ANNUAL REPORT

July 1, 2006 – June 30, 2007

Submitted by:

The Center for Water and Society Advisory Committee

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Abstract

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 second year of operation and development. The CWS annual report for 2006-2007 is organized by the CWS year in review, conferences and workshops, Degree subcommittee and Seminar & Symposia subcommittee activities, CWS budget analysis, Advisory Committee members and CWS participant roster, affiliated research projects and submitted proposals, and publications and presentations by CWS participants.
1. 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 has 47 participants in 12 units across the Michigan Tech campus (see Appendix1). CWS is governed by a director and advisory committee (see Appendix 2)
2. CWS Year in Review

2.1 CWS 2006 Retreat Survey Results

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.

After the 2006 retreat, surveys were sent to CWS participants to get additional input on the group’s vision, goals, and anticipated commitments for the Center for Water and Society.

As a direct result of the retreat and survey results, CWS led an informal research group composed of faculty members from multiple disciplines across the MTU campus to focus on Great Lakes research. This group then compiled a pre-proposal to the NSF-IGERT program.

A second research group meeting is planned for 2007-2008 with the focus on international research and education on water related issues.

2.2 CWS Discussion on Great Lakes Research

The Center for Water & Society discussion on Great Lakes Research was held on October 10, 2006. A summary of the discussion is found in Appendix 3.

Subsequent meetings of this group resulted in the submission of an NSF IGERT pre-proposal for the project, “IGERT: Multi-scale stressors and the sustainability of the Lake Superior basin”. The PI is Alex Mayer (GMES), and co-PI’s are Noel Urban (CEE), Nancy Auer (BIO), Kathy Halvorsen (SS/SFRES), and Charles Kerfoot (BIO).

2.3. CWS Weekly News email

The Center for Water and Society began a water-related news email which has been submitted to the CWS participants on a weekly basis. The content has consisted of CWS highlights, listings of water-related seminars and graduate defenses, links to water related news articles, and links to new funding opportunities.
2.4 CWS Poster Competition

The Center for Water and Society sponsored a special competition held as part of the Graduate Student Council (GSC) Poster Session held on Oct. 13 and 14, 2006. The Center for Water and Society offered cash awards for first, second and third best posters on water-related issues from all university disciplines. This was the first occurrence of another campus organization joining the Graduate Student Council with awards for special interests in the GSC Poster Session.

To be considered for the CWS award, students pre-registered their entries with a brief abstract of their poster which declared participation in the CWS competition.

2006 CWS Poster Competition Awards:

The winning posters can be viewed online at http://www.mtcws.mtu.edu/index_Archived_Events_Oct2006-Oct2007.html.

First place: Cory P. McDonald, Engineering – Environmental
“Modeling copper transport in the sediments of Torch Lake, Houghton County, MI”

Second place: Melba D. Apoya-Horton, Biological Sciences
“Movement Modalities As Adaptive Response To Salinity Changes Of The Mudflat Diatom Cylindrotheca closterium (Bacillariophyceae)”

Third place: Andrea Munoz Hernandez, Engineering – Environmental
“Calibration of a water surface model for a basin in a semiarid region: The Rio Yaqui-Basin, Mexico”
GSC Best Overall:  Agustin Robles Morua, Engineering – Environmental
“A Collaborative Approach to Improve Sanitation in a Marginalized Rural Community in Mexico” (registered in CWS Poster Competition)

2.5 CWS Graduate travel award
Gerald Greer, Social Sciences, was awarded a CWS graduate student travel award to attend the 13th International Symposium on Society and Resource Management Conference at Park City, UT in June, 2007.

Co-authors: Gerald K. Greer, Kathleen E. Halvorsen, Alex S. Mayer, Julia Kalloz.

2.6 CWS Graduate research award
Nancy-Jeanne Bachman, Civil and Environmental Engineering was awarded a CWS graduate research award for her research work.

Project: “Hydrologic Monitoring of an Underdrained Low Impact Development (LID) Stormwater Management System in Gainesville, VA”
Advisors: John S. Gierke and David W. Watkins
2.7 Lake Superior Youth Symposium scholarship
CWS awarded a scholarship for one high school student to attend the 7th Annual Lake Superior Youth Symposium held at Bay Cliff Health Camp in Big Bay, Michigan, May 10-13, 2007.

2.8 World Water Day
World Water Day tents were created and displayed on tables in the U. J. Noblet Forestry Building, the DOW Environmental Sciences & Engineering Building, the J. R. Van Pelt Library, and the Memorial Union Building.

Kathy Halverson made a pledge to WNMU radio and dedicated her pledge to set the Michigan Tech Center for Water & Society as the sponsor for a day of broadcasting for World Water Day.

2.9 Project Cost Share
CWS provided equipment cost share in the amount of $1000 to purchase a CO$_2$ analyzer for the “REF: Air: A Conduit between Water, Society, and Space” project managed by Noel Urban.

2.10 Conferences and Workshops
Conferences and workshops attended by the CWS Director in support of CWS.

Complex Interacting Systems for a Sustainable Future
NSF Workshop
June 7-8, 2007
Sand Key Beach Sheraton Hotel, Clearwater Beach, Florida

Climate Change in the Great Lakes Region
March 15-16, 2007
2.11 Degree Subcommittee Activities

(Members: Nancy Auer, Kathy Halvorsen, Alex Mayer)

The CWS Degree Subcommittee has developed a list of all current water-related courses offered at MTU, and is working towards a course framework for a minor and a graduate certificate in water study. The course list is posted on the CWS website as a reference for students and instructors (http://www.mtcws.mtu.edu/education.html)

The CWS Degree Subcommittee has also developed a formal application which will be used in the competition for graduate student research and travel awards.

2.12 Seminars & Symposia Subcommittee Activities

(Members: Noel Urban, Kathy Halvorsen, Chris Anderson, Alex Mayer)

Co-Sponsored seminars and events

David Gallo, Special Projects Coordinator
Woods Hole Oceanographic Institute

“Extreme Deep: Exploring the Ends of the Earth—Neptune’s Basement”

“Global Water Crisis”

Meetings with Michigan Tech department and centers, toured research facilities, and interacted with teachers and students from local schools
ISSRM 2007
CWS was a supporter of the 13th International Symposium on Society and Resource Management held in Park City, Utah, June 17-21, 2007. The theme of the symposium was “Landscape Continuity and Change - Social Science Perspectives and Interdisciplinary Contributions”.

Aboard the Agassiz
CWS co-sponsored community & school programs held on excursions taken on board the Agassiz research vessel which were held during the summer and fall of 2006.

Inconvenient Truth
CWS co-sponsored the free showing of Al Gore’s Inconvenient Truth film, which was presented on campus October 29th and 30th, 2006.
3. CWS Budget

CWS Institute O/H Incentive Account

Beginning Balance July 1, 2006 .......................................................... $18,711.99
Research Incentive Transfer In ............................................................ $3,299.57
Expenditures .................................................................................... $16,220.79
Balance as of June 30, 2007 ............................................................. $5,478.13
4. Research

4.1 New awards 2006-7

New Research Funding 2006-7: $405,327

- ExCit: Expanding Cities-People, Water and Infrastructure
  PI: Alex Mayer
  Sponsor: U.S. Department of Education
  $63,462 (9/2006 – 8/2008, Third Year of Funding)

- Herring Gull BioSentinal Sampling Program Cooperative Agreement
  PI: Judith Perlinger
  Sponsor: Clemson Univ
  $8,000 (8/2006 – 9/2008)

- Streamside Lake Sturgeon Culture for the Ontonagon River, Michigan
  PI: Nancy Auer
  Sponsor: MI DNR
  $30,394 (10/2006 – 9/2008, First Year of Funding)

- Collaborative Research: The carbon balance of Lake Superior: modeling lake processes and understanding impacts on the regional carbon budget
  PI: Noel Urban
  Sponsor: NSF
  $242,199 (8/2006 - 7/2010)

- Evaluating Riparian Timber Harvesting Guidelines: Phase 3, Result 2 Evaluate Aquatic Habitat Impacts
  PI: Casey Huckins
  Sponsor: U.S. Dept. of Agriculture Forest Service, Northern Research Station

- Huron Creek Watershed Management Plan
  PI: Alex Mayer
  Sponsor: MI-EPA
  $38,667 (7/2007 - 12/2008)
4.2 Active Research Projects Affiliated with CWS, 2006-7

Total Research Expenditures 2006-7: .................. $281,571.59
Project Expenditures: .................................................. $242,603.40
Cost Share Expenditures: .............................................. $38,968.19

- Sedimentation in Schoharie Reservoir: Temporal Dynamics
  PI: Noel R. Urban
  Sponsor: Upstate Freshwater Institute (pass through funding from NYC Dept. Environmental Protection)
  Project Expenditures: $83,866.25

- TIES - MTU-UNISON Linkage: Training a Core of Water Resource Experts
  PI: Alex S. Mayer
  Sponsor: Association Liaison Office/US Agency for International Development
  Project Expenditures: $2,071.04

