

V(A). Planned Program (Summary)

Program # 6

1. Name of the Planned Program

Natural Resources & Environment

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
314	Toxic Chemicals, Poisonous Plants, Naturally Occurring Toxins, and Other Hazards Affecting Animals			100%	
	Total			100%	

V(C). Planned Program (Inputs)

1. Actual amount of professional FTE/SYs expended this Program

Year: 2010	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	5.8	0.0
Actual	0.0	0.0	0.2	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
0	0	25656	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	32856	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

The NHAES supports multiple research efforts related to natural resources and the environment, with many of these funded through the McIntire-Stennis program that is not covered in this report. Others are included in this report but in different Program Areas based on appropriate grouping of related projects.

Microcystins are a hepatotoxin produced by cyanobacteria that are common in freshwater lakes and reservoirs. They present a significant danger to humans who live near these bodies of water, and who swim in or drink from them. In an integrated research and extension project, cyanobacteria testing was carried out on six New Hampshire lakes as part of a class project in the UNH course entitled Field Studies in Lake Ecology. Eleven undergraduate students in the class were trained in the collection of lake water samples and ELISA testing of microcystins. Microcystins were tested for in over 250 water quality and drinking water samples sent to our laboratory from the ME Department of Environmental Protection, Lake Associations in NH and MA, and public water suppliers in NH, ME, MA and CT. In sum, samples for microcystins cyanobacteria counts and identification were processed from 5 northeast states. The project worked with public water suppliers and Lake Associations to develop cyanobacteria monitoring programs. A very large number of oral presentations and workshops were provided across the state and region by the supported scientist, Extension collaborator, and the multiple graduate and undergraduate students involved in the research. Audiences included individual and groups of stakeholders, lakes management and advisory groups, state and federal agency staff including USEPA and departments of Public Health, town officials, and scientific peers.

The citizen-based Cyanobacteria Monitoring Program or CCMP was created and is designed to assist lakes in developing cyanobacteria monitoring protocols and to provide microcystin analysis for lakes and drinking water supplies. The CCMP also trained four undergraduates in field and lab methods in lake monitoring and microcystins analysis. A webpage (<http://cfb.unh.edu/programs/CCMP/CCMP.html>) was developed describing the CCMP and providing sampling protocols to the public. Research on cyanobacteria at Lake Attitash, MA and Shoals Marine Lab, ME was incorporated into the UNH Project SMART, a summer program for high school science students throughout the northeast.

Multiple undergraduate students were trained in the laboratory, and five of these presented the results of their research at the UNH Undergraduate Research Conference. Two graduate students were actively involved in the work.

2. Brief description of the target audience

The target audiences for this work included University of New Hampshire (UNH) students in multiple classes, high school students in Project SMART, UNH undergraduate students trained in cyanobacteria toxin research in the laboratory, faculty collaborators and patients at the ALS (Lou Gehrig's Disease) Clinic at Dartmouth-Hitchcock Medical Center, UNH Veterinary Diagnostic Laboratory, Tufts School Veterinary Medicine, MA Nature Conservancy Cape Cod, Loon Preservation Committee, Squam Lakes Natural Science Center, Town planners, decision-makers and Conservation Commissions from the NH towns of Guilford, Laconia, Dover, Milton, Holderness, Meredith, Barrington, and the MA towns of Amesbury, Merrimac and Nantucket), Meredith, Lakes Region Planning Commission, North Country Resource Conservation and Development Agency, the Belknap County Conservation District and the State and Federal Agencies (eg NH Dept Environmental Services, NH Office of Energy and Planning, MA Dept Public Health, Maine Dept Environmental Protection, US EPA Laboratory Chelmsford MA, US EPA Atlantic Ecology Division RI), lake association members, lake shore residents, New England Interstate Water Pollution Control Commission, Maine Rural Water Association, public water suppliers (CT MA ME NH RI).

V(E). Planned Program (Outputs)

1. Standard output measures

2010	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Plan	900	1500	50	80
Actual	250	200	20	800

2. Number of Patent Applications Submitted (Standard Research Output)

Patent Applications Submitted

Year: 2010

Plan: 0

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2010	Extension	Research	Total
Plan	0	12	
Actual	0	14	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of undergraduate students directly involved in the projects

Year	Target	Actual
2010	15	0

Output #2

Output Measure

- Number of graduate students directly involved in the projects

Year	Target	Actual
2010	15	2

Output #3

Output Measure

- Number of non-peer-reviewed publications (theses, abstracts, newsletters, fact sheets, articles, etc)

Year	Target	Actual
2010	18	3

Output #4

Output Measure

- Number of websites in which project results have been incorporated

Year	Target	Actual
2010	12	3

Output #5

Output Measure

- Number of peer-reviewed publications

Year	Target	Actual
2010	4	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of graduate students involved and trained
2	Number of undergraduate students involved and trained
3	Increased knowledge through publications and other means

Outcome #1

1. Outcome Measures

Number of graduate students involved and trained

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	6	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Graduate student involvement in experiment station research projects is fundamental to our mission to train the next generation of agricultural scientists.

What has been done

Two graduate students were integrally involved in an integrated research and extension effort to evaluate the risks and potential solutions to the problem of hepatotoxic mycrosistins produced by freshwater aquatic cyanobacteria blooms in northeastern lakes and reservoirs, and therefore potentially drinking water supplies. The students carried out laboratory and field work targeted at this important natural resources-related public health problem.

Results

Graduate students met with stakeholder groups, state and federal agency staff, university and high school students, faculty members and scientists to relay their findings. They simultaneously gained firsthand knowledge and experience about real world management and statutory implications and procedures.

4. Associated Knowledge Areas

KA Code	Knowledge Area
314	Toxic Chemicals, Poisonous Plants, Naturally Occurring Toxins, and Other Hazards Affecting Animals

Outcome #2

1. Outcome Measures

Number of undergraduate students involved and trained

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	6	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Engaging undergraduate students in research, particularly as related to agriculture and associated natural resources, is crucial to achieving a stream of highly qualified future scientists and managers, as well as an educated and discerning populace.

What has been done

184 students in multiple classes at the University of New Hampshire, 23 high school students from the northeast region through the summer Project SMART program, and 14 UNH undergraduate students trained in cyanobacteria toxin research in the laboratory, were involved in or exposed to research on toxic microcystins in northeastern lakes and open waters.

Results

A substantial number of young citizens have been educated about this important issue, and the scientific and management approaches targeted toward potential solutions. This change of knowledge and condition will propagate to others via peer-to-peer discussions.

4. Associated Knowledge Areas

KA Code	Knowledge Area
314	Toxic Chemicals, Poisonous Plants, Naturally Occurring Toxins, and Other Hazards Affecting Animals

Outcome #3

1. Outcome Measures

Increased knowledge through publications and other means

Not Reporting on this Outcome Measure

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Other (No external factors interfered substantially with the outcomes.)

Brief Explanation

Many of these external factors may impact public management approaches and outcomes in response to the issue, but none have interfered with our integrated research and extension efforts.

V(I). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

- Retrospective (post program)
- During (during program)
- Case Study

Evaluation Results

Results of ongoing evaluations are still pending. Some may have been provided in the UNH Extension annual report by our Extension cooperator on the project.

Key Items of Evaluation