Water Resources Research Center

Program Evaluation Report

Fiscal Years 1998–2002

Submitted By

William McDowell, Director

To:

Office of External Research

Water Resources Discipline

U.S. Geological Survey

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Preface

The Water Resources Research Center receives an annual Federal matching grant as authorized by section 104 of the Water Resources Research Act of 1984 (Public Law 98−242) as amended by Public Law 101−397, Public Law 104−147, and Public Law 106−374. Section 104 of the Act requires that the Secretary of the Interior "conduct a careful and detailed evaluation of each institute at least once every 5 years to determine that the quality and relevance of its water resources research and its effectiveness as an institution for planning, conducting, and arranging for research warrants its continued support under this section." The U.S. Geological Survey (USGS), Department of the Interior, administers the provisions of the Act. This evaluation report describes, in the format prescribed by the USGS, the research, training, and information transfer activities supported by the section 104 grants and required matching funds during fiscal years 1998 through 2002.

Program Evaluation Report

Introduction

The Water Resource Problems of New Hampshire

New Hampshire’s water resources are extremely valuable, contributing significantly to the state’s economic base through tourism, recreation and real estate revenues. Further, many lakes, rivers and groundwater resources are current or potential sources of public drinking water. Therefore, good water quality is an imperative pre−requisite for much of the state’s economy and quality of life.

A survey of NH water resource stakeholders was conducted in 1998 to get a sense of New Hampshire’s most significant water resource problems and concerns in order to develop a list of research priorities for the NH WRRC (see below). Almost all of the issues can be included into the broad category of Land Use and Water Quality. This is not terribly surprising based on the rapid development and population pressures of the last decade or so, particularly in southern areas of the state. The long term effects of development and land use change are uncertain. To minimize and manage the impacts of these activities on water quality, understanding the mechanisms that control, remediate and exacerbate chemical, biological and physical pollutants is essential.

Research Priority issues for the New Hampshire WRRC, based on a survey of stakeholders conducted in 1997−1998.

Surface Water •Land use impact on surface water quality •Non point source pollution •Effects of urban development and storm water runoff on surface water quality •Impacts of highway maintenance on surface water quality •Low flow wastewater flow interactions and effect on surface water quality •Linking water quality data and biological functions •Effect of individual septic systems on surface water quality

Groundwater •Bedrock aquifer delineation and protection •Mapping aquifers for GIS database •Effects of sand and gravel extraction on groundwater quality

Land Use/Application •Impact of development/land use on surface and groundwater quality •Biosolids in land farming •Buffer zone/riparian zone effectiveness with different land use •BMP effectiveness

Management/Planning Issues •Impact of development •Level of sustainable development

Watershed •Watershed approach to management decisions •Watershed approach to studying water quality •Systems approach on a watershed scale to management: economic factors and quality of life

Technology Transfer •Water quality and water use •Water conservation education

Water Resources Research Center: An Overview

The New Hampshire Water Resources Research Center, located on the campus of the University of New Hampshire, is an institute which serves as a focal point for research and information on water issues in the state. The NH WRRC actually predates the Federal program. In the late 1950's Professor Gordon Byers (now retired) began a Water Center at UNH. This Center was incorporated into the Federal program in 1965 as one of the original 14 state institutes established under the Water Resource Research Act of 1964.

Early in FY 1999, Dr. Thomas Ballestero resigned as Director of the WRRC. In late February of 2000, a new Director was appointed. This transition coincided with the loss of dedicated office space for the WRRC and the WRRC library. The NH WRRC is now housed in the College of Life Sciences and Agriculture.

The NH WRRC is currently directed by Dr. William McDowell. The NH WRRC is a stand alone organization, in that it is not directly affiliated with any other administrative unit at UNH. The NH WRRC has no dedicated office or laboratory space on campus and no formal library holdings. To overcome these potential limitations, our website (www.wrrc.unh.edu) is used heavily, and serves as a focal point for information dissemination and includes all NH WRRC publications, results from past research, as well as links to other sites of interest to NH citizens and researchers.

The primary focus of the NH WRRC is research and education, with the main goal to encourage and facilitate research on water quality issues in the state. Annually, the NH WRRC supports two or three research projects related to water resources issues of the state and region. Generally one or more students are hired for each project to help perform the research, providing valuable work experience. Several lake and watershed monitoring groups have also been involved in recent research projects, allowing for an information exchange between researchers and the public. Recent research topics include: effects of biosolids on groundwater quality, phosphorus management strategies for dairy farms, bacterial transport through soil, and various aspects of lake ecology. A list of recent research projects can be found in the index of our NH WRRC website. Research reports are also available online at our website.