  ExCit: Expanding Cities - People, Water and Infrastructure
  PI: Alex S. Mayer
  Sponsor: US Dept. of Education
  Project Expenditures: $37,681.75
  Cost Share Expenditures: $31,618.50

- REF: Air: A Conduit between Water, Society, and Space
  PI: Alex Mayer
  Sponsor: State of Michigan – REF
  Project Expenditures: $49,263.37

- Herring Gull BioSentinal Sampling Program Cooperative Agreement
  PI: Judith Perlinger
  Sponsor: Clemson Univ
  Project Expenditures: $4,149.82

- Streamside Lake Sturgeon Culture for the Ontonagon River, Michigan
  PI: Nancy Auer
  Sponsor: MI DNR
  Project Expenditures: $17,046.85
  Cost Share Expenditures: $7,349.69

- Collaborative Research: The carbon balance of Lake Superior: modeling lake processes and understanding impacts on the regional carbon budget
  PI: Noel Urban
  Sponsor: NSF
  Project Expenditures: $48,524.32
4.3 Proposals Submitted under CWS, 2006-7

- Regionalization Techniques for Ensemble Streamflow Prediction  
  PI: David Watkins  
  Sponsor: NOAA  
  Requested Amount: $131,360

- Factors Influencing Successful Water Quality Trading Programs  
  PI: David Watkins  
  co-PI: Barry Solomon  
  Sponsor: EPA  
  Requested Amount: $135,750

- Bioaccumulation of Hg Released from Mine Tailings on Michigan’s Keweenaw Peninsula  
  PI: Noel Urban  
  co-PI: Judith Perlinger  
  co-PI: Charles Kerfoot  
  Sponsor: EPA Great Lakes National Program Office  
  Requested Amount: $58,924

- PIRE: Risk Perception Analysis and Water Resources Management in Latin America  
  PI: David Watkins  
  co-PI: Kathy Halverson  
  co-PI: Veronica Webster Griffis  
  co-PI: James Mihelcic  
  co-PI: Alex Mayer  
  Sponsor: NSF (Pre-Proposal)

- Herring Gull BioSentinal Sampling Program Cooperative Agreement  
  PI: Judith Perlinger  
  co-PI: Noel Urban  
  Sponsor: Clemson Univ  
  Requested Amount: $8,000

- A Modified Relaxed Eddy Accumulator for Measurement of Persistent Bioaccumulative Toxicant Fluxes in Coastal/Estuarine Areas  
  PI: Judith Perlinger  
  Sponsor: CICEET Univ of NH  
  Requested Amount: $475,873

- Optimal Identification of Climate Signals and Conditioning of Ensemble Streamflow Prediction Forecasts  
  PI: Dave Watkins  
  co-PI: Veronica Griffis  
  Sponsor: US Dept of Commerce  
  Requested Amount: $245,655

- Streamside Lake Sturgeon Culture for the Ontonagon River, Michigan  
  PI: Nancy Auer  
  Sponsor: MI DNR  
  Requested Amount: $64,240

- Monitoring Biodiversity: An Illustrated Atlas to the Larval Fishes of the Great Lakes Basin  
  PI: Nancy Auer  
  Sponsor: NSF  
  Requested Amount: $445,797
- **Enhanced Natural Recovery of Hg-Contaminated Sediments by Nitrate Augmentation**
  PI: Martin Auer
  co-PI: Noel Urban
  co-PI: Gilbert Lewis
  Sponsor: NIH
  Requested Amount: $911,125

- **Society, Sustainability, and N: A History of Society's Changing Knowledge of and Interaction with the Nitrogen Cycle**
  PI: Hugh Gorman
  Sponsor: NSF
  Requested Amount: $134,541

- **The Calumet Watershed, Lake Superior Basin: An observatory to assess impacts of change in the hydrologic cycle and land use on biogeochemical processes**
  PI: Robert Stottlemeyer
  co-PI: Alex Mayer
  co-PI: David Toczydlowski
  Sponsor: NSF
  Requested Amount: $2,739,067

- **Development of a Stream Management Guide to Enhance Great lakes Coastal Habitats**
  PI: Joan Chadde
  co-PI: Casey Huckins
  co-PI: Alex Mayer
  Sponsor: U.S. Fish & Wildlife Service
  Requested Amount: $19,997

- **Assessment of groundwater influence on coaster brook trout spawning habitat using non-invasive methods in the Salmon Trout River, Upper Peninsula of Michigan**
  PI: Alex Mayer
  Sponsor: U.S. Fish & Wildlife Service's Coastal Program - Great Lakes
  Requested Amount: $19,617

- **Collaborative Research: Modeling and Analyzing the Use, Efficiency, Value and Governance of Water as a Material in the Great Lakes Region Through an Integrated Approach**
  PI: Alex Mayer
  co-PI: James Mihelcic
  co-PI: David Watkins
  co-PI: Qiong (Jane) Zhang
  Sponsor: NSF
  Requested Amount: $1,078,322

- **Assessment of groundwater influence on coaster brook trout spawning habitat using non-invasive methods in the Salmon Trout River, Upper Peninsula of Michigan**
  PI: Alex Mayer
  Sponsor: Huron Mountain Wildlife Foundation
  Requested Amount: $20,869

- **Collaborative Research: Modeling of the lower food web in Lake Superior**
  PI: Noel Urban
  co-PI: Marty Auer
  Sponsor: NSF
  Requested Amount: $517,552
• Disappearing Diporeia: Testing the Food Limitation Hypothesis
  PI: Marty Auer  
  co-PI: Nancy Auer  
  co-PI: Noel Urban  
  Sponsor: EPA Great Lakes Nat'l Prog Office  
  Requested Amount: $285,460

• Disappearing Diporeia: Testing the Food Limitation Hypothesis
  PI: Marty Auer  
  co-PI: Nancy Auer  
  co-PI: Noel Urban  
  Sponsor: Great Lakes Fishery Commission  
  Requested Amount: $285,460

• Disappearing Diporeia: Testing the Food Limitation Hypothesis
  PI: Marty Auer  
  co-PI: Nancy Auer  
  co-PI: Noel Urban  
  Sponsor: Great Lakes Fishery Trust  
  Requested Amount: $285,460

• IGERT: Multi-scale stressors and the sustainability of the Lake Superior basin
  PI: Alex Mayer  
  co-PI: Noel Urban  
  co-PI: Nancy Auer  
  co-PI: Kathy Halvorsen  
  co-PI: Charles Kerfoot  
  Sponsor: NSF IGERT (pre-proposal)

• Sustainable Development for Rural Communities: Social, Health, Economic, and Environmental Advances
  PI: Alex Mayer  
  co-PI: Blair Orr  
  co-PI: Carol MacLennan  
  co-PI: Jim Mihelcic  
  co-PI: David Watkins  
  Sponsor: US Dept. of Education NA Mobility Program  
  Requested Amount: $199,966

• Evaluating Riparian Timber Harvesting Guidelines: Phase 3, Result 2 Evaluate Aquatic Habitat Impacts
  PI: Casey Huckins  
  Sponsor: U.S. Dept. of Agriculture Forest Service, Northern Research Station  
  Requested Amount: $22,605

• Global Watershed: Integrating Rural and Global Perspectives with Research and Technological Advances
  PI: Alex Mayer  
  co-PI: Linda Nagel  
  co-PI: Casey Huckins  
  co-PI: Bradley Baltensperger  
  Sponsor: NSF GK12  
  Requested Amount: $2,287,782
5. Publications by CWS Participants, 2006-7

Publications are ordered by CWS author or co-author and include journal articles, books, and chapters in books that are published, in press, forthcoming, or accepted. Items which are in press, forthcoming, or accepted will be counted as published with complete references in the next CWS Annual Report.

Published journal articles, books, and book chapters ..............................................................30
Journal articles, books, and chapters in books in press, forthcoming, or accepted .................18
Proceedings..............................................................................................................................18
Presentations ..........................................................................................................................37

5.1 Published journal articles, books, and book chapters


### 5.2. Proceedings


5.3 Presentations


23. **Mayer, A.S.**,” Watershed Management,” short course on watershed management, College of Sonora, Mexico, 10/06

24. **Mayer, A.S.**,” Crecimiento de Ciudades: la Población, el Agua y su Infraestructura,” Presented paper, North American Mobility Program Conference, Guanajuato, Mexico, 10/06


26. **Mayer, A.S.**,” Watershed Studies at Michigan Tech,” short course on watershed management, College of Sonora, Mexico, 4/07


Appendix 1: CWS Participants

Biological Sciences
Nancy A. Auer
Susan T. Bagley
Casey J. Huckins
Charles W. Kerfoot

Chemistry
Sarah A. Green

Civil & Environmental Engineering
Martin T. Auer
C. Robert Baillod
Brian D. Barkdoll
Kristine L. Bradolf
Veronica Griffis
David W. Hand
Neil J. Hutzler
Alex S. Mayer
James R. Mihelcic
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
William S. Breffle
Gary Campbell
Thomas E. Merz
Christa L. Walck

School of Forest Resources &
Environmental Science
David J. Flaspohler
Margaret R. Gale
Kathleen E. Halvorsen
Martin F. Jurgensen
Linda M. Nagel
Blair D. Orr
Tom G. Pypker
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
# Appendix 2: CWS Advisory Committee

## Director
Alex S. Mayer  
asmayer@mtu.edu  
Geological & Mining Engineering & Science

## Administrative Assistant
Carol J. Asiala  
cjasiala@mtu.edu  
Geological & Mining Engineering & Science

## Advisory Committee

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</tbody>
</table>
Appendix 3. Great Lakes Research

Center for Water & Society discussion on Great Lakes Research, held on October 10, 2006

Attendees of CWS Great Lakes Research Discussion:
Marty Auer                Jeff Henquinet                   Carol MacLennan
Nancy Auer                Casey Huckins                    Judith A. Perlinger
Stacey Cotey              Neil Hutzler                     Noel R. Urban
John Gierke               Charles Kerfoot
Kathy Halvorsen            Alex Mayer

1. Great Lakes restoration
   - Great Lakes Regional Collaboration: http://www.glrc.us/
   - Prescription for Great Lakes Ecosystem Protection and Restoration (Avoiding the Tipping Point of Irreversible Changes)
     http://restorethelakes.org/PrescriptionforGreatLakes.pdf
   - Should we join the Healing Our Waters Coalition
     http://www.restorethelakes.org/about.html

2. Making connections with Altarum
   - Tech Topics news item on Michigan Tech acquisition of Altarum Environmental and Emerging Technologies Division (EETD)
     http://www.admin.mtu.edu/urel/news/media_relations/516/
   - Web site for Environmental and Emerging Technologies Division (EETD)
     http://www.altarum.org/eetd/index.htm

3. Investigate funding and collaborative research opportunities associated with Great Lakes monitoring networks
   - NEON program http://www.neoninc.org/
   - CUAHSI http://www.cuahsi.org/index.html
   - GLOS – Great Lakes Observing System, Regional Interest Group http://glos.us/
   - There is a Great Lakes Research advisory committee;
   - Integrated Atmospheric Deposition Network
     http://www.epa.gov/glnpo/monitoring/air/iadn/iadn.html;
   - UMD Large Lakes Observatory http://www.d.umn.edu/llo/

4. Ballast water/Exotic species: potential research topics
   - disinfection technology
   - modeling of dispersal of exotic species and subsequent ecosystem impacts
   - authority of institutions to enforce ballast rules
   - social considerations for preventing small-scale introduction of exotic species (e.g. edible fish markets, bait shops,...)
5. Gay/Keweenaw Bay stamp sands research ideas
   - remediation design
   - modeling of sediment transport, ecosystem impacts in support of remediation
   - Army Corps of Engineers connection
   - Great Lakes Legacy Act funds for research in support of remediation
   - social aspects of stamp sands and remediation

6. Focus on Lake Superior vs. Great Lakes
   - We have tremendous expertise on Lake Superior and will continue research on Lake Superior. However, we should be able to promote/position ourselves as having expertise that can be applied to all of the Great Lakes.

7. Modeling
   - Since many of us have expertise on modeling- surface and groundwater flow, chemical fate and transport, food web modeling, general numerical methods, etc., we should be able to promote ourselves as being able to model many of the phenomena that are important to Great Lakes.
   - If we integrated this modeling expertise, we could develop models capable of simulating relevant processes from watersheds to the open water.
   - These models could be used to predict the combined effects of climate change and land use change on the Great Lakes.
   - These models could be used to support decisions on how best to restore the Great Lakes.
   - Outputs from these models could be used to guide policy-makers (and policy-makers should be involved in model development).
   - Various aspects of models will need to be validated

8. Notre Dame is in the UP...
   - University of Notre Dame Environmental Research Center
     http://www.nd.edu/~underc/east/research/

9. Snow and ice
   - Our location is well suited for research on snow and ice as drivers for ecosystem behavior.
   - Climate change is expected to have impacts (or is already impacting) temporal and spatial patterns of snow and ice- how will this impact (or how is this impacting) ecosystems.

10. Critical areas of expertise needed at Michigan Tech to further contribute to Great Lakes research.
    - Hydrodynamicist would contribute to understanding of physical processes in open lakes and near shore areas.
    - Meteorologist would contribute to understanding effects of climate change on the Great Lakes and would connect with hydrodynamicist.
    - CWS could “lobby” for faculty positions to be filled by scientists with this expertise, but perhaps should be done as part of a larger research thrust proposal.