

V(A). Planned Program (Summary)

Program # 6

1. Name of the Planned Program

Sustaining Natural Resources

Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
102	Soil, Plant, Water, Nutrient Relationships			14%	
112	Watershed Protection and Management			39%	
133	Pollution Prevention and Mitigation			4%	
403	Waste Disposal, Recycling, and Reuse			6%	
511	New and Improved Non-Food Products and Processes			4%	
608	Community Resource Planning and Development			13%	
901	Program and Project Design, and Statistics			10%	
903	Communication, Education, and Information Delivery			10%	
	Total			100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2014	Extension		Research	
	1862	1890	1862	1890
Plan	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}
Actual Paid	0.0	0.0	1.9	0.0
Actual Volunteer	0.0	0.0	0.0	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	76286	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	129751	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

- Students conducted interviews of tourists about their experience in the tourist corridor of Rockingham County. Results were used by the Regional Planning Commission, NH State Park and NH Department of transportation
- Stable isotopes of nitrate were used to examine timing of storm exports of different sources in river catchment.
- A method was tested to recycle excess nitrogen from the Great Bay Estuary by using eelgrass wrack as animal bedding.

2. Brief description of the target audience

Target audiences for the research projects covered by this planned program include: resource managers, farmers and land owners as well as the general public in the Great Bay Estuary watershed, UNH graduate and undergraduate students, as well as state and local government officials, town councilors, watershed associations, farmers, school children, families, and citizens interested in watershed health.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2014	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	93	5000	0	0

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

Year: 2014
 Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2014	Extension	Research	Total
Actual	0	7	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Undergraduates who participated in research.

Year	Actual
2014	20

Output #2

Output Measure

- Number of graduate students directly involved in research projects.

Year	Actual
2014	3

Output #3

Output Measure

- Number of university courses in which project results have been incorporated.

Year	Actual
2014	4

Output #4

Output Measure

- Number of presentations at regional, national, or international scientific meetings.

Year	Actual
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2014 5

Output #5

Output Measure

- Number of workshops, training sessions and presentations to non-scientific stakeholders

Year	Actual
2014	8

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	A spatially distributed river network model for the Great Bay watershed that relative land use sources and sinks for N, P and C.
2	Is it possible to remove nitrogen from the Great Bay Estuary by removing eelgrass wrack to be used as animal bedding, and subsequently for organic enrichment of soils?

Outcome #1

1. Outcome Measures

A spatially distributed river network model for the Great Bay watershed that relative land use sources and sinks for N, P and C.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Seven rivers drain a mixed landscape of agricultural, forested and suburban land into New Hampshire's Great Bay Estuary. Development in the region have resulted in eutrophication of the Estuary and the decline of this ecosystem. The Environmental Protection Agency has mandated that communities improve sewage waste treatment. However, this will go only part way to restoring the health of the estuary. Municipalities and regulatory agencies critically need additional information about nonpoint sources are contributing to eutrophication.

What has been done

1)Sensor networks were installed along portions of the Lamprey designed to quantify the amount and stoichiometry of C, N, and P in the mainstem or trunk of the Lamprey River during base flow and during storms, and compare with headwater storm events to determine changes due to river network biogeochemical processes or unaccounted for sources. 2)Synoptic surveys throughout 2013 and 2014 were conducted to quantify N concentrations in a variety of catchments.

Results

1)Nitrate exports from agricultural lands are more responsive per unit storm runoff than suburban lands. Agricultural lands have higher nitrogen, but lower chloride than suburban lands. Chloride is elevated in areas with impervious surfaces due to road salt applications. 2) Dissolved organic nitrogen exports were higher in suburban (62-93 kgN/km²) than agricultural land (42 kg/km²) and forest (44 kg/km²), so that total nitrogen fluxes from agricultural catchments are lower than from urban catchments. Land cover alone cannot explain much of the variation across a wide range of agricultural and suburban land. Land management practices also are likely significant while the distribution of land use within the catchment, relative to streams, also may be important.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management

Outcome #2

1. Outcome Measures

Is it possible to remove nitrogen from the Great Bay Estuary by removing eelgrass wrack to be used as animal bedding, and subsequently for organic enrichment of soils?

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

There is too much nitrogen in Great Bay Estuary. Current approaches to reversing this problem included expensive upgrades to sewage treatment, but there are still high levels of N in the Bay's sediment. Is it possible to remediate N already in the Great Bay by repurposing eelgrass wrack as animal bedding?

What has been done

Eelgrass was collected, dried, and delivered to Tuckaway Farm in Lee, NH.

Results

The dried eelgrass proved successful as bedding for horses. Based on chemical analysis of the dried eelgrass, it will be possible to calculate the potential nitrogen removal from the estuary.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
112	Watershed Protection and Management
133	Pollution Prevention and Mitigation

403	Waste Disposal, Recycling, and Reuse
903	Communication, Education, and Information Delivery

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Other (developing animal care plan acceptable for UNH Institutional Animal Care and Use Committee)

Brief Explanation

The initial funding of the project # 228521 was delayed by almost a year and caused a year's delay in initiation of project activities.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

The key measures for evaluation of the research in this planned area include the presentation of results in national conferences and to stakeholder groups as well as publication in peer-reviewed journals. The projects covered in Sustaining Natural Resources met these criteria with strong engagement with stakeholders, a significant number of presentations at national and international conferences, and a robust publication record.

Key Items of Evaluation

NHAES research is making significant contributions to the knowledge base needed to target efforts to on non-point sources of N loading in New Hampshire's Great Bay Watershed.