



ANNUAL REPORT

July 1, 2005 – June 30, 2006

Submitted by:

The Center for Water and Society Advisory Committee

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Table of Contents

Table of Contents	1
Purpose of CWS Annual Report	2
CWS Mission Statement	3
CWS Highlights	4
Seminars, Symposia, and Presentations	5
Co-Sponsored seminars	5
Presentations on CWS	5
CWS Budget	6
CWS Advisory Committee	7
CWS Participants	8
Research	9
Active Research Projects Affiliated with CWS	9
Proposals Submitted under CWS	9
First-year CWS Retreat	11
Publications by CWS Participants	12
Presentations and Abstracts by CWS Participants	16

Purpose of CWS Annual Report

The Center for Water and Society (CWS) at Michigan Tech was established in June of 2005 under the Sustainable Futures Institute (SFI) to provide the multidisciplinary perspectives and tools to manage water-related problems of local, regional, and international interest.

The following document is a record of the center's accomplishments over its first year of operation and development. The CWS annual report for 2005-2006 is organized by CWS Highlights for the first year, co-sponsored seminars and presentations, CWS budget analysis, Advisory Committee members and CWS participant roster, affiliated research projects and submitted proposals, a summary of the center's first-year retreat, and publications and presentations by CWS participants.

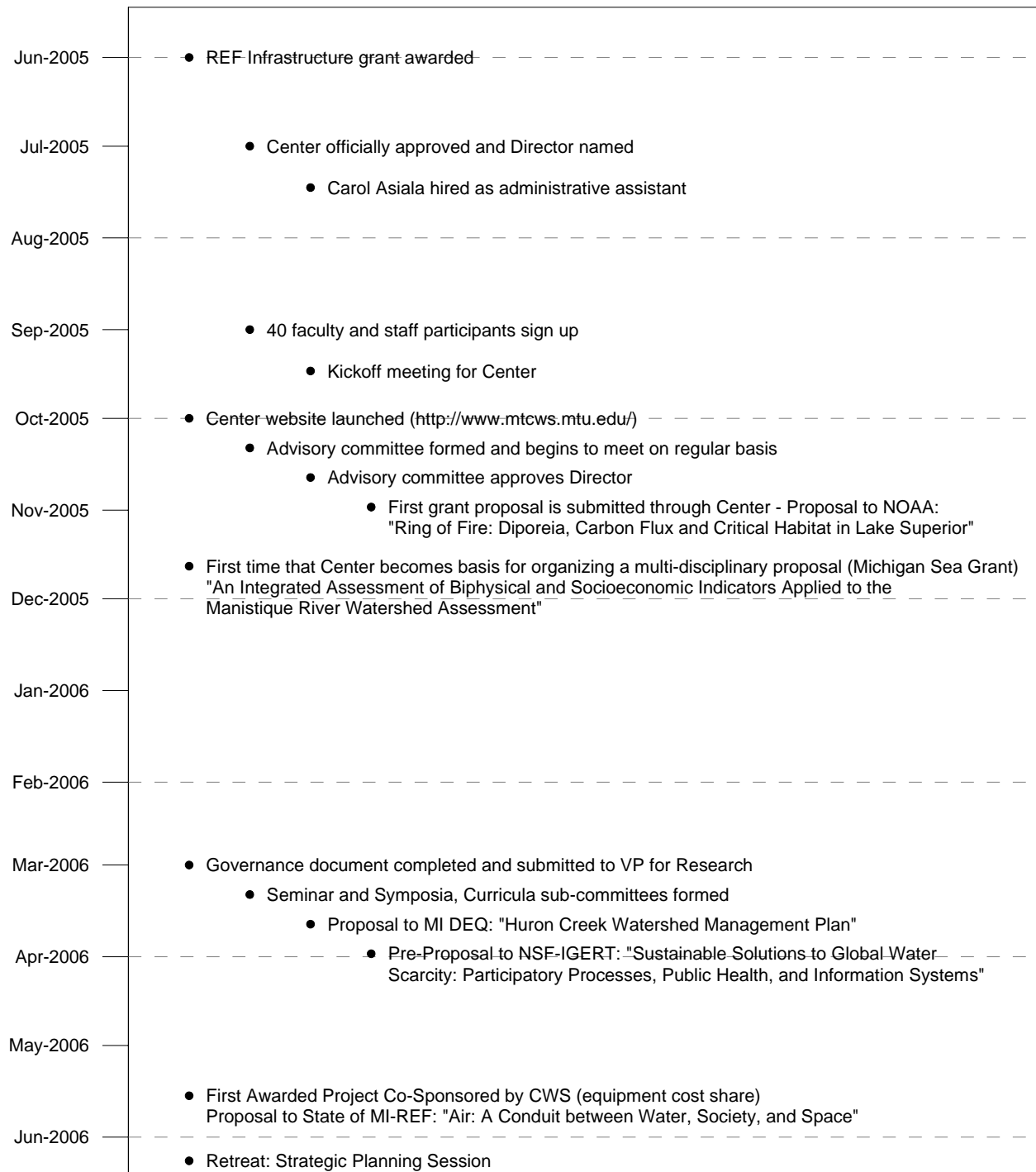
CWS Mission Statement

The mission of the Center for Water and Society (CWS) at Michigan Tech is to support research, education, and outreach in all disciplines at Michigan Tech related to water issues. The goal is to establish Michigan Tech as a state, regional, national and international leader in these disciplines and, in particular, in interdisciplinary approaches to solving water-related problems. CWS is a “virtual” Research Center. By virtual, we mean that the CWS will not occupy physical space, but is a consortium of people at Michigan Tech whose focal point is water-related activities.

The objectives of the Center for Water and Society are:

- To serve as a focal point for instructional and research activities in water-related fields and water-related outreach activities across the Michigan Tech campus
