

Information Transfer

In New Hampshire, state regulations, planning board decisions and zoning classifications all address the environmental consequences of rapid population growth. Despite the urgency of the problem of unchecked population growth, the decisions by these various resource managers are often made without a real understanding of the consequences to 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. The NH WRRC website (<http://www.wrrc.unh.edu/>) is also used to disseminate information on water resources, and is also 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." On January 8, 2010 the NH WRRC totally funded and organized the **Third Annual Lamprey River Symposium** (see also below). Presentations focused on water quality, hydrology, stormwater, nitrogen cycling in coastal New Hampshire and also the effects of forest fragmentation and water chemistry on vernal pool-breeding amphibians. The symposium attracted almost 70 attendees, including scientists (33 from UNH and 4 from elsewhere), regional leaders (15), town officials (7), members of state agencies (4), and federal agencies (3). The agenda and presentations have been posted 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 WRRC.

Examples of Information Transferred

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 provided EGGI with long-term Lamprey River data to assess whether seasonality and year to year variability in water quality made it appropriate for artificial recharge. The town of Newmarket is still working towards approval of this project, but the long-term dataset provided by the NH WRRC has been instrumental in this water supply decision-making process.

In addition to providing data on surface water quality, the NH WRRC has also identified water quality impairments in private wells within southeastern NH and presented the results to homeowners and local town officials. Private wells are not regulated, even though they supply 40% of the NH population, and therefore it is up to the individual homeowner to test and treat their water if necessary. This puts the uninformed homeowner at risk of consuming contaminated water. We sampled 188 private wells to infer linkages between land use practices and groundwater quality and to educate the general public on the importance of private well testing. One well exceeded the US EPA public drinking water standard for nitrate (10 mg N/L), 10 wells were greater than levels associated with increased risk of gastric cancer (4 mg N/L; Ward et al. 1996), and 28 wells were elevated above 2 mg N/L, indicating anthropogenic sources of N contamination (e.g. fertilizers or septic system effluent). Nine percent of the wells exceeded the EPA secondary drinking water standard for chloride (250 mg/L) and 46% of the wells exceeded the EPA advisory level (20 mg Na/L) for persons with hypertension. It is likely that road salt application is the dominant source of such high sodium and chloride levels in groundwater. In summary, 21% of the wells exceeded the EPA MCL for either nitrate, arsenic, lead or uranium and 38% of the wells exceeded advisory levels for nitrate (4.0 mg N/L), chloride (250 mg/L) or sodium (20 mg/L). A total of 59% of private well users are exposed to contaminants that are cause for health concern. The NH WRRC has shown that even private wells drilled deep into bedrock fractures are subject to contamination from activities on the land surface. These results were included within many of the presentations listed below.

Over the past year, 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), only 22% of the nitrogen entering Great Bay and Little Bay is from point sources; the majority (78%) enters via non-point sources of pollution. The Lamprey River is the largest tributary to Great Bay, and thus the data provided by the NH WRRC from the LRHO are of considerable value for watershed management. The WRRC data focus on the spatial and temporal variability in N concentrations and export throughout the watershed over the last 10 years. 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.

Presentations:

Daley, M.L. 2009. Current Water Quality Research in the Lamprey River Watershed. Southern New Hampshire Planning Commission Meeting. Manchester, NH. April 2009.

Daley, M.L. 2009. Current Water Quality Research in the Lamprey River Watershed. Rockingham Planning Commission and Strafford Regional Planning Commission special joint meeting. Exeter, NH. May 2009.

