-reared fishes • Conducted stream sampling

SERVICE

Reviewer

Aquatic Botany, 2011, 2014 • *Development in Practice*, 2012, 2013 • *Ecological Indicators*, 2010 • *Ecological Research*, 2012 • Elsevier book chapter, 2014 • *Environmental Management*, 2010 • *Estuaries and Coasts*, 2014 • *Hydrobiologia*, 2012 • *International Journal of Tropical Biology and Conservation*, 2013 • *International Journal of River Basin Management*, 2013 • *Journal of the North American Benthological Society*, 2011 • *Lake and Reservoir Management*, 2013, 2014 • *Limnology and Oceanography*, 2013 • *Marine Ecology*, 2014 • *Marine Pollution Bulletin*, 2014 • Minnesota Department of Natural Resources, 2011 • *North American Journal of Fisheries Management*, 2010, 2011, 2012 • *Polar Biology*, 2011 • *Remote Sensing*, 2014 • *Science of the Total Environment*, 2011 • USEPA Office of Research and Development, 2014

Graduate student representative, University of Minnesota

Jan. 2013 - May 2013

Served as graduate student representative and voting member for faculty meetings in the Fisheries and Wildlife Department

Planning Committee Co-Chair, American Fisheries Society

Jun. 2010 - Aug. 2012

Served as student activities committee co-chair for 2012 annual meeting of the American Fisheries Society • Organized student social, career fair, student colloquium for 350 students

Fundraising Coordinator, University of Minnesota

spring 2011, spring 2012

Committee chair for Conservation Biology Graduate Program fundraiser in spring 2012, active fundraiser in spring 2011 • Raised approximately \$6000 in funds for student travel

Seminar Coordinator, University of Minnesota

2009, fall 2011, spring 2012

Conservation Biology Program, Fisheries and Wildlife Department, four semesters

Student Representative, MN Chapter of American Fisheries Society

Aug. 2009 - Aug. 2012

Held student representative position for the Minnesota Chapter of the American Fisheries Society

Student Club Officer, University of Minnesota

Sep. 2010 - May 2012

Served as vice-president of University of Minnesota Fisheries and Wildlife Club

Lab Volunteer, Florida Museum of Natural History Shark Lab

summer 2005

Assisted marine biologists with preparation and maintenance of elasmobranch specimens

PUBLICATIONS

Beck, M.W., Murrell, M.C., Hagy, J.D. In prep. Improving estimates of estuary metabolism with

time series of dissolved oxygen. Intended: *Limnology and Oceanography: Methods*.

Beck, M.W., Hagy, J.D. **In review.** Adaptation of a weighted regression approach to evaluate water quality trends in an estuary. *Environmental Modeling and Assessment*.

Beck, M.W., Tomcko, C.M., Valley, R.D., Staples, D.F. 2014. Analysis of macrophyte indicator variation as a function of sampling, temporal, and stressor effects. *Ecological Indicators*. 46:323-335.

Beck, M.W., Wilson, B.N., Vondracek, B., Hatch, L.K. 2014. Application of neural networks to quantify utility of indices of biotic integrity for biological monitoring. *Ecological Indicators*. 45:195-208.

Vondracek, B., Koch, J.D., and **Beck, M.W.** 2014. A comparison of survey methods to evaluate macrophyte index of biotic integrity performance in Minnesota lakes. *Ecological Indicators*. 36:178-185.

Beck, M.W., Vondracek, B. Hatch, L.K. 2013. Between- and within-lake responses of macrophyte richness metrics to shoreline development. *Lake and Reservoir Management*. 29(3):179-193.

Beck, M.W., Vondracek, B., Hatch, L.K., and Vinje, J. 2013. Semi-automated analysis of high-resolution aerial images to quantify docks in glacial lakes. *ISPRS Journal of Photogrammetry and Remote Sensing*. 81:60-69.

Beck, M.W., Vondracek, B., and Hatch, L.K. 2013. Environmental clustering of lakes to evaluate performance of a macrophyte index of biotic integrity. *Aquatic Botany*. 108:16-25.

Beck, M.W., Claassen, A.H., and Hundt, P.J. 2012. Environmental and livelihood impacts of dams: Common lessons across development gradients that challenge sustainability. *International Journal of River Basin Management*. 10(1):73-92.

Beck, M.W., Hatch, L.K., Vondracek, B., and Valley, R.D. 2010. Development of a macrophyte-based index of biotic integrity for Minnesota lakes. *Ecological Indicators*. 10:968-979.