- To provide an organizational structure that supports continuing growth in water-related fields and outreach activities and encourage interdisciplinary projects
- To promote the visibility of Michigan Tech’s water-related research in state, regional, national and international arenas
- To support interdisciplinary graduate and undergraduate education and research in water related fields
- To pursue external funding opportunities to support these objectives and to facilitate the acquisition of external support by faculty participating in CWS.

CWS Highlights



Seminars, Symposia, and Presentations

Co-Sponsored seminars

Dave Dempsey

Great Lakes Policy Advisor for Clean Water Action

"On the Brink - The Great Lakes in the 21st Century"

Thursday, October 27, 2005 at 3:00 pm

DOW 641

Dr. Willett Kempton

Associate Professor of Marine Policy and Senior Policy Scientist in Center for Energy and Environmental Policy at the University of Delaware

"Why Climate Change Leads to Wind Power"

Thursday, March 16 at 11:05

G002 (the lecture hall) in the School of Forest Resources and Environmental Science at MTU

"Wiring the Vehicle Fleet"

Friday, March 17 at 12:00

EERC 100

Part of the Sustainable Futures Institute Brown Bag series

Presentations on CWS

2/20/2006	Alex Mayer:	Rita Colwell, former NSF Director
4/07/2006	Alex Mayer:	Dept. of Civil & Environmental Engineering Industrial Advisory Board
4/19/2006	Kathy Halvorsen:	Sustainable Futures Institute Advisory Board

CWS Budget

State of Michigan REF grant Awarded to provide Startup funds for CWS

Beginning Balance July 1, 2005	\$40,000.00
Expenditures	-\$21,664.87
Balance as of June 27, 2006	\$18,335.13

CWS Institute O/H Incentive Account

Beginning Balance July 1, 2005.....	\$0.00
Research Incentive Transfer In (July-Dec 2005)	\$1,062.95
Research Incentive Transfer In (Jan-Mar 2006)	\$429.04
Balance as of June 7, 2006.....	\$1,491.99
Amount encumbered as Equipment Cost Share for REF Project 060604 "Air: A Conduit between Water, Society, and Space"	-\$1,000.00

CWS Research Expenditures **\$90,028.89**

CWS Research Expenditures include all expenses incurred during the year, July 1, 2005 – June 30, 2006 from research accounts affiliated with CWS. Expenses from the CWS Incentive and Overhead Return Accounts are not included. Overhead Charges (E971 – Overhead – Current Federal Rate) are not included.

