V(A). Planned Program (Summary)

Program # 8

1. Name of the Planned Program

Climate Change

☑ 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
101	Appraisal of Soil Resources	10%		10%	
112	Watershed Protection and Management	50%		50%	
131	Alternative Uses of Land	15%		15%	
133	Pollution Prevention and Mitigation	25%		25%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2012	Extension		Research	
	1862	1890	1862	1890
Plan	3.0	0.0	7.0	0.0
Actual Paid Professional	2.1	0.0	1.6	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**
216921	0	71877	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
56538	0	162369	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

• Research investigations focus on watershed patterns and processes that affect the fate of nitrogen and environmental flows. Research methods include lab and field studies as well as geospatial analyses.
• Extension programs create locally relevant programs focused on land and community management.In cooperation with stakeholders and partner agencies, we will identify needs and build upon successful local programs to create and disseminate new materials, tools and curricula in RI and New England. Our water quality programs will continue development, delivery, training and application of proven water quality management tools and techniques such as:
Develop of curricula and training on best management practices (BMPs) for conventional and alternative and innovative onsite waste water treatment

- Public outreach and training on stormwater management
- Development of curricula and training regarding private wells
- