

# New Hampshire WRRC Information Transfer

## Basic Information

<b>Title:</b>	New Hampshire WRRC Information Transfer
<b>Project Number:</b>	2008NH97B
<b>Start Date:</b>	3/1/2011
<b>End Date:</b>	2/29/2012
<b>Funding Source:</b>	104B
<b>Congressional District:</b>	01
<b>Research Category:</b>	Water Quality
<b>Focus Category:</b>	Management and Planning, Water Quality, Non Point Pollution
<b>Descriptors:</b>	None
<b>Principal Investigators:</b>	William H H. McDowell

## Publications

There are no publications.

## Information Transfer

Unbridled development and population growth can have detrimental impacts to water resources and ecosystem services. Rapid population growth is occurring in New Hampshire and state regulations, planning board decisions and zoning classifications all attempt to minimize the environmental impact of this rapid population growth. Most land use planning decisions are made at the local level on a town by town basis, often by volunteers who serve on various boards, commissions and committees. Decisions by these various resource managers are often made without a full understanding of the consequences that their decisions will have on water resources or ecosystem services.

This project provided salary for the Center's Director and Associate Director to meet with state representatives, local town officials, watershed groups, the general public and scientists to discuss WRRC findings that relate to population growth and land use change. The NH WRRC website (<http://www.wrrc.unh.edu/>) is also used to disseminate information on water resources, and is updated and maintained by salary provided by this project. The time of the Director and Associate Director is increasingly spent discussing current and future research in the Lamprey River Hydrologic Observatory, which is partially funded by the longstanding 104B project "Water Quality and the Landscape: Long-term monitoring of a rapidly developing suburban watershed" and on nitrogen dynamics in New Hampshire's Great Bay watershed. On January 7, 2011 the NH WRRC totally funded and organized the **Fifth Annual Lamprey River Symposium** (see also below). Presentations focused on water quality, hydrology, geomorphology, stormwater, climate and landuse change, aquatic species and habitat, watershed planning and nitrogen cycling in coastal New Hampshire. The symposium attracted approximately 100 attendees, including scientists, regional leaders, town officials, members of state agencies, and federal agencies. The agenda can be found on the NH WRRC website at: <http://www.wrrc.unh.edu/lrho/symposium.htm>. This annual symposium and other discussions in which the Center's Director and Associate Director participate further the research and information transfer goals of the NH WRRC.

### Examples of Information Transferred

#### *Data for Public Water Supplies*

The NH WRRC's long-term water quality data on the rapidly developing suburban Lamprey River watershed has been shared with local towns as they investigate new potential sources for public water supply. Several towns in the watershed are investigating new water supplies to support the increased demand for water from their growing populations. Newmarket, NH is under considerable pressure to develop new water supplies, as its surface water treatment plant was shut down several years ago due to high concentrations of dissolved organic carbon (DOC). This DOC, although of largely natural origin from wetlands in the Lamprey River basin, results in production of dangerous trihalomethanes upon chlorination. Trihalomethanes are known carcinogens and the town of Newmarket was required to shut down the water treatment plant and rely solely on the two town wells.

Newmarket has contracted with Emery & Garrett Groundwater, Inc (EGGI) to increase their town water supply. Emery & Garrett Groundwater, Inc has suggested that the town withdraw water from the Lamprey River in Lee NH during high flow periods and artificially "recharge" their town wells to generate an underground storage supply that would meet the town

water needs even during dry summer conditions. The NH WRRC has provided EGGI with long-term Lamprey River data to assess whether seasonality and year to year variability in water quality (especially DOC) made it appropriate for artificial recharge. The town of Newmarket has not been able to appropriate funding to further develop this artificial recharge project, but the long-term dataset provided by the NH WRRC was instrumental in this water supply decision-making process and will be relied on as the town assesses how to increase its public water supply.

The town of Durham (including the University of New Hampshire) relies heavily on the Lamprey River for water supply since the town's local surface water source, the Oyster River, is often unable to meet the town's demand. Like Newmarket, Durham has also contracted with EGGI to determine if artificial recharge of their Spruce Hole Aquifer with Lamprey River water is an appropriate and viable option to meet the town's water supply needs. The NH WRRC continues to provide EGGI with long-term water quality data on the Lamprey River to inform this water supply decision-making process in Durham. As more towns in the future look to the Lamprey for water supply, the long-term dataset provided by the NH WRRC will become increasingly valuable.

### ***Nitrogen Data in New Hampshire's Great Bay watershed***

Over the three years, there has been significant focus on nitrogen loading to New Hampshire's largest estuary, the Great Bay estuary, and the impairment to aquatic life it has caused. In June 2009, numeric nitrogen criteria were established for Great Bay and in August 2009, Great Bay, Little Bay and the tidal rivers were added to the New Hampshire 2008 303d list of impaired waters rendering them in violation of the federal Clean Water Act. Based on a draft version of a waste load allocation report prepared by Philip Trowbridge (NH DES 2010), only 27% of the nitrogen entering Great Bay and Little Bay is from point sources; the majority (73%) enters via non-point sources of pollution. The Lamprey River is the largest tributary to Great Bay, and thus the long-term data provided by the NH WRRC from the LRHO are of considerable value for watershed management. The NH WRRC provides the best dataset in NH for assessing the spatial and temporal variability in N concentrations and export in response to suburbanization and changes in land use. These 11+ years of data will be instrumental in assessing the success of current and future efforts to reduce non-point sources of nitrogen pollution reaching Great Bay. There is much interest in LRHO datasets from NH DES, the Piscataqua Region Estuaries Partnership (PREP), the Environmental Protection Agency (EPA) and other municipal, regional, state and federal agents. Many of the presentations and meetings listed below focused on transferring information on nitrogen cycling to stakeholders throughout NH's coastal watershed and beyond. The NH WRRC has received several phone calls to discuss the Great Bay nitrogen issue and also the EPA's draft National Pollutant Discharge Elimination System (NPDES) permits that were issued to Exeter, Newmarket and Dover which limit nitrogen in the towns' wastewater treatment plant effluent to 3 mg/L. The NH WRRC provided the town of Newmarket, NH and Underwood Engineers, Inc. with monthly average nitrogen concentrations in the Lamprey River to inform the town's comments to EPA on the draft NPDES permit for Newmarket's wastewater treatment facility.

### **Symposia, Conferences and Seminars Organized and Funded**

The NH WRRC totally funded and organized the "**Fifth Annual Lamprey River Symposium**" held January 6, 2012 in Durham, NH. The symposium is dedicated to exchanging

the results of recent research on the water quality, hydrology, water resources issues, and management of the Lamprey River basin. The Symposium is a vehicle for researchers to share data and insights with other researchers, as well as those in the management and policy arena who would benefit from exposure to the latest research on the watershed. The symposium drew approximately 100 attendees, including researchers, legislators, water system operators, town officials, regional leaders and government officials. The symposium contained 13 presentations split up over three sessions. There was a break out session on nitrogen cycling and a poster session during lunch (5 posters and displays were exhibited). The day ended with an open discussion on research priorities in the Lamprey watershed and southeast NH. This event was totally funded and organized by the NH WRRC. Staff from UNH cooperative extension and Great Bay National Estuarine Research Reserve helped moderate the open discussions. Survey results indicate that over 90% of the attendees found the topics covered to be either helpful or very helpful.

The NH WRRC sponsored the “**NH Water and Watershed Conference**” in Plymouth, NH on March 25-26, 2011. This unique two-day event was designed to meet the information and networking needs of lake, river, and watershed groups; environmental organizations; volunteer monitors; municipal board and staff members; elected officials; local and regional planners; policy makers; scientists; educators; consultants and students. The focus for the 2011 conference was on effective strategies at the local, regional, state, and federal levels that address the changing environmental and societal conditions and their effects on New Hampshire’s aquatic environment. The NH WRRC co-Sponsored this conference along with FB Environmental Associates, GeoInsight Inc., Hach Hydromet, In-Situ Inc., New England EnviroStrategies, New Hampshire Department of Environmental Services, New Hampshire Fish and Game Department, Plymouth State University, Squam Lakes Association, United States Geological Survey Water Resources of NH and VT, Vanasse Hangen Brustlin, Inc. (VHB), Weston & Sampson Engineers Inc., Waterline Companies and the White Mountain National Forest. The conference contained 4 or 5 tracks each day including headwaters, streams and rivers; lakes wetlands and the coastal zone; wastewater and stormwater infrastructure; groundwater; land use change; local, regional, statewide and national strategies and skill building. The conference drew over 250 people, including researchers, legislators, water system operators, land use planners, and government officials.

### **Outcomes of Information Transferred**

In June 2009, the NH WRRC together with the Great Bay National Estuarine Research Reserve (GBNERR) Coastal Training Program, Lamprey River Watershed Association (LRWA), Lamprey River Advisory Committee (LRAC) and Piscataqua Region Estuaries Partnership (PREP) formed the Lamprey River Watershed Outreach Collaborative and co-sponsored an outreach conference in June 2009 focusing on pressing water issues for the residents of the 14 towns that make up the watershed. The conference was titled "Your Water, Your Wallet, Your Watershed - Why Working Together Across Town Boundaries Makes Sense For Protecting Our Water" and drew over 70 people including teachers, legislators, town officials, regional leaders and government officials. Topics covered were 1) issues and challenges to land use decision making in the 14 towns that share the Lamprey watershed (presented by Erika Washburn, UNH PhD candidate) 2) water quality issues with road salt use and elevated nitrogen levels (presented by NH WRRC associate director) 3) consistency of environmental planning and regulation between towns in the watershed (presented by PREP).

The Lamprey River Outreach Collaborative conference highlighted the need for watershed wide land use planning and decision making and gave momentum to an earlier idea that the entire Lamprey should be nominated into the NH Rivers Management and Protection Program (RMPP). Previously, the Lamprey River only had 17.5 km (in Durham and Lee) of the 78 km mainstem reach designated into the NH RMPP. Following the Lamprey River Outreach Conference, a Lamprey River Nomination Committee (LRNC) was formed and in June 2010, a nomination package was submitted by the LRNC, LRWA and the LRAC to the NH Department of Environmental Services (DES) to designate the remaining portions of the Lamprey River and all its major tributaries into the NH RMPP. This nomination represented a total of 141 river km and the major tributaries included were the North Branch, Pawtuckaway, North, Little and Piscassic Rivers. Together, these nominated rivers capture 14 towns, two counties and 3 regional planning commissions that all share the Lamprey River watershed. This nomination package was the most complex nomination that the NH State Rivers Management Committee had ever seen and the first one to push for a watershed approach (as opposed to nominating a segment of a river or the main stem of a river, but not its tributaries). The committee was extremely impressed that elected officials from all of the watershed towns wrote letters of support and by the number and variety of individual support letters. On September 28, 2010, the NH State Rivers Management Committee voted to approve the nomination and the resulting House Bill has passed in both the House and the Senate. The Governor signed this Bill into law on June 7, 2011. A watershed wide local advisory committee has now been formed with representatives from each of the 14 towns. The designation will give the Lamprey watershed preferential eligibility over non-designated rivers for state funding and technical resources.

The progressive movement of this nomination represents significant outreach efforts of the NH WRRC, all the partners of the Lamprey River Outreach Collaborative (<http://www.wrrc.unh.edu/lrho/outreach.html>) and also the social science work of Erika Washburn (PhD dissertation "To pave or not to pave: a social landscape analysis of land use decision-making in the Lamprey River watershed", December 2009). The LRNC, LRWA and LRAC made considerable efforts to put the nomination package together, but the public support for this nomination which is necessary for state designation would not have been possible without the extensive outreach of the Lamprey River Outreach Collaborative of which the NH WRRC plays a large role (<http://www.wrrc.unh.edu/lrho/outreach.html>). The concept of land use decision-making and natural resource management from a watershed perspective instead of solely by political boundaries with no regard to upstream or downstream neighbors is one that is gaining traction in southeast NH and is an outcome that the NH WRRC as well as other organizations is very proud of. This type of approach is the only to solve some of the current water quality impairments in New Hampshire (e.g. road salt contamination and elevated nitrogen and phosphorous in several water bodies).

## **Presentations**

Daley, M.L., McDowell, W.H. and Bucci, J. 2011. Nitrogen inputs, outputs, retention and concentrations in watersheds of the Great Bay Estuary system. NH Water and Watershed Conference. Plymouth, NH. March 2011. Shared slides with an EPA employee and discussed nitrogen cycling with NHDES employees and a university professor.

- Daley, M.L. and McDowell, W.H. 2011. Nitrogen Research in the Lamprey River Watershed and the Great Bay Estuarine Ecosystem. Southeast Watershed Alliance Science Symposium. Portsmouth, NH. May 2011. Shared slides with Zach Henderson for a presentation on nitrogen in the Great Bay watershed given by Woodard & Curran to the Southeast Watershed Alliance.
- Daley and McDowell. 2011. Human induced threats to surface and groundwater supplies in NH: a focus on nitrogen and sodium chloride. Drinking Water Source Protection Workshop. Concord, NH. May 2011.
- Daley, M.L. 2011. Shared PowerPoint slides on nitrogen cycling, a manuscript on road salt impacts and a nitrogen report from the Lamprey River watershed with Tom Irwin from the Conservation Law Foundation in New Hampshire. May 2011.
- Daley, M.L. 2011. Previous Nitrogen Research in the Lamprey Watershed and Current research in the Great Bay Watershed. University of New Hampshire Balancing Resource Management, Land Use and Development Class. Durham, NH. June 23, 2011.
- Daley, M.L. and McDowell, W.H. 2011. Identifying Non-Point Nitrogen sources in the Great Bay Watershed and Moving Towards Sustainability. Invited presentation. Joint EPA and NH DES Sustainability on a Shoestring meeting. Concord, NH. June 2011.
- Daley, M.L., Dr. John Bucci, McDowell, W.H., Dr. Erik Hobbie, Dr. Charlie French, Jody Potter and Steve Miller. Great Bay Nitrogen Sources and Transport presentations to Nitrogen Sources Collaborative Advisory Board. June 2011, November 2011 and February 2012. Greenland, NH.
- Daley, M.L. and McDowell, W.H. 2011. Non-Point Sources of Nitrogen in the Lamprey and Great Bay watershed. Invited presentation. Newington, NH. July 2011. Invitees included Newington conservation commission, selectmen, planning board, sewer commission, and interested residents.
- Daley, M.L. and McDowell, W.H. 2011. Viewing Great Bay from a Nitrogen (and Watershed) Perspective. Invited presentation. Great Bay Stewards Bay Views. Greenland, NH. July 2011.
- Daley, M.L. 2011. Urbanization and Suburbanization in NH watersheds. University of New Hampshire Watershed Water Quality Management class. Durham, NH. September 2011.
- Daley, M.L. and McDowell, W.H. 2011. Non-Point Sources of Nitrogen in the Lamprey and Great Bay watershed. Invited presentation. Newmarket, NH. September 2011.
- Daley, M.L. 2011. Watershed management in practice: Great Bay. University of New Hampshire Watershed Water Quality Management class. Durham, NH. December 2011.

- Daley, M.L. and McDowell, W.H. 2011. Nitrogen Research in the Lamprey and Great Bay watershed. Great Bay Dialogue. Greenland, NH. December 2011.
- Daley, M.L. McDowell, W.H., Bucci, J., Hobbie, E., French, C., Potter, J. and Miller, S. 2012. Detecting non-point nitrogen sources and transport pathways in the Great Bay watershed and engaging decision makers in the science. Annual Lamprey River Science Symposium. Durham, NH. January 2012.
- Daley, M.L. McDowell, W.H., Bucci, J., Hobbie, E., French, C., Potter, J. and Miller, S. 2012. Detecting non-point nitrogen sources and transport pathways in the Great Bay watershed and engaging decision makers in the science. Southeast Watershed Alliance quarterly meeting. Newington, NH. February 2012.
- McDowell, W.H. and Daley, M.L. 2011. Nitrogen Research in the Lamprey River Watershed and the Great Bay Estuarine Ecosystem. US EPA Region 1 meeting. Boston, MA. May 6, 2011. Meet with EPA staff in Boston to discuss non-point N sources in the Lamprey and other watersheds.
- McDowell, W.H. Biogeochemistry of a Suburban Basin. Chinese Research Academy of Environmental Sciences, Beijing, China 19 September 2011.
- McDowell, W.H. Biogeochemistry of a Suburban Basin. Chinese University of Geosciences, Wuhan, China, September 25 2011.
- McDowell, W.H. Biogeochemistry of a Suburban Basin. China Three Gorges University, Yichang, China, 26 Sept. 2011

### **Press Releases**

- Daley, M.L. and McDowell, W.H. 2011. "Sewer Plants in Great Bay Face Tougher Clean Water Standards" by Amy Quinton NH Public Radio. <http://www.nhpr.org/sewer-plants-great-bay-face-tougher-clean-water-standards> May 20, 2011.

### **Meetings Attended:**

- Daley, M.L. 2011. Attended several of the Ecosystem Task Force meetings that occur monthly during the academic year at UNH. Durham, NH.
- Daley, M.L. 2011. Attended several of the PREP Technical Advisory Committee meetings that occur approximately bi-monthly in either Durham or Portsmouth, NH.
- Daley, M.L. 2011. Lamprey River Instream Flow Public Hearing. Durham, NH. May 2011.
- Daley, M.L. 2011. Sustainability Research Collaboratory workshop, Durham, NH May 24-25, 2011.
- Daley, M.L. 2011. Meet with US EPA Region 1 scientists to investigate potential field sites for tracing sources of non-point N pollution delivered to streams in the Great Bay watershed. May 2011.

Daley, M.L. and McDowell, W.H. 2011. September 14, 2011. Met with Rob Wofchuck from Brentwood Town Council and Gershon Peleg, who is the Chairman of the Society for the Protection of Nature in Israel to talk about water resource issues in Israel and in New Hampshire.