- Daley, M.L. 2009. Water Quality Research in the Lamprey River Watershed: Road Salt and Nitrogen. Lamprey River Outreach Conference: "Your Water, Your Wallet, Your Watershed - Why Working Together Across Town Boundaries Makes Sense For Protecting Our Water". Nottingham, NH. June 2009.
- Daley, M.L. 2009. Current water quality research in the Lamprey River watershed. Lamprey River Advisory Committee. Durham, NH. October 2009.
- Daley, M.L. 2009. Nitrogen Sources and Retention within the Lamprey River Watershed and Implications for Management. State of the Estuaries Conference. Somersworth, NH. October 2009.
- Daley, M.L. 2009. Salt Research, Impacts to Surface & Ground Water. Road Salt BMPs for the Ossipee Watershed. Chocorua, NH. November 2009.
- Daley, M.L. 2009. Water Quality of Private Wells in Suburban NH and Impacts of Land Use. Northeast Private Well Symposium. Portland, ME. November, 2009.
- Daley, M.L. 2009. Spatial and Temporal variability in nitrogen concentrations, export and retention in the Lamprey River watershed. Joint NH Water and Watershed Conference. Concord, NH. November, 2009.
- Daley, M.L. and W.H. McDowell. 2009. Nitrogen Saturation in Highly Retentive Watersheds? American Geophysical Union Fall Conference, San Francisco, CA. December, 2009.
- Daley, M.L. 2010. Nitrogen Saturation in the Highly Retentive Lamprey River Watershed? Annual Lamprey River Science Symposium. Durham, NH. January 2010.
- Dunlap, K. 2010. Seasonal Nitrate Dynamics in a New Hampshire Agricultural Stream. Annual Lamprey River Science Symposium. Durham, NH. January 2010.
- McDowell, W.H. 2009. Biogeochemistry of Suburban Basins – Putting People into the Landscape. University of Georgia. Athens, GA. October, 2009.
- McDowell, W.H. 2009. Biogeochemistry of Suburban Basins – Putting People into the Landscape. University of Reading, United Kingdom. November, 2009.
- McDowell, W.H. 2010. Overview of the Lamprey River Hydrologic Observatory Objectives. Annual Lamprey River Science Symposium. Durham, NH. January 2010.

Meetings Attended:

- Daley, M.L. 2009. Meet with Lee Water Resources Committee to discuss Lee Water Resource Management Plan. April 2009.

McDowell, W.H. Meeting with NH DES Commissioner Tom Burack and the director of the NH DES Water Bureau Harry Stewart to discuss nitrogen cycling and other water resource issues in NH. Spring 2009.

McDowell, W.H. and Daley, M.L. met with Paul Currier (NH DES), Phil Trowbridge (NH DES), Gregg Comstock (NH DES) and Jim Latimer (EPA) to discuss nitrogen cycling as it relates to N impairments in Great Bay. July 2009.

McDowell, W.H. and Daley, M.L. met with Paul Currier (NH DES) and Phil Trowbridge (NH DES) to discuss nitrogen cycling as it relates to N impairments in Great Bay. October 2009.

Daley, M.L. 2010. Attended NH Water Quality Standards Committee Meeting in Concord, NH. January 2010.

Symposia Organized and Funded:

The NH WRRC totally funded and organized the "**Third Annual Lamprey River Symposium**" held January 8, 2010 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 almost 70 attendees, including researchers, legislators, water system operators, town officials, regional leaders and government officials. The symposium contained 15 presentations split up over three sessions. There was a poster session during lunch and 3 posters and displays were exhibited. The day ended with an open discussion on research priorities in the watershed and southeast NH. This event was totally funded, organized and moderated by the NH WRRC.

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**". The conference was held in Nottingham, NH on Saturday June 13, 2009 and drew over 70 people including teachers, legislators, town officials, regional leaders and government officials.

In 2009, the organizing committees of the annual New Hampshire Water Conference and the annual New Hampshire Watershed Conference joined forces to offer a single, comprehensive event: the "**Joint NH Water and Watershed Conference**" in Concord, NH on November 20-21, 2009. The merger combined the talent, resources, and audiences from both events into a unique, two-day event 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. This conference provided a state-wide forum for learning and

networking about issues related to water resources in New Hampshire and drew over 200 people, including researchers, legislators, water system operators, land use planners, and government officials. The NH WRRC co-Sponsored this conference along with the New Hampshire Rivers Council, NH Dept of Environmental Services, NH Lakes, Comprehensive Environmental Inc., Public Service of New Hampshire, Weston & Sampson, Vanasse Hangen Brustlin, Inc., YSI, New England Interstate Water Pollution Control Commission, Naturesource Communications, Gomez and Sullivan and GeoInsight. The conference contained 6 tracks each day including stormwater, climate change, water infrastructure, organizational development, watershed management, land use/ land conservation and a GIS track that was facilitated solely by the UNH cooperative extension and the NH WRRC.

In January 2010, planning began for the “**Road Less Salted**” water quality and salt reduction seminar which was held on May 13, 2010 as a follow-up activity to the conference "Your Water, Your Wallet, Your Watershed - Why Working Together Across Town Boundaries Makes \$ense For Protecting Our Water". The event was co-sponsored by NH Department of Environmental Services, GBNERR Coastal Training Program, LRAC, LRWA, NH WRRC, and Hodgson Brook Restoration Project. Targeted audiences for the seminar were: local boards and commissions, public works directors and road agents, municipal decision makers/planners, private contractors and landscapers who plow snow, property managers or owners, and local watershed or environmental organizations.