Beck, M.W., and Hatch, L.K. 2009. A review of research on the development of lake indices of biotic integrity. *Environmental Reviews*. 17:21-44.

TECHNICAL REPORTS

Beck, M.W. 2014. SWMPPr: An R package for the National Estuarine Research Reserve System. Version 0.3.3. <https://github.com/fawda123/SWMPPr>

Beck, M.W. 2013. Minnesota macrophytes: Linking aquatic plants, lake health, and human

activities. Doctoral Dissertation. University of Minnesota. 214 pp.

Beck, M.W. 2009. Development of an ecological assessment method for Minnesota lakes. Masters Thesis. University of Minnesota. 164 pp.

Beck, M.W. 2006. Reproductive characteristics of the green treefrog *Hyla cinerea*: effects of agricultural contaminants. Honors Thesis. University of Florida. 32 pp.

INVITED PRESENTATIONS

Beck, M.W. 2014. The search for truth in numbers: Quantitative approaches for evaluating trends in water quality data. *Oral presentation*. Biology Department seminar (PCB 3930/4922/5924), University of West Florida, Pensacola, FL.

Beck, M.W., Vondracek, B., Wilson, B., and Hatch, L.K. 2013. Understanding indicators of lake health and the utility of a plant-based index. *Oral presentation*. Gulf Ecology Division seminar series, USEPA NHEERL ORD, Gulf Breeze, FL.

Beck, M.W., Vondracek, B., Hatch, L.K., and Wilson, B. 2013. Minnesota macrophytes: Linking aquatic plants, lake integrity, and human activities. *Poster presentation*. Doctoral Research Showcase, University of Minnesota, Minneapolis, MN.

Beck, M.W., Vondracek, B., and Hatch, L.K. 2012. Between and within lake responses of macrophyte richness metrics to shoreline development. *Oral presentation*. MN Department of Natural Resources Fall research meeting, Itasca State Park, MN.

Beck, M.W., Vondracek, B., Hatch, L.K. 2011. Biological assessment of aquatic macrophytes in Midwest glacial lakes. *Oral presentation*. University of Minnesota Water Resources Graduate Program student symposium, Stillwater, MN.

Beck, M.W. 2009. Perspectives on sustaining Minnesota's lakes: Biological monitoring, IBIs, and stressor identification. *Oral presentation*. University of Minnesota Water Resources Graduate Program seminar, St. Paul, MN.

Beck, M.W. 2009. The Minnesota macrophyte IBI for lake assessment. *Oral presentation*. Habitat research meeting, Minnesota Department of Natural Resources, St. Paul, MN.

Beck, M.W., Hatch, L.K., Vondracek, B., Valley, R.D. 2009. Development of a macrophyte-based index of biotic integrity for Minnesota lakes. *Oral presentation*. Aquatic plant assessment meeting, Minnesota Pollution Control Agency, St. Paul, MN.

Beck, M.W., Hatch, L.K., Vondracek, B., Valley, R.D. 2009. Development of a macrophyte-based index of biotic integrity for Minnesota lakes. *Oral presentation*. Fisheries research meeting, Minnesota Department of Natural Resources, Cloquet, MN.

CONTRIBUTED PRESENTATIONS

Beck, M.W. 2014. ggplot2 redux. *Oral presentation*. USEPA R User Group meeting, USEPA NHEERL ORD, Gulf Breeze, FL.

Beck, M.W., Tomcko, C.M., Valley, R.D., and Staples, D.F. 2014. Analysis of macrophyte indicator variation as a function of sampling, temporal, and stressor effects. *Poster presentation*. Joint Aquatic Sciences Meeting, Portland, OR.

Beck, M.W., Hagy, J.D. 2014. Adaptation of a weighted regression approach to evaluate water quality trends in Tampa Bay, Florida. *Oral presentation*. National Water Quality Monitoring Council annual meeting, Cincinnati, OH.

Beck, M.W. 2014. The nuts and bolts of Sweave/Knitr for reproducible research. *Oral presentation*. USEPA R User Group meeting, USEPA NHEERL ORD, Gulf Breeze, FL.

Beck, M.W., Vondracek, B., Hatch, L.K., and Wilson, B. 2013. Evaluating the utility of a plant-based index of lake condition using neural networks. *Oral presentation*. Ecological Society of America annual meeting, Minneapolis, MN.

Beck, M.W., Vondracek, B., Wilson, B., and Hatch, L.K. 2013. Understanding indicators of lake health and the utility of a plant-based index. *Oral presentation*. Conservation Biology Graduate Program seminar, University of Minnesota, St. Paul, MN.