We facilitate water resources research through technical assistance and sample analysis through The Water Quality Analysis Laboratory (WQAL). The WQAL was established by the Department of Natural Resources in 1996 to meet the needs of various research and teaching projects both on and off the UNH campus. It is currently administered by the NH WRRC and housed in James Hall. The mission of the Water Quality Analysis Laboratory is to provide high−quality, reasonably priced analyses in support of research projects conducted by scientists and students from throughout the University, state, and nation. Past clients have included numerous research groups on the UNH campus, federal agencies, scientists from other universities, and private firms. Many thousands of analyses are conducted each year. To further encourage and support water resources research near the University campus, we have put forth a concentrated effort to establish an appropriate infrastructure and background dataset for the Lamprey River Basin. The entire basin is referred to as The Lamprey River Hydrologic Observatory. Its goal is to serve as a platform to study the biogeochemistry of a developing suburban basin. As part of a cooperative project between the Department of Natural Resources and the Department of Earth Science, the Lamprey River Hydrologic Observatory is used in student and faculty research on the hydrology, biology, biogeochemistry and management of a suburban basin. The Water Resources Research Center has provided laboratory equipment and technical advice needed for various ongoing projects and long term sampling of the Lamprey River. A small part of the 104b funding goes towards this project.

Current objectives of the Lamprey River Hydrologic Observatory are:

1. Develop the infrastructure of the Lamprey River Hydrologic Observatory including, install stream gauges, wells and precipitation collectors and to develop Geographical Information System (GIS) coverages that quantify landscape characteristics.

2. Examine relationships between groundwater quality and landscape characteristics.

3. Examine relationships between surface water quality and groundwater quality.

4. Examine biogeochemical transformations along flow paths.

5. Study instream nutrient dynamics in small streams.

6. Examine the influence of property values on surface water quality.

Section 104 Objectives

The primary emphasis of the 104b funding is research and education of undergraduate and graduate students through support of research projects. Research objectives were primarily dictated by the list of research priorities presented earlier (Water Resource Issues and Problems of NH), but vary based on the interests of the principal investigators applying for funding. All other things being equal, preference is given to principal investigators who are early in their academic and research careers. Information transfer is primarily carried out via our website.

Allocation of Federal Grant and Matching Funds Among Program Activities (Percent): 1998−2002

Research	47
Information Transfer	5
Education	20
Administration	28
Other (please specify)	
Total	

Institutional Support and Effectiveness

The NH WRRC receives no discretionary funding from the state or from the University.

Discretionary Base Funding

Appropriated or Other Discretionary Funds Available to the Institute: 1998 − 2002

Source of Discretionary Funds	1998	1999	2000	2001	2002
	0	0	0	0	0

Total Institute Water Resources Research Funding

The Director of the NH WRRC has a very active research program, however most of it is not directly attached to the WRRC. Annual research funding is approximately $300,000, not including the projects listed below. Projects that are affiliated with the WRRC are shown below.

Water Resources Grants, Contracts, and Cooperative Agreements in Which the Institute Had a Major Role during the Period of the Evaluation: 1998 − 2002

Title/Topic	Source of Funds	Year Initiated	Amount
Connecticut River Airshed Watershed Consortium	EPA−subcontract through UConn	2001−2007	585000
		2002−2005	73000

Suburbanization, water quality and property values in the Northern Forest	USDA Forest Service Northeastern States Research Cooperative − Subcontract through U. Vermont

Research Program

The number of proposals requesting funding through the NH WRRC has declined over the evaluation term. This decline is largely due to the increase in non−competitive Federal funds with large project budgets coming into the UNH campus. The availability of other funding, as well as the required 2:1 match for the WRRC funds has likely discouraged potential applicants. However, we also recognize our responsibility to make the availability of WRRC funding better known, and we plan to solicit proposals more aggressively in the upcoming years.

Despite the decline in proposals submitted, our research program remains strong. We have funded about 3 projects each year, with topics ranging from biosolids application to estimating flow−duration curves at ungaged streams. Most projects include heavy involvement of one or more graduate students.