CWS Advisory Committee

Director

Alex S. Mayer
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Geological & Mining Engineering & Science

Administrative Assistant

Carol J. Asiala
cjasiala@mtu.edu

Geological & Mining Engineering & Science

Advisory Committee

Christine S. Anderson
csanders@mtu.edu

Educational Opportunity

Nancy A. Auer
naauer@mtu.edu

Biological Sciences

Mary Ann Beckwith
mabeckwi@mtu.edu

Fine Arts

Gary A. Campbell
gacampbe@mtu.edu

School of Business & Economics

John S. Gierke
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Geological & Mining Engineering &
Science

Sarah A. Green
sgreen@mtu.edu

Chemistry

Joan F. Schumaker-Chadde
jchadde@mtu.edu

Western Upper Peninsula Center for
Science, Mathematics & Environmental
Education

Noel R. Urban
nurban@mtu.edu

Civil & Environmental Engineering

R. Craig Waddell
cwaddell@mtu.edu

Humanities

CWS Participants

Biological Sciences

Nancy A. Auer
Susan T. Bagley
Casey J. Huckins

Chemistry

Sarah A. Green

Civil & Environmental Engineering

Martin T. Auer
C. Robert Baillod
Brian D. Barkdoll
Kristine L. Bradof
David W. Hand
Neil J. Hutzler
Judith A. Perlinger
Noel R. Urban
David W. Watkins
Qiong Zhang

Educational Opportunity

Christine S. Anderson

Fine Arts

Mary Ann Beckwith

Geological & Mining Eng. & Science

Gregg J. Bluth
Judith R. Budd
Suzanne J. Beske-Diehl
John S. Gierke
Alex S. Mayer
Wayne D. Pennington

Humanities

R. Craig Waddell

Mechanical Engineering

John W. Sutherland

School of Business & Economics

Gary Campbell
Thomas E. Merz
Christa L. Walck

School of Forest Resources & Environmental Science

Stacy R. Cotey
David J. Flaspohler
Margaret R. Gale
Martin F. Jurgensen
Linda M. Nagel
Blair D. Orr
James M. Schmierer

Social Sciences

Hugh Gorman
Carol A. MacLennan
Patrick E. Martin
Susan R. Martin
Timothy Scarlett
Bruce E. Seely
Barry D. Solomon
Kathleen E. Halvorsen

Western UP Center for Science, Mathematics & Environmental Education

Joan F. Schumaker-Chadde

Research

Active Research Projects Affiliated with CWS

- REF: The First Year of the Michigan Tech Initiative for Water & Society (CWS)
PI: Margaret Gale
Sponsor: State of Michigan – REF
\$40,000 (6/2005 – 6/2006)
- Sedimentation in Schoharie Reservoir: Temporal Dynamics
PI: Noel R. Urban
Sponsor: Upstate Freshwater Institute (pass through funding from NYC Dept. Environmental Protection)
\$177,175 (1/1/05-12/31/06)
- TIES - MTU-UNISON Linkage: Training a Core of Water Resource Experts
PI: Alex S. Mayer
Sponsor: Association Liaison Office/US Agency for International Development
02/2003 - 08/2006
- ExCit: Expanding Cities - People, Water and Infrastructure
PI: Alex S. Mayer
Sponsor: US Dept. of Education
\$92,350 (10/2003 - 08/2006)
- REF: Air: A Conduit between Water, Society, and Space
PI: Alex Mayer
Sponsor: State of Michigan – REF
\$49,045 (7/2006 – 8/2007)

Proposals Submitted under CWS

- Remote Sensing for Groundwater Exploration in Volcanic Terrain
PI: John Gierke
Co-PI: Jill Barbour
Sponsor: NASA
Requested Amount: \$24,000
- Coupling Geochemical and Geophysical Characterizations for Understanding Watershed Hydrology in Volcanic Terrain in Boaco, Nicaragua
PI: John Gierke
Co-PI: Wayne Pennington
Sponsor: NSF
Requested Amount: \$150,000
- Collaborative Research: The carbon balance of Lake Superior: modeling lake processes and understanding impacts on the regional carbon budget
PI: Noel Urban
Sponsor: NSF
Requested Amount: \$242,199

- An Integrated Assessment of Biophysical and Socioeconomic Indicators Applied to the Manistique River Watershed Assessment
PI: Kathy Halvorsen
Co-PIs: Nancy Auer, Alex Mayer
Sponsor: MI Sea Grant
Requested Amount: \$161,546
- Huron Creek Watershed Management Plan
PI: Alex Mayer
Sponsor: Michigan Dept of Environmental Quality
Requested Amount: \$19,095
- IGERT: Sustainable Solutions to Global Water Scarcity: Participatory Processes, Public Health, and Information Systems
PI: Alex Mayer
Sponsor: NSF (Pre-proposal)
Requested Amount: \$3,534,887
- Global Watershed: Integrating Rural and Global Perspectives with Research and Technology
PI: Alex Mayer
Co-PIs: Susan Bagley, Brian Barkdoll, Linda Nagel, Andrew Storer
Sponsor: NSF
Requested Amount: \$1,443,760
- Collaborative Research: Rapid Assessment Tool for Determining Risks to Human Health and Sensitive Ecosystems as a Result of Chemical Releases Due to Hurricane Katrina
PI: Alex Mayer
Co-PI: Susan Bagley
Sponsor: NSF
Requested Amount: \$43,246
- Ring of Fire: Diporeia, Carbon Flux and Critical Habitat in Lake Superior
PI: Nancy Auer
Co-PIs: Noel Urban, Martin Auer, Joan Schumacher Chadde
Sponsor: NOAA
Requested Amount: \$708,639
- Development of a Michigan Stream Management Guide
PI: Joan Schumaker-Chadde
Co-PIs: Casey Huckins, Alex Mayer, David Watkins
Sponsor: National Fish & Wildlife Foundation
Requested Amount: \$47,024
- Improved Decision-Making for Sulfide Mining: Enhancing the Sustainability of Mining Projects in the Lake Superior Region
PI: John Sutherland
Co-PIs: John Gierke, Carol MacLennan, Christa Walck, David Watkins
Sponsor: Environmental Protection Agency
Requested Amount: \$299,897

First-year CWS Retreat

The CWS retreat was held on June 9, 2006 at McLain State Park on Lake Superior. The goal of the retreat was to reinforce the strategic plan for the center and develop a shared vision for CWS.

We were in consensus about our vision for the Center for Water and Society. We are participants in the center because it has an applied focus on water problem solving through research and education, with an interdisciplinary membership, and a commitment to water-related outreach at MTU and within the larger community. We would like to be known as an excellent source of research, education, and outreach products on water-related problem solving.

The group(s) suggested a wide variety of strategies for fulfilling this vision, as described in the following potential goals set forth by the retreat participants.

1. Potential strategies to achieve our vision.

- Develop water-related outreach efforts to schools and the broader community.
- Foster interest in water issues at MTU through a water-related event (such as around World Water Day).
- Make links to additional groups and individuals within and outside of MTU.
- Sponsor a series of water-related seminars.

2. Identify potential topical niches, build our capacity to fill them, and publicize this expertise.

- Lake Superior.
- The Great Lakes
- Water and sustainability.
- Climate change and the Great Lakes

To follow-up the developments of the retreat, and implement the strategic plan of the Center, it is important to obtain broader participation in the form of specific commitments from the CWS participants.

Publications by CWS Participants

Arpke, A., and **N. Hutzler**, "Operational Life Cycle Assessment and Life Cycle Cost Analysis for Water Use in Multioccupant Buildings" *ASCE Journal of Architectural Engineering*, Vol. 11, No. 3, pp. 99-109, 2005.

Arpke, A., and **N. Hutzler**, "A Life Cycle Assessment of Domestic Water Use", *Journal of Industrial Ecology*, Vol. 10, No. 1-2, pp. 169-184, 2006.

Auer, N.A. and Baker E.A. "submitted" Rapid Assessment of lake sturgeon spawning stocks using fixed-location, split-beam sonar technology. *C. J. Fisheries and Aquatic Sciences*.

Bau, D. and **A.S. Mayer**, "Stochastic Management of Pump-and-Treat Strategies Using Surrogate Functions," *Advances in Water Resources*, in press, 2006.

Beach, D.N., M.J. Hutchins, **J.S. Gierke**, and **J.W. Sutherland**, "Evolving Undergraduate Engineering Education for the 21st Century, Part 1: Enabling Sustainable Thinking," *International Journal of Engineering Education*, in press.

Carlson, A.J. and **C. J Huckins**. Dispersion of stocked brook trout between Lake Superior tributaries. *Transactions of the American Fisheries Society* "in revision"

Chai, Y, **Urban NR**, 2005, Timescale and magnitude of cross-margin transport in Lake Superior: insights from 210Pb inventories, *Geochim. Cosmochim. Acta*, submitted 2/06

Durfee, M.H., and **S. T. Bagley**. Bacteriology and Diplomacy in the Great Lakes, 1912-1920. *Journal of Great Lakes Research*. In preparation

K.L. Endres, **A. Mayer**, and **D.W. Hand**, "Groundwater Treatment Modeling in the Optimal Design of Pump-and-Treat Groundwater Remediation Systems" Submitted to *Water Research*, 12/16/05 (pending)

Fry, L., J.R. Mihelcic, and **D.W. Watkins Jr.** "Improving Public Health by Improving Water Supply: Results from Springbox Projects in Cameroon," *J. Sustainable Engineering*, in press, 2006.

Gerold, L.A., and **D.W. Watkins Jr.** "Short Duration Rainfall Frequency Analysis in Michigan Using Scale-Invariance Assumptions," *Journal of Hydrologic Engineering*, ASCE, 10(6): 450-457, 2005.

Gierke, J.S., T.J. Kremer, J. Drelich, and P. Imhoff, "Laboratory Evaluation of Surfactant-Enhanced Air Sparging Performance," *Environmental Science & Technology*, submitted.

Gorman, H.S., "The Houston Ship Channel and the Changing Landscape of Industrial Pollution" in *Energy intensive Metropolis: An Environmental History of Houston and the Gulf Coast*, ed. Martin V. Melosi and Joseph Pratt (University of Pittsburgh Press, forthcoming 2006).

Gorman, H.S. and **K.E. Halvorsen**. 2006. The Regulation of Alternative Onsite Wastewater Treatment Systems along the Great Lakes. *Small Flows Quarterly* 7 (2006) 23-33.

Gorman, H.S., "Laying the Foundation for the Control of Industrial Pollution, 1930-1970: Two Canals, a Refinery, and Clarence W. Klassen" *Journal of Illinois History* 8 (2005): 182-208.

Gorman, H.S., and Erik Conway, "Monitoring the Environment: Taking a Historical Perspective," *Environmental Management and Assessment* 106 (2005): 1-10.

Hallack-Alegria, M., and **D.W. Watkins Jr.** "Annual and Warm Season Drought Intensity-Duration-Frequency Analysis for Sonora, Mexico," *Journal of Climate*, in press, 2006.

Halvorsen, K.E. 2006. Critical Next Steps in Research on Public Meetings and Environmental Decision Making. Invited Submission for Special Issue of Human Ecology Review on Public Participation. 13(2)XX. In Press.

Halvorsen, K.E., and **H.S. Gorman.** 2006. Onsite Sewage System Regulation along the Great Lakes and the USEPA "Homeowner Awareness" Model. *Environmental Management*. 37(3)395-409.

Huckins, C. J., E. A. Baker, K. D. Fausch and J. B. K. Leonard. Ecology and Life History of Coaster Brook Trout *Salvelinus fontinalis* and Potential Bottlenecks in Their Rehabilitation. *North American Journal of Fish Management*. "in press".

Huckins, C. J., E. A. Baker Ecology and Status of Coaster Brook Trout in the Salmon Trout River, Marquette County, Michigan. *Transactions of the American Fisheries Society* "in revision"

Hutzler, N., Water Use in Multioccupant Buildings" *ASCE Journal of Architectural Engineering*, Vol. 11, No. 3, pp. 99-109, 2005.

M.E. Jarvie, **D.W. Hand,** S. Bhuvendralingam, J.C. Crittenden and D.R. Hokanson "Simulating the performance of fixed-bed granular activated carbon adsorbers: Removal of synthetic organic chemicals in the presence of background organic matter , *Water Research*, Volume 39, Issue 11, June 2005, Pages 2407-2421

Kracman, D.R., D.C. McKinney, **D.W. Watkins Jr.,** and L.S. Lasdon. "Stochastic Optimization of the Highland Lakes System in Texas," *Journal of Water Resources Planning and Management*, ASCE, 132(2): 62-70, 2006.

H. Li, **D.W. Hand,** Y.S. Chen, J.C. Crittenden, and R. Taylor "Modeling of Indoor Air Treatment of Polychlorinated Dibenzo-p-dioxins and Dibenzofurans (PCDD/Fs) Using HEPA-Carbon Filtration" *Air and Waste Management Journal*, (in press 2006).

MacLennan, C., Walck, C. L., "How Mining, Ranching and State Power Changed the Landscape of Southwestern New Mexico 1850-2005", Cligget, L., Pool, C., (Economies and the Transformation of Landscapes, Lanham, MD).

Mayer, A.S. and S.M. Hassanizadeh, *Soil and Groundwater Contamination: Nonaqueous Phase Liquids*, American Geophysical Union, Washington, CD, 2005.

Mayer, A.S., May, W., and C. Lukkarila, "Estimation of Fault Zone Conductance by Calibration of a Regional Groundwater Flow Model – Desert Hot Springs, California," *Hydrogeology Journal*, 2006 (submitted).

Mayer, A.S. and K.L. Endres, "Simultaneous Optimization of Contaminant Source and Plume Remediation," *Journal of Contaminant Hydrology*, 2006 (submitted).

Mayer, A.S., Endres, K.L. and **D.W. Hand,** "Groundwater Treatment Modeling in the Optimal Design of Pump-and-Treat Groundwater Remediation Systems," *Journal of Environmental Engineering*, 2006 (submitted).

McDonald, C.P., **Urban, N.R.,** 2006, Sediment Radioisotope Dating in a Mining-Impacted Lake, *J. Environ. Rad.*, submitted 4/25/06

Mihelcic, J.R., L. Phillips, and **D.W. Watkins Jr.** "Integrating a Global Perspective into Education and Research: Engineering International Sustainable Development," *Environmental Engineering Science*, in press, 2006.

O'Connell, S., **D. W. Watkins, Jr.** "Teleconnections and Disconnections in Central Texas: A Guide for Water Managers," in *Climate Variations, Climate Change and Water Resources Engineering*, eds. J. Garbrecht and T. Piechota, ASCE Press., 2005.

Oyadomari, J.K. and **N. Auer**. "submitted" Factors Influencing Otolith Microstructure in Larval Cisco" Transactions of the American Fisheries Society.

Perlinger, J.A., Tobias, D.E., Morrow, P.S., and Doskey, P.V., "Evaluation of novel techniques for measurement of air-water exchange of persistent bioaccumulative toxicants in Lake Superior", Environmental Science & Technology, 39, 8411-8419, 2005.

Perlinger, J.A. "Quality Assurance Project Plan: Measurement and Modeling of PBT Transport in Lake Superior", Great Lakes Commission, MTU Contract # 051212, 77 pp., April 28th, 2006.

Perrings, C. and **B.D. Solomon**, "Ecological economics", Living Spirit, Aug./Sept. 2006 in press.

Rose, W.I. and **G.J.S. Bluth**, 2005, Geohazards graduate study with the U.S. Peace Corps. Eos, 86, n. 34, p. 311.

Rowe, M.D., **Perlinger, J.A.**, and **Urban, N.R.**, "Modeling contaminant behavior in Lake Superior: A comparison of PCBs, PBDEs, and mercury", In State of Lake Superior, Ecovision World Monograph Series, M. Munawar (Ed.), Taylor & Francis Publ., London, UK, in press.

Rucinski, D.K., **M.T. Auer**, **D.W. Watkins Jr.**, S.W. Effler, S.M. Doerr O'Donnell and R.K. Gelda. "Assessing Assimilative Capacity: A Dual Discharge Approach: 1. Concept Development and Feasibility Testing," *Journal of Water Resources Planning and Management*, ASCE, accepted, 2006.

Schumaker-Chadde, Joan, 2006. *Michigan Water Quality curriculum unit for middle school students*. Michigan Department of Environmental Quality. Lansing, MI.

Sherman, H.M., **J.S. Gierke**, and C.P. Anderson, "Controls on Spatial Variability of Uranium and U Isotope Ratios in Sandstone Aquifers," Ground Water, submitted.

Solomon, B.D. C.M. Corey and **K.E. Halvorsen**. Safe minimum standard analysis of the Florida manatee. In J. Gowdy and J.D. Erickson, eds. *Frontiers in Environmental Valuation and Policy* (Northampton, MA: Edward Elgar), forthcoming.

Solomon, Barry D., Editor, *Readings in American Socioeconomic Institutions*, 3rd edition (Boston: Pearson, 2006), submitted.

Solomon, B.D., C.M. Corey-Luse, and **K.E. Halvorsen**, "Safe minimum standard analysis of the Florida manatee." Chapter 7 in *Frontiers in Environmental Valuation and Policy*, eds. J. Gowdy and J.D. Erickson (Edward Elgar, Cheltenham, UK, 2006), in press.

Solomon, B.D. , "The size thing reconsidered: The optimal scale of the transdiscipline of ecological economics", *International Journal of Ecological Economics and Statistics*, Vol. 3, No. 3, September 2005, pp. 1-20.

MTU, Environmental Sustainability Committee (co-author **B.D. Solomon**). *Greenprint for Environmental Sustainability in Campus Operations and Activities*, March 2006, 60 pages.

Sorby, Sheryl, and **Joan Schumaker Chadde**. *Partnering to Bring Engineering Concepts to Elementary Students*. *International Journal of Engineering Education*. (in progress)

Trefry, C.M., **D.W. Watkins Jr.**, and D. L. Johnson. "Regional Rainfall Frequency Analysis for the State of Michigan," *Journal of Hydrologic Engineering*, ASCE, 10(6): 437-449, 2005.

Urban, N.R., 2006, *Nutrients in Lake Superior: a retrospective*, AEHMS Lake Superior Monograph, ed. M.

Munawar, in review

Urban, NR, 2006, Carbon cycling in Lake Superior: A regional and ecosystem context, AEHMS Lake Superior Monograph, ed. M. Munawar, in review

Urban, N. R., M. T. Auer, S. A. Green, X. Lu, D. S. Apul, K. D. Powell, and L. Bub, "Carbon cycling in Lake Superior", *Journal of Geophysical Research-Oceans*, 110 (C6) (2005).

VanDusen, P. J., **C. J Huckins, D. J. Flaspohler**. 2005. Associations among selection logging history, brook trout, macroinvertebrates and habitat in Northern Michigan headwater streams. *Transactions of the American Fisheries Society*. 134:762-774

Walck, C. L., "A Use-Centered Perspective on Sustainability: A Case Study of Land use in the American Southwest", Sharma, S., Starik, M., (Organizations and the Sustainability Mosaic: Crafting Long-Term Ecological and Societal Solutions, Northampton, MA), vol. 3.

Walck, C. L., MacLennan, C., *Using Environmental History To Understand Sustainability: Land Use And Land Health In Silver City.*: Organization & Environment. Submitted

Watkins, D.W., D. Morton, and D.C. McKinney, "A Stochastic Groundwater Management Model," in *Applications of Stochastic Programming*, eds. S.W. Wallace and W.T. Ziemba, MPS-SIAM Series in Optimization, pp. 409-424, 2005.

Watkins, D.W., H. Li, and J.R Cowden. "Adjustment of Radar-Based Precipitation Estimates for Great Lakes Hydrologic Modeling" *Journal of Hydrologic Engineering*, ASCE, accepted, 2006.

Watkins, D.W. Jr., and D.A. Moser. "Economic-Based Optimization of Panama Canal System Operations," *Journal of Water Resources Planning and Management*, ASCE, in press, 2006.

Watkins, D., and D. Ford. "The Quentin Martin Award," *Journal of Water Resources Planning and Management*, ASCE, 132(2): 61, 2006. (editorial)

Watkins, D. "A case for case studies in water resources planning and management education," *Journal of Water Resources Planning and Management*, ASCE, in press, 2006. (editorial)

Zhang, Q., Shonnard, D. R., Crittenden, J. C., Chen, H., Mihelcic, J. R. "Overcome the Barrier of Applying Life Cycle Assessment: Simplified Impact Assessment Methods Based on Inhalation Noncarcinogenic Impact," *Journal of Industrial Ecology*, submitted in Feb. 2006

Presentations and Abstracts by CWS Participants

Auer, M.T., "A Modeling Analysis of the Clear Water Phase in Onondaga Lake," 7th Onondaga Lake Scientific Forum, Syracuse, New York, November 2005.

Auer, M.T., and Bub, L., "Seasonal and Spatial Trends in Primary Production: Contributions to the Carbon Budget of Lake Superior," 48th Conference on Great Lakes Research, Ann Arbor, Michigan, May 2005.

"An Analysis of the Distribution of Diporeia in Lake Superior using Ecological and Biological Indices," with **N.A. Auer** and B.A. Cannon, presented by **M.T. Auer** at the 48th Conference on Great Lakes Research, Ann Arbor, Michigan, May 2005.

Auer, N.A., "Beginning your Professional Journey," 2005 Midwest Fish and Wildlife Conference, Dec 11, 2005.

Bagley, S.T., Workshop on "Environmental Microbiology: What's Hot!" Conference on Undergraduate Education, American Society for Microbiology, Atlanta, GA, June 4/5, 2005.

Garcilaso, L., Gaines, W., and **Barkdoll, B.D.** (2005). "Determining the ``True Cost of Water" in an Automotive Manufacturing Plant." Conference Proceeding Of World Water & Environmental Resources Congress 2005, Anchorage, AK, 173, 68, also presented.

Thiemann, K., Yossef, M.F.M., and **Barkdoll, B. D.** (2005). "A Laboratory Study of the Effects of Groyne Height on Sediment Behavior in Rivers." Conference Proceeding Of World Water & Environmental Resources Congress 2005, Anchorage, AK, 173, 590, also presented.

Volkman, S., **Barkdoll, B. D.**, and Bingner, R. (2005). "Quickbird Satellite Imagery for Riparian Management: Characterizing Riparian Filter Strips and Detecting Concentrated Flow in an Agricultural Watershed." Conference Proceeding Of World Water & Environmental Resources Congress 2005, Anchorage, AK 173, 487, also presented.

Li, H., Kuhnle, R., and **Barkdoll, B.D.** (2005). "Spur Dikes as an Abutment Scour Countermeasure." Conference Proceeding Of World Water & Environmental Resources Congress 2005, Anchorage, AK, 173, 444, also presented.

Shrestha, R.C. and **Barkdoll, B. D.** (2005) "A Direct Solution to Normal Depth in Open Channels." Conference Proceeding Of World Water & Environmental Resources Congress 2005, Anchorage, AK 173, 405, also presented.

Li, H., **Barkdoll, B. D.**, and Kuhnle, R. (2005) "Bridge Abutment Collar as a Scour Countermeasure." Conference Proceeding Of World Water & Environmental Resources Congress 2005, Anchorage, AK 173, 395, also presented.

Ghimire, S., **Barkdoll, B. D.**, and Bergstrom, P. (2005). "Network Modeling to Demonstrate Efficacy of Improved Water Quality Monitoring." Conference Proceeding Of World Water & Environmental Resources Congress 2005, Anchorage, AK 173, 38, also presented.

Cotey, S.R., 2006, "Monitoring School Forests," Michigan Science Teachers Association, Lansing, MI.

Cotey, S.R., 2005, "Hamilton Creek Watershed: A Case Study in Partnerships. Finding the Balance Between Development and Natural Resources in the Keweenaw," Great Lakes National Wildlife Federation, Copper Harbor, MI.

Kadlec J., Grygar T., Diehl J.F., **Beske-Diehl S.**, Mihaljevic M., Ettler V., Bezdicka P., Svetlik I. (2006): The Late Holocene climatic and anthropogenic record in flood-plain deposits of the Morava River (Czech Republic).- Geophysical Research Abstracts, 8, 10542, CD ROM. European Geophysical Union, Vienna (abstract).

Gierke, J.S., "Aqua Terra Tech: A Multiyear, Multidisciplinary Undergraduate Enterprise Working on Water Resources Development and Protection," Association of Environmental Engineering & Science Professors First Biennial Research and Education Conference, 23-27 July 2005, Clarkson University, Potsdam, New York.

Gierke, J.S., "A Unique, Sustainable Undergraduate Educational Approach for Fostering Practical and Research Skills in Hydrogeology," Clemson Hydrogeology Symposium, 30 March 2006, Clemson, South Carolina.

Gierke, J.S., and E.L. Gross, "Using Groundwater Exploration Projects in Developing Countries for Undergraduate Engineering Education," National Ground Water Association Ground Water Summit, 23-26 April 2006, San Antonio, Texas.

Barbour, J.N., R.W. Porritt, **J.S. Gierke**, and others, "Geophysical Exploration for Ground Water in Boaco, Nicaragua," National Ground Water Association Ground Water Summit, 23-26 April 2006, San Antonio, Texas.

Gierke, J.S., "Effectiveness of Enhancements on Air Sparging Performance," Geology Lecture Series, 18 November 2005, Clemson University, South Carolina.

Gorman, Hugh S., Paper presented, "N in the City," American Soc. for Env. History, March 2006

Green, Sarah A., W. Charles Kerfoot, **Judith Wells-Budd**, and Matthew Julius, "Donut in the Desert: Structure of a Winter Production Pulse," at American Geophysical Union, Fall Meeting, San Francisco, 2005.

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