V(A). Planned Program (Summary)

Program # 4

1. Name of the Planned Program

Urban Non Point Source Pollution

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
111	Conservation and Efficient Use of Water	0%		12%	
112	Watershed Protection and Management	100%		33%	
133	Pollution Prevention and Mitigation	0%		15%	
402	Engineering Systems and Equipment	0%		13%	
403	Waste Disposal, Recycling, and Reuse	0%		15%	
405	Drainage and Irrigation Systems and Facilities	0%		12%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

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

Year: 2010	Extension		Research	
	1862	1890	1862	1890
Actual	2.2	0.0	1.4	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
14636	0	30076	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
43100	0	160863	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
102153	0	1153	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

• **Urban Watershed and Water Quality**: work with towns, municipalities, community organizations with consultations, demonstrations, workshops, newsprint, presentation, youth camps
• **Watershed & Water Quality Programs**:Watershed education for educators and students, and community members with consultation, train the trainer, demonstration, field site visits
• **Healthy Coastal Ecosystems:** work with marinas and coastal businesses, consultation, field site visits
• Assessment of P loading from non point pollution sources and the development of appropriate technologies that reduce p pollution.
• Quantify dairy farm pathogens Escherichia coli (E. coli) and Cryptosporidium parvum (C. parvum) in barnyard and milking operations wastewater and in feed bunk and farm ditch runoff generated during precipitation events, and to assess a novel steel slag filter technology for reducing these organisms from point and non-point dairy farm effluents in a cold northern climate.

2. Brief description of the target audience

• Adults
• Age 13 - 18 Youth
• Age 19 - 24 Young Adult
• Age 25 - 45 Adult
• Age 25 - 60 Adult
• Age 6 - 12 School Age
• Age 8 - 18 Youth
• Agriculture/Natural Resources: Watershed Based Organizations
• Agriculture: Farmers
• Agriculture: Service Providers
• Communities: Local Officials/Leaders
• Communities: Non-Governmental Organizations
• Community leaders and citizens
• Environmental Professionals: Environmental Managers
• Public: Age 13-18 (Youth)
• Public: General
• Public: Homeowners
• Public: Small Business Owners/Entreprenuers
• Youth

V(E). Planned Program (Outputs)

1. Standard output measures

2010	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Plan	{NO DATA	{NO DATA	{NO DATA	{NO DATA
Actual	804	5300	1577	0

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

Patent Applications Submitted

Year: 2010
Plan:
Actual: 1

Patents listed
Phosphorus removal process and method for residential and commercial wastewater treatment

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2010	Extension	Research	Total
Actual	0	1	1

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Consultations

Year	Target	Actual
2010	{No Data Entered}	27

Output #2

Output Measure

- Demonstrations

Year	Target	Actual
2010	{No Data Entered}	13

Output #3

Output Measure

- Field day/fair

Year	Target	Actual
2010	{No Data Entered}	2

Output #4

Output Measure

- Presentation

Year	Target	Actual
2010	{No Data Entered}	18

Output #5

Output Measure

- Tours

Year	Target	Actual
2010	{No Data Entered}	2

Output #6

Output Measure

- Train the trainer

Year	Target	Actual
2010	{No Data Entered}	1

Output #7

Output Measure

- Web page updating

Year	Target	Actual
2010	{No Data Entered}	1

Output #8

Output Measure

- Workshop series

Year	Target	Actual
2010	{No Data Entered}	8

Output #9

Output Measure

- Workshop single session

Year	Target	Actual
2010	{No Data Entered}	32

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of households using lawn care inputs in designated no-input buffer zones; Number of properties under one or more low input/ no phosphorous lawn care practices
2	Number of commercial lawn care firms using low input/ no phosphorous lawn care practices
3	Number of lakeshore residential properties planting buffer strips or maintaining native vegetation as a buffer to decrease erosion and sedimentation
4	Number of lakeshore residents changing residential practices to reduce impact on water quality
5	Number of requests for information or technical assistance for educational watershed stewardship projects or implementation of water quality improvement projects
6	Number of retail lawn and garden centers providing information on low input/no phosphorous lawn care options to customers
7	Number of schools that demonstrate an increase in, or institutionalization of, integrated watershed education into returning educators curriculum
8	Number of towns/municipalities using one or more bioengineering methods for shoreline stabilization to decrease erosion and sedimentation
9	Vermont dairy farm reduction in farm point and non point pollution sources

Outcome #1

1. Outcome Measures

Number of households using lawn care inputs in designated no-input buffer zones; Number of properties under one or more low input/ no phosphorous lawn care practices

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	19

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Urban storm water runoff is a major contributor to impairment of Mussey Brook in Rutland. We are working with watershed property owners to reduce storm water related pollution and improve water quality sufficiently to remove the brook from impaired status.