Research Projects

Summary of Research Projects

Number of Research Projects and Percentage of Research Funds, by Research Category: 1998−2002

Research Category	Number	Percent of Funds
Biological Sciences	1	11
Climate and Hydrologic Processes	1	8
Engineering	0	0
Ground−water Flow and Transport	3	15
Social Sciences	0	0
Water Quality	8	66

Research Projects Receiving Follow−on Funding

The number of projects receiving follow−on funding from another source after completion as a section 104−funded project was: 1.

Summary of Research Publications

Number of Research Publications, by Category of Publication

Publication Category	Number
Articles in Refereed Journals	4
Book Chapters	1
Theses and Dissertations	3
Water Resources Institute Reports	1
Articles in Conference Proceedings	1
Other Publications	5

Most Significant Research Findings

FY1998 A Survey of 50 NH Lakes for Microcystins This study found that all lakes surveyed had microcystin toxins present, and that toxicity parallels the relationship between nutrients and phytoplankton biomass. Surprisingly total nitrogen provided a better predictor of toxin concentration than phosphorus. Also, the study demonstrated that microcystin toxin concentrations are correlated with other parameters commonly measured in lake monitoring programs, such as chlorophyll a, Secchi disk depth and acid neutralizing capacity. This is a significant finding in that it indicates the results from lake monitoring surveys can be applied to predict the likelihood of toxicity problems in lakes.

FY1999 Development of Statewide Nutrient Loading Coefficients Through Geographic Information System Aided Analysis. Results from this study led to a multi−agency and local stakeholder partnership to improved water quality in Lake Chocurua through a water nutrient budget analysis and subsequent implementation of road drainage best management practices and mitigation in a cost effective, cost shared framework.

FY2000 Effects of Biosolids on Groundwater Quality. The study site had had repeated applications of biosolids on an annual basis since 1989 with top−soil removal approximately every 5 years. Each year materials were typically stockpiled on−site for up to 9 months prior to application. Results showed unacceptably high levels of nitrate in some wells within the application area, but not in others. Elevated groundwater nitrate levels tended to be found directly beneath, and immediately down−gradient from the stockpiling areas. Groundwater in other zones of the application area did not show elevated nitrate concentrations. These observations suggest that repeated application of residuals does not by itself cause significant increases in groundwater nitrate levels, but that stockpiling of residuals prior to application does cause significant groundwater contamination of nitrate. This indicates that state regulations at the time of this study were not sufficient to protect groundwater quality. Metal concentrations in groundwater were all well below state and federal allowable limits in all areas and all times. The project PI has testified to the state legislature regarding the study findings and the project results will play a role in determining future biosolid management practices in New Hampshire.

FY2000 Lakes Lay Monitoring Program. A statewide volunteer sampling effort of NH’s lakes and tributaries has been used as a nation model for volunteer sampling programs.

Summary of Awards

The UNH Presidential Award of Excellence (2001) was given to Jeffrey Schloss for his service in statewide water quality assistance.

Information Transfer Program

No specific Information Transfer projects were funded during the evaluation period. Information Transfer occurs through a number of channels. First, our website is frequently updated, and serves as our primary information transfer component. The site provides on−line access to NH WRRC reports, a list of recent and current research projects, data from several projects, and links to other sites of potential interest to NH residents and water resource professionals. Other Information Transfer occurs through our interaction with local watershed and lake associations, phone calls, public presentations and scientific meetings.

Information Transfer Projects

Information Transfer Publications

IT Publication Type	IT Publication Citation

Audio−visual Productions

None.

Newsletter

The NH WRRC does not currently produce a newsletter. We have made the decision to rely on our website to disseminate information. The site is updated frequently (every week or two) to include items we feel might be of interest to the public and researchers.

Conferences

Lead Sponsor

Cosponsor or Supporter

Internet Services

We rely extensively on our website (www.wrrc.unh.edu) for information transfer. The website is a gateway to a plethora of water resources information relevant to the state and region.

The site's "WRRC News" section is frequently updated with USGS press releases, reports from state and local agencies, requests for proposals and other news items we feel might be of interest to the NH public and researchers.

The website also includes a listing of research project titles and abstracts funded through the WRRC since 1990. Electronic versions of final reports are also available on the site.

Other highlights of the website include an overview of the WRRC at UNH, a description of our Water Quality Analysis Lab, links to departments, programs and faculty on the UNH campus that focus on water resource issues and links to other sites of interest to NH water resources shareholders (e.g. federal, state agencies, non−profit NGOs, etc.).