Vondracek, B., Koch, J.D., and **Beck, M.W.** 2013. A comparison of survey methods to evaluate macrophyte index of biotic integrity performance in Minnesota lakes. *Oral presentation*. Minnesota chapter of the American Fisheries Society annual meeting, St. Cloud, MN.

Beck, M.W., Vondracek, B., Wilson, B., and Hatch, L.K. 2013. Understanding indicators of lake health and the utility of a plant-based index. *Oral presentation*. Conservation Biology Graduate Program seminar, University of Minnesota, St. Paul, MN.

Beck, M.W. 2012. Effects of shoreline development on aquatic macrophytes: Summary of analyses. *Class lecture*. Ecological Modeling (FW 8200), University of Minnesota, St. Paul, MN.

Beck, M.W., Vondracek, B., Hatch, L.K., and Vinje, J. 2012. Image analysis techniques to evaluate effects of lakeshore development on aquatic habitat. *Oral and poster presentation*. American Fisheries Society annual meeting, St. Paul, MN.

Beck, M.W., Vondracek, B., Hatch, L.K., and Vinje, J. 2012. Image analysis techniques to evaluate effects of lakeshore development on aquatic habitat. *Oral presentation*. Water Resources Conference, St. Paul, MN.

Beck, M.W., Vondracek, B., Hatch, L.K., 2012. Identifying covariates of a lake assessment index to improve biological assessment. *Oral presentation*. Minnesota chapter of Society for

Conservation Biology annual meeting, St. Paul, MN.

Beck, M.W., Vondracek, B., Hatch, L.K. 2011. Image analysis techniques to evaluate effects of nearshore lake development on aquatic macrophytes. *Oral presentation*. Midwest Fish and Wildlife Conference, Des Moines, IA.

Beck, M.W. 2011. R is my friend: Or how I learned to stop worrying and love the machine. *Oral presentation*. Conservation Biology Graduate Program breakfast seminar, University of Minnesota, St. Paul, MN.

Beck, M.W., Vondracek, B., Hatch, L.K. 2011. Image analysis techniques to evaluate effects of nearshore lake development on aquatic macrophytes. *Poster presentation*. Water Resources Conference, St. Paul, MN.

Beck, M.W., Vondracek, B., Hatch, L.K. 2011. Image analysis techniques to evaluate effects of nearshore lake development on aquatic macrophytes. *Oral presentation*. American Fisheries Society annual meeting, Seattle, WA.

Beck, M.W., Vondracek, B., Hatch, L.K. 2011. Image analysis techniques to evaluate effects of nearshore lake development on aquatic macrophytes. *Oral presentation*. Minnesota chapter of the American Fisheries Society annual meeting, Sandstone, MN.

Beck, M.W., Hatch, L.K., Vondracek, B., Valley, R.D. 2010. Development of a macrophyte-based index of biotic integrity for Minnesota lakes. *Poster presentation*. Midwest Fish and Wildlife Conference, Minneapolis, MN.

Koch, J.D., **Beck, M.W.**, Carlin, J. 2010. A comparison of survey methods to evaluate macrophyte index of biotic integrity performance in Minnesota lakes. *Poster presentation*. Midwest Fish and Wildlife Conference, Minneapolis, MN.

Beck, M.W., Hatch, L.K., Vondracek, B., Valley, R.D. 2010. Development of a macrophyte-based index of biotic integrity for Minnesota lakes. *Oral presentation*. International Congress for Conservation Biology, Edmonton, Alberta.

Beck, M.W., Vondracek, B., Hatch, L.K. 2010. Assessing the health of Minnesota's lakes using indices of biotic integrity. *Oral presentation*. Joint meeting of the Minnesota chapters of American Fisheries Society, Society for Conservation Biology, and The Wildlife Society, Nisswa, MN.

Beck, M.W., Hatch, L.K., Vondracek, B., Valley, R.D. 2009. Development of a macrophyte-based index of biotic integrity for Minnesota lakes. *Oral presentation*. Water Resources Conference, St. Paul, MN.

Beck, M.W., Hatch, L.K., Vondracek, B., Valley, R.D. 2009. Development of a macrophyte-based index of biotic integrity for Minnesota lakes. *Poster presentation*. Land Conservation and Clean

Water Summit, Chaska, MN.

Beck, M.W., Hatch, L.K., Vondracek, B., Valley, R.D. 2009. Development of a macrophyte-based index of biotic integrity for Minnesota lakes. *Oral presentation*. Symposium for best student paper, American Fisheries Society annual meeting, Nashville, TN.