What has been done
In partnership with the city, local NGOs, VT Agency of Natural Resources and UVM Extension/Sea Grant the Moon-Mussey Brook Watershed Good Stewards project began last summer (2008), targeting business/institutional property managers for one-on-one low input lawn care training.

Results
A follow up survey in August 2009 showed all nine priority properties that adopted practices in 2008 are still using low input lawn care practices. In addition, 16 private property owners also adopted low input practices. Project is on-going so total acreage under low input care will be calculated.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management

Outcome #2

1. Outcome Measures

Number of commercial lawn care firms using low input/ no phosphorous lawn care practices

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	11

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Urban storm water runoff is a major contributor to impairment of Watersheds. The business community as well as private property owners benefit from a healthy watershed and can contribute to efforts to prevent and improve impairment.

What has been done
A larger business community meeting was held to discuss the impacts of having an MS4 designation placed on the Moon-Mussey watershed held in March 2010.

Results
11 small business owners agreed to participate in 2010 low input grounds care in Moon-Mussey brook watershed. They have agreed to adopt practices that a) reduce sediment inputs and b) decrease lawn care inputs.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management

Outcome #3

1. Outcome Measures

Number of lakeshore residential properties planting buffer strips or maintaining native vegetation as a buffer to decrease erosion and sedimentation

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	28

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
A 2007 report estimated that 46% of the nonpoint source phosphorus load to Lake Champlain is from urban land uses, even though urban/suburban developed areas account for only 3% of the basin area. Urban NPS pollutants originate from decisions by individuals on how they manage their property, be it residential, commercial or municipal property. Only when large numbers of residents, property managers, lawn care firms, municipal governments and others act together to reduce lawn inputs and storm water runoff on their property will we achieve success in control and reduction of urban NPS pollution.

What has been done
Non Point Source pollution prevention trainings were attended by lakeshore homeowners collaborating with the Centennial Brook Community group.

Results
Since 2008, 5400' of buffer plantings have been completed on 28 properties on Lake St Catherine's lakeshore and we have an extensive waiting list for future assistance.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management

Outcome #4

1. Outcome Measures

Number of lakeshore residents changing residential practices to reduce impact on water quality

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	56

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
A 2007 report estimated that 46% of the nonpoint source phosphorus load to Lake Champlain is from urban land uses, even though urban/suburban developed areas account for only 3% of the basin area. Urban NPS pollutants originate from decisions by of individuals on how they manage their property, be it residential, commercial or municipal property. Only when large numbers of residents, property managers, lawn care firms, municipal governments and others act together to reduce lawn inputs and storm water runoff on their property will we achieve success in control and reduction of urban NPS pollution.

What has been done
A presentation titled "Reduced P on Lawns" was attended by business owners and "Shoreline erosion workshops" was attended by local officials from three counties. A follow up survey was conducted to evaluate changes made.

Results
Residential surveys have demonstrated that over 31% (56/180) of lakeshore households contacted have changed practices to reduce domestic NPS pollution. Follow up surveys show that over 60% (106/180) of lakeshore households contacted are aware of the link between residential practices and coastal water quality.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management

Outcome #5

1. Outcome Measures

Number of requests for information or technical assistance for educational watershed stewardship projects or implementation of water quality improvement projects

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	9

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management

Outcome #6

1. Outcome Measures

Number of retail lawn and garden centers providing information on low input/no phosphorous lawn care options to customers

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	57

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management

Outcome #7

1. Outcome Measures

Number of schools that demonstrate an increase in, or institutionalization of, integrated watershed education into returning educators curriculum

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	10

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The Allen Brook watershed is Williston's largest and has been under increasing development pressures. Allen Brook is a tributary of the Winooski and meets with Muddy Brook. Allen Brook

has been degraded from its status as a Class B Waterway due to stormwater runoff and E. coli levels, sections have been eroding the stream-bank and it suffers from sedimentation. Additionally, both project sites have a number of invasive species.

What has been done
The UVM Watershed Alliance coordinated multiple service projects with two schools. Groups focused on improving riparian habitat along Allen Brook in Williston and the Huntington River in Huntington. 170 students worked almost 200 hours improving the habitat.

Results
The work done will stabilize the stream bank, preventing sediment from flowing downstream and provide additional food and cover for wildlife. One year later one school has returned to the site and the 5-8th grade science teacher has decided to adopt the site with his students and become permanent stewards with the support from the Watershed Alliance and Town of Williston planning department. This is not only improving the water quality but giving students the opportunity to know and experience what it means to be stewards of their watersheds.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management

Outcome #8

1. Outcome Measures

Number of towns/municipalities using one or more bioengineering methods for shoreline stabilization to decrease erosion and sedimentation

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	2

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Lake Champlain shoreline communities are vulnerable to erosion and shoreline destabilization. Decision makers, local officials and coastal land owners need to be aware of the hazards associated with development on Lake Champlain cliffs and near unstable stream channels.These include property loss, structural damage to public and private infrastructure, and public safely concerns.

What has been done
In collaboration with the Northwest (VT) Regional Planning Commission (NWRPC), we held workshops through 2008 and 2009 to educate town and municipal officials in the Lake Champlain basin about using bioengineered methods for shoreline stabilization and erosion control. Bioengineering uses vegetative materials for structural support for banks subject to erosion. Although an accepted erosion control practice in New England, bioengineering is little used in the Lake Champlain basin.

Results
The town of Colchester changed zoning regulations and coastal construction guidelines to require future shoreline construction to use Sea Grant-NWRPC promoted bioengineering methods.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management

Outcome #9

1. Outcome Measures

Vermont dairy farm reduction in farm point and non point pollution sources

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	2

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Community; steel slag filtration is very efficient in reducing both E.coli and Cryptosporidium from agricultural wastewater

What has been done
Farm wastewater samples were collected monthly at eight sampling points (barnyard settling pit, barnyard manure tank, dairy tank, feed bunk runoff, steel slag filters, constructed wetland effluent, a splitter tank/flume and Potash Brook). Samples of feed bunk runoff generated during storm and snowmelt events were also collected from four sites. Another facet of this study was the inclusion of laboratory column experiments to investigate the ability of steel slag filtration in reducing E.coli

levels from agricultural effluents. Columns filled with slag were used to investigate the effect of different hydraulic residence times on E. coli reduction performance.

Results

All samples contained E. coli, but with counts varying significantly by season. The highest E.coli concentrations were observed in a dairy tank followed by feed bunks runoff and a splitter tank flume. These results provided further evidence that feed bunks runoff can represent a significant source of E.coli contamination. The results from this study also suggest that E.coli is strongly affected by temperature fluctuations as well as farm practices that vary seasonally, such as quantity of germicidal chemicals used during winter and summer. Parasitic coccidians were not detected in any of the wastewater samples.Remarkable E. coli reduction efficiency was achieved, averaging 92 percent over 450 days. Column experiments confirmed that hydraulic residence time affects the efficiency of E. coli reduction via steel slag filters, with increasing time leading to increased efficiency. Investigations on the ability of steel slag to reduce Cryptosporidium from wastewater using Nosema microspordia showed a decrease in the number of parasites.

4. Associated Knowledge Areas

KA Code	Knowledge Area
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
402	Engineering Systems and Equipment
405	Drainage and Irrigation Systems and Facilities

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Government Regulations
- Competing Public priorities

Brief Explanation

None to note.

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

1. Evaluation Studies Planned

- After Only (post program)
- Retrospective (post program)

Evaluation Results

Post program survey of residents at lakes where program is active demonstrate that 31% of those contacted have changed practices to reduce domestic NPS pollution and 60% of the

lakeshore households contacted are aware of the link between residential practices and coastal water quality.

Key Items of Evaluation