Awards

None.

Most Significant Achievements

Education

Most projects funded by the 104 base grant and matching funds include significant involvement of graduate and undergraduate students and approximately 20% of these funds goes toward tuition waivers, stipends and hourly salary for students. Over the 5 year review period WRRC base grant projects have directly supported or involved over 50 graduate and undergraduates, but have likely indirectly impacted at least twice as many, through volunteer efforts, use of data in several field and lecture classes, equipment loan, analytical services, technical advice and field support.

In addition to the number of completed M.S. and Ph.D. dissertations in the next section, at least 1 other M.S. thesis is nearly completed and an additional Ph.D. dissertation should be complete in April, 2004.

Number of Students Supported

Number of Students Supported, by Degree and Grant Type: 1998−2002

Degree	Base Grants	Regional and National Competitive Grants
Undergraduate	34	
Masters	18	2
Ph.D.	3	
Post Doc		

Theses and Dissertations

Number of Theses and Dissertations Resulting from Student Support: 1998−2002

Master's Theses	2
Ph.D. Dissertations	1

Student Grants and Fellowships

Administration, Coordination, and Cooperation

Regional and National Competitive Grant Programs

One proposal was submitted to the regional grant program in FY98 and was funded. One proposal was submitted to the National grant program in FY00, and was not funded.

Cooperation

One funded research project took place at Dartmouth College. This was a 2−year project that began in FY02 and continued through FY03. The funds represented in the table for Dartmouth College include only FY02.

Expenditure of Section 104 and Matching Funds, by University or Other Organization, State, and Year: 1998 − 2002

		Section 104 Federal Grant and Matching Fund Expenditures				
University or Organization	State	1998	1999	2000	2001	2002
University of New Hampshire	NH	224169	204704	204534	226160	167228
Dartmouth College	NH					87130

Institute Directors over Evaluation Period

Name	Academic Discipline	Term
Thomas Ballestero	Civil Engineering/Hydrology	1986 − 2000
William McDowell	Biogeochemistry	Feb. 2000 − present

Advisory Committees

Our advisory/review committee is made up of, Dr. Scott Bailey (USDA Forest Service), Dr. Stephen Jones (Marine Science Director, UNH Center for Marine Biology), Richard Flanders (NH Department of Environmental Services, Manager Sludge and Septage Program), Jeff Merriam (NH WRRC Associate Director) and the Director, Dr. William McDowell. The committee does not meet formally, however they are contacted on an individual basis as needed for program development and guidance. The committee also reviews the proposals submitted for 104b funding.

Research Proposal Review and Selection Process

The request for proposals is posted around the 1st of August each year, with a submission deadline of October 15. Preposals are reviewed by our advisory committee, including the Director and Assoicate Director. Another reviewer from a a more appropriate area of expertise is also selected if necessary. Each preproposal gets an independent review by each reviewer, critiquing the proposal for scientific merit, relevance of work to state and regional problems as well as likelihood of success. Based on these reviews the director and associate director select the projects for funding. Reviewer's comments are given to the PIs annonymously. The accepted proposals are then fine tuned and the budgets are finalized as necessary, with the final proposals due sometime in mid December.

Peer Review of Institute Publications

Institute manuscripts are reviewed by the director and associate director prior to acceptance and posting on our website. Comments are made to the authors, who them make any necessary changes.

Number of Principal Investigators Supported, by Rank and Year

Principal Investigators on Research Projects Supported by Section 104 Grants and Matching Funds, by Academic Rank and Year: 1998 − 2002

Academic Rank	1998	1999	2000	2001	2002
Assistant Professor and below		2	1	4	3
Associate Professor					3
Professor	2	1	1	1	1
Total	2	3	2	5	7

Additional Information for the Evaluation Panel

Attachment A: 1998NH105B Research Project Description

Title	A Survey of 50 NH Lakes for Microcystins
Project Number	1998NH105B
Start Date	9/1/1998
End Date	8/31/2000
Research Category	Water Quality
Focus Categories	['Ecology', 'Toxic Substances', 'Water Quality']

Principal Investigators

Name	Rank During Project Period	Affiliation
James Haney	Professor	University of New Hampshire
Miyoshi Ikawa	Professor	University of New Hampshire

Funding

Funding Period	Federal 104 Funds	Required 104 Matching Funds	Other Funding	
			Source	Funds
9/1/1998 − 8/31/2000	73688	75505	−	−

This project received follow−on funding after completion as a section 104−funded project (Yes ___ No _X_).
If yes, please describe the funding period, source and amount in the funding table.