Beck, M.W., Hatch, L.K., Vondracek, B., Valley, R.D. 2009. Development of a macrophyte-based index of biotic integrity for Minnesota lakes. *Oral presentation*. Minnesota chapter of the Society for Conservation Biology annual meeting, St. Paul, MN.

Beck, M.W., Hatch, L.K., Vondracek, B., Valley, R.D. 2008. Development of a macrophyte-based index of biotic integrity for Minnesota lakes. *Poster presentation*. Water Resources Conference, St. Paul, MN.

Beck, M.W. 2008. The index of biotic integrity: A review. *Class lecture*. Water quality and natural resources (ESPM 4061), University of Minnesota, St. Paul, MN.

Beck, M.W., Hatch, L.K., Vondracek, B., Valley, R.D. 2008. Development of a macrophyte-based index of biotic integrity for Minnesota lakes. *Oral presentation*. Conservation Biology Graduate Program seminar, University of Minnesota, St. Paul, MN.

Hatch, L.K., **Beck, M.W.**, Vondracek, B. 2007. Ecological assessment method development for Minnesota lakes. *Oral presentation*. North American Lake Management Society annual meeting, Orlando, FL.

HONORS AND AWARDS

LaBounty Best Paper Award nomination, North American Lake Management Society	Oct. 2014
Interdisciplinary Doctoral Fellowship, University of Minnesota	\$22500 Sep. 2012
Best student paper award, Minnesota chapter for Society of Conservation Biology	Mar. 2012
Carolyn Crosby Fellowship, University of Minnesota	\$1000 Jan. 2012
Travel award, Conservation Biology Graduate Program	\$300 Sep. 2011
Best student paper award, Minnesota chapter of American Fisheries Society	\$200 Feb. 2011
Travel award, Minnesota chapter of American Fisheries Society	\$65 Feb. 2011
Fenske Memorial Award finalist, Midwest Fish and Wildlife Conference	Dec. 2010
Travel award, Strategic Environmental Research and Development Program	\$700 Jul. 2010
Travel award, Conservation Biology Graduate Program	\$300 Jul. 2010
Travel award, Graduate and Professional Student Assembly	\$200 Jul. 2010
Travel award, Minnesota chapter of American Fisheries Society	\$103 Mar. 2010
Finalist in best student paper symposium, American Fisheries Society	Sep. 2009
Travel award, Conservation Biology Graduate Program	\$400 Sep. 2009
Travel award, Graduate and Professional Student Assembly	\$165 Sep. 2009
Conservation Biology Graduate Program summer fellowship	\$3500 summer 2008
Elected to Phi Beta Kappa Honor Society	Dec. 2006
Dean's list for academic excellence duration of undergraduate education	2004 - 2006

Florida Bright Futures undergraduate scholarship \$5250

2003 - 2006

PROFESSIONAL SOCIETY MEMBERSHIP

Coastal and Estuarine Research Federation	Sep. 2013 - Present
Midwest Aquatic Plant Management Society	Jan. 2012 - Present
Minnesota Native Plant Society	Mar. 2011 - Present
Society for Conservation Biology	Feb. 2008 - Present
American Fisheries Society	Feb. 2008 - Present

SKILLS

R statistical software with RStudio Integrated Development Environment
Python programming language for geo-spatial modeling
Version control with Git and Github
L^AT_EX typesetting including Sweave/knitR integration with R
ArcGIS software
ERDAS Imagine 2010 image analysis software
Microsoft Office including Access
Aquatic plant and fish identification of Minnesota lakes
Standard survey techniques for aquatic plants and fishes of Minnesota lakes
Boat/trailer operation
CPR and first aid certification

ADDITIONAL EXPERIENCE

Author of Github repositories - <http://github.com/fawda123/>
Blog contributor for R-bloggers - <http://beckmw.wordpress.com/>
Webinar participant, The Grammar and Graphics of Data Science
Workshop participant, New Tools for Water Quality Data Access and Trend Analysis. An Overview of the USGS R Packages: dataRetrieval and EGRET
Webinar participant, Revolution Analytics Introduction to R for Data Mining
Workshop participant, An Introduction to the Fundamentals of Linear Quantile Regression in R
On-line course, Principles and Techniques of Electrofishing, US FWS
Workshop participant, Simple Tools for Lake and Watershed Trophic Assessment (FLUX32, Bathtub, TASTR), St. Paul, MN
Workshop participant, Aquatic Plant Identification, Itasca State Park, MN