Student Support

Degree Level	Number of Students	Number of Dissertations/Theses
Undergraduate	0	0
Masters	2	0
Ph.D.	0	0
PostDoctoral	0	0

Publications

Publication Type	Publication Citation
Water Resources Research Institute Reports	Haney, J.F. and M. Ikawa, 2000, A Survey of 50 NH Lakes for Microcystins (MCs), New Hampshire WRRC, University of New Hampshire, Durham, NH, 60 pg.
Articles in Refereed Scientific Journals	Ikawa, M., N. Phillips, J.F. Haney, and J.J. Sasner, 1999, Interference by plastics additives in the HPLC determination of microcystin−LR and YR. Toxicon 37, 923−929.

Awards and Achievements

[None]

Attachment A: 1999NH101B Research Project Description

Title	Development of Statewide Nutrient Loading Coefficients Through Geographic Information System Aided Analysis
Project Number	1999NH101B
Start Date	3/1/1999
End Date	2/28/2000
Research Category	Water Quality
Focus Categories	['Nutrients', 'Surface Water', 'Water Quality']

Principal Investigators

Name	Rank During Project Period	Affiliation
Jeffrey Schloss	Associate Extension Educator/Research Scientist	UNH Cooperative Extension
Jody Connor	Limnology Center Director	NH Department of Environmental Services

Funding

Funding Period	Federal 104 Funds	Required 104 Matching Funds	Other Funding	
			Source	Funds
3/1/1999 − 2/28/2000	22362	37415	−	−

This project received follow−on funding after completion as a section 104−funded project (Yes ___ No _X_).
If yes, please describe the funding period, source and amount in the funding table.

Student Support

Degree Level	Number of Students	Number of Dissertations/Theses
Undergraduate	2	0
Masters	3	0
Ph.D.	1	0
PostDoctoral	0	0

Publications

Publication Type	Publication Citation

Awards and Achievements

[None]

Attachment A: 1999NH102B Research Project Description

Title	Estimation of Flow−Duration Curves at Ungaged Stream Reaches in New Hampshire and Vermont
Project Number	1999NH102B
Start Date	3/1/1999
End Date	2/28/2000
Research Category	Climate and Hydrologic Processes
Focus Categories	['Hydrology', 'Surface Water', 'Water Quantity']

Principal Investigators

Name	Rank During Project Period	Affiliation
S. Lawrence Dingman	Professor	University of New Hampshire

Funding

Funding Period	Federal 104 Funds	Required 104 Matching Funds	Other Funding	
			Source	Funds
3/1/1999 − 2/28/2000	28349	31850	−	−

This project received follow−on funding after completion as a section 104−funded project (Yes ___ No _X_).
If yes, please describe the funding period, source and amount in the funding table.

Student Support

Degree Level	Number of Students	Number of Dissertations/Theses
Undergraduate	0	0
Masters	1	1
Ph.D.	0	0
PostDoctoral	0	0

Publications

Publication Type	Publication Citation
Dissertations	Kelliher, J.L., 2001, Estimation of Flow−Duration Curves at Ungaged Reaches in New Hampshire and Vermont, MS Dissertation, Earth Sciences, UNH, Durham, NH.

Awards and Achievements

[None]

Attachment A: 2000NH103B Research Project Description

Title	Effects of Biosolids on Groundwater Quality
Project Number	2000NH103B
Start Date	3/1/2000
End Date	2/28/2002
Research Category	Water Quality
Focus Categories	['Groundwater', 'Nitrate Contamination', 'Water Quality']

Principal Investigators

Name	Rank During Project Period	Affiliation
William McDowell	Professor	University of New Hampshire

Funding

Funding Period	Federal 104 Funds	Required 104 Matching Funds	Other Funding	
			Source	Funds
3/1/2000 − 2/28/2001	33805	53238	−	−
3/1/2001 − 2/28/2002	14439	24853	−	−

This project received follow−on funding after completion as a section 104−funded project (Yes ___ No _X_).
If yes, please describe the funding period, source and amount in the funding table.
Student Support

Degree Level	Number of Students	Number of Dissertations/Theses
Undergraduate	2	0
Masters	1	0
Ph.D.	0	0
PostDoctoral	0	0

Publications

Publication Type	Publication Citation
Other Publications	McDowell, W.H. &T.J. Chestnut, 2002, Monitoring Demonstration at Top−Soil Manufacturing Site in New Hampshire. Final Report for New England Biosolids and Residuals Association, June 1998 – November 2001, UNH.
Other Publications	McDowell, W.H. and T.J. Chestnut, 2002, Final Report to DES and NH State Legislature, June 1998−November 2001; Monitoring Demonstration at a Top−Soil Manufacturing Site in New Hampshire, www.wrrc.unh.edu, 47 pages.

Awards and Achievements

[None]

Attachment A: 2000NH16N Research Project Description

Title	Lakes Lay Monitoring Program
Project Number	2000NH16N
Start Date	3/1/2000
End Date	2/28/2001
Research Category	Water Quality
Focus Categories	['Nutrients', 'Surface Water', 'Water Quality']

Principal Investigators

Name	Rank During Project Period	Affiliation
Jeffrey Schloss	Associate Extension Educator/Research Scientist	University of New Hampshire, Cooperative Extension

Funding

Funding Period	Federal 104 Funds	Required 104 Matching Funds	Other Funding	
			Source	Funds
3/1/2000−2/28/2001	3000	21319	−	−

This project received follow−on funding after completion as a section 104−funded project (Yes ___ No _X_).
If yes, please describe the funding period, source and amount in the funding table.

Student Support

Degree Level	Number of Students	Number of Dissertations/Theses
Undergraduate	4	0
Masters	1	0
Ph.D.	0	0
PostDoctoral	0	0

Publications

Publication Type	Publication Citation

Awards and Achievements

[None]

Attachment A: 2000NHprojectnumbernotprovided Research Project Description

Title	Stream Chemistry as an Index of Sustainability in the College Brook Watershed
Project Number	2000NHprojectnumbernotprovided
Start Date	3/1/2000
End Date	2/28/2001
Research Category	Water Quality
Focus Categories	['Non Point Pollution', 'Nutrients', 'Surface Water']

Principal Investigators

Name	Rank During Project Period	Affiliation
William McDowell	Professor	University of New Hampshire

Funding

Funding Period	Federal 104 Funds	Required 104 Matching Funds	Other Funding	
			Source	Funds
3/1/2000 − 2/28/2001	5343	27666	−	−
2002−2005	−	−	USDA Forest Service	73000

This project received follow−on funding after completion as a section 104−funded project (Yes _X_ No ___).
If yes, please describe the funding period, source and amount in the funding table.

Student Support

Degree Level	Number of Students	Number of Dissertations/Theses
Undergraduate	1	0
Masters	0	0
Ph.D.	0	0
PostDoctoral	0	0

Publications

Publication Type	Publication Citation

Awards and Achievements

[None]

Attachment A: 2001NH541B Research Project Description

Title	Developing Phosphorus Management Guidelines for Agriculture in the Connecticut River Watershed
Project Number	2001NH541B
Start Date	3/1/2001
End Date	2/28/2002
Research Category	Water Quality
Focus Categories	['Non Point Pollution', 'Nutrients', 'Water Quantity']

Principal Investigators

Name	Rank During Project Period	Affiliation
Elizabeth Rochette	Assistant Professor	University of New Hampshire
Tom Buob	Senior Extension Associate II	UNH Cooperative Extenstion

Funding

Funding Period	Federal 104 Funds	Required 104 Matching Funds	Other Funding	
			Source	Funds
3/1/2001 − 2/28/2002	12407	24832	−	−

This project received follow−on funding after completion as a section 104−funded project (Yes ___ No _X_).
If yes, please describe the funding period, source and amount in the funding table.

Student Support

Degree Level	Number of Students	Number of Dissertations/Theses
Undergraduate	1	0
Masters	1	1
Ph.D.	0	0
PostDoctoral	0	0

Publications

Publication Type	Publication Citation
Articles in Refereed Scientific Journals	Buob, T.E., and E.A. Rochette, 2003, Status of phosphorus in soils of Connecticut River Watershed in New Hampshire. Communications in Soil Science and Plant Analysis. 34:1177−1193.
Dissertations	Gayda, Amanda, 2004, Soil Phosphorus Thresholds and Runoff Characteristics of New Hampshire Agricultural Lands, M.S. Dissertation, Department of Natural Resources, University of New Hampshire, Durham, NH.

Awards and Achievements

[None]

Attachment A: 2001NH501B Research Project Description

Title	Effect of Surface Coatings and Ionic Strength on Bacterial Removal Rates in Porous Media
Project Number	2001NH501B
Start Date	3/1/2001
End Date	2/28/2002
Research Category	Ground−water Flow and Transport
Focus Categories	['Groundwater', 'Toxic Substances', 'Water Quality']

Principal Investigators

Name	Rank During Project Period	Affiliation
Carl Bolster	Assistant Professor	University of New Hampshire

Funding

Funding Period	Federal 104 Funds	Required 104 Matching Funds	Other Funding	
			Source	Funds
3/1/2001−2/28/2002	16335	34351	−	−

This project received follow−on funding after completion as a section 104−funded project (Yes ___ No _X_).
If yes, please describe the funding period, source and amount in the funding table.

Student Support

Degree Level	Number of Students	Number of Dissertations/Theses
Undergraduate	0	0
Masters	2	0
Ph.D.	0	0
PostDoctoral	0	0

Publications

Publication Type	Publication Citation

Awards and Achievements

[None]

Attachment A: 2001NH104B Research Project Description

Title	Effects of Land Use on Water Quality in a Changing Landscape
Project Number	2001NH104B
Start Date	3/1/2001
End Date	2/28/2002
Research Category	Water Quality
Focus Categories	['Nutrients', 'Surface Water', 'Water Quality']

Principal Investigators

Name	Rank During Project Period	Affiliation
Jeffrey Schloss	Associate Extension Educator/Research Scientist	UNH Cooperative Extension
William McDowell	Professor	University of New Hampshire

Funding

Funding Period	Federal 104 Funds	Required 104 Matching Funds	Other Funding	
			Source	Funds
3/1/2001 − 2/28/2002	4500	41007	−	−

This project received follow−on funding after completion as a section 104−funded project (Yes ___ No _X_).
If yes, please describe the funding period, source and amount in the funding table.

Student Support

Degree Level	Number of Students	Number of Dissertations/Theses
Undergraduate	10	0
Masters	4	0
Ph.D.	1	0
PostDoctoral	0	0

Publications

Publication Type	Publication Citation
Book Chapters	Schloss, J.A., 2002, GIS Watershed Mapping: Developing and Implementing a Watershed Natural Resources Inventory. In R. France, (ed.) Handbook of Water Sensitive Design and Planning. Boca Raton, FL, Lewis Publishers. Pages 557−576.

Awards and Achievements

[None]

Attachment A: 2002NH3B Research Project Description

Title	Characterization of Groundwater Discharge to Hampton Harbor
Project Number	2002NH3B
Start Date	3/1/2002
End Date	2/28/2003
Research Category	Ground−water Flow and Transport
Focus Categories	['Groundwater', 'Non Point Pollution', 'Nutrients']

Principal Investigators

Name	Rank During Project Period	Affiliation
Thomas Ballestero	Associate Professor	University of New Hampshire
Robert Roseen	Research Project Engineer II	University of New Hampshire

Funding

Funding Period	Federal 104 Funds	Required 104 Matching Funds	Other Funding	
			Source	Funds
FY2002	3000	6000	−	−

This project received follow−on funding after completion as a section 104−funded project (Yes ___ No _X_).
If yes, please describe the funding period, source and amount in the funding table.

Student Support

Degree Level	Number of Students	Number of Dissertations/Theses
Undergraduate	0	0
Masters	0	0
Ph.D.	1	1
PostDoctoral	0	0

Publications

Publication Type	Publication Citation
Dissertations	Roseen, Robert M., 2002, Quantifying Groundwater Discharge Using Thermal Imagery and Conventional Groundwater Exploration Techniques for Estimating the Nitrogen Loading to a Meso−scale Inland Estuary (New Hampshire), Ph. D. Dissertation, Civil Engineering, University of New Hampshire, Durham, NH, 188 pages.

Awards and Achievements

[None]

Attachment A: 2002NH2B Research Project Description

Title	Dynamics of Groundwater Inflows to the Lamprey River, New Hampshire
Project Number	2002NH2B
Start Date	3/1/2002
End Date	2/28/2003
Research Category	Ground−water Flow and Transport
Focus Categories	['Groundwater', 'Surface Water', 'Water Quantity']

Principal Investigators

Name	Rank During Project Period	Affiliation
J. Matthew Davis	Associate Professor	University of New Hampshire

Funding

Funding Period	Federal 104 Funds	Required 104 Matching Funds	Other Funding	
			Source	Funds
FY2002	17480	38070	−	−

This project received follow−on funding after completion as a section 104−funded project (Yes ___ No _X_).
If yes, please describe the funding period, source and amount in the funding table.

Student Support

Degree Level	Number of Students	Number of Dissertations/Theses
Undergraduate	0	0
Masters	1	0
Ph.D.	0	0
PostDoctoral	0	0

Publications

Publication Type	Publication Citation

Awards and Achievements

[None]

Attachment A: 2002NH4B Research Project Description

Title	Effects of Land Use on Water Quality in a Changing Landscape
Project Number	2002NH4B
Start Date	3/1/2001
End Date	2/28/2002
Research Category	Water Quality
Focus Categories	['Non Point Pollution', 'Nutrients', 'Water Quality']

Principal Investigators

Name	Rank During Project Period	Affiliation
Jeffrey Schloss	Associate Extension Educator	University of New Hampshire
William McDowell	Professor	University of New Hampsire

Funding

Funding Period	Federal 104 Funds	Required 104 Matching Funds	Other Funding	
			Source	Funds
3/1/02 − 2/28/03	7584	38039	–	–

This project received follow−on funding after completion as a section 104−funded project (Yes ___ No _X_).
If yes, please describe the funding period, source and amount in the funding table.

Student Support

Degree Level	Number of Students	Number of Dissertations/Theses
Undergraduate	8	0
Masters	4	0
Ph.D.	1	0
PostDoctoral	0	0

Publications

Publication Type	Publication Citation
Conference Proceedings	Schloss, J., N. Lambert and F. Rubin. 2002. GIS Outreach and Training for Decision−makers and Educators to Ensure Data to Action in Local Watersheds. National Water Quality Monitoring Conference. Madison, Wisconsin , May 2002. (On web and CD).
Other Publications	J. Schloss 2002 Squam Lakes Watershed Study− Water and Nutrient Budget. UNH Center for Freshwater Biology/ UNH WRRC/ UNH Cooperative Extension.
Other Publications	R. Craycraft and J. Schloss. 2002. Lakes Lay Monitoring Program Annual Report for 2001. A series of more than 50 individual lake reports distributed to lake associations, towns, conservation and planning commissions, and state agencies. UNH Cooperative Extension.
Other	“Protecting a Postcard−Perfect Lake (Chocorua) “Volunteer Monitor” newsletter co−wrote

Publications	with Eleanor Ely.

Awards and Achievements

[None]

Attachment A: 2002NH1B Research Project Description

Title	Linking Lakes with the Landscape: The Fate of Terrestrial Organic Matter in Planktonic Food Webs
Project Number	2002NH1B
Start Date	3/1/2002
End Date	2/28/2003
Research Category	Biological Sciences
Focus Categories	['Ecology', 'Models', 'Surface Water']

Principal Investigators

Name	Rank During Project Period	Affiliation
Kathryn Cottingham	Assistant Professor	Dartmouth College
Jay Lennon	Ph.D. candidate	Dartmouth College

Funding

Funding Period	Federal 104 Funds	Required 104 Matching Funds	Other Funding	
			Source	Funds
FY2002	18304	68826	−	−

This project received follow−on funding after completion as a section 104−funded project (Yes ___ No _X_).
If yes, please describe the funding period, source and amount in the funding table.

Student Support

Degree Level	Number of Students	Number of Dissertations/Theses
Undergraduate	6	0
Masters	0	0
Ph.D.	1	0
PostDoctoral	0	0

Publications

Publication Type	Publication Citation
Articles in Refereed Scientific Journals	Lennon, J.T. 2003, Experimental Evidence That Terrestrial Carbon Subsidies Increase CO2 Flux From Lake Ecosystems. Oecologia. 138:584−591.
Articles in Refereed Scientific Journals	Lennon, J.T. Sources of terrestrial−derived subsidies affects aquatic bacterial metabolism. In preparation for submission to Microbial Ecology or Limnology and Oceanography in April 2004.

Awards and Achievements

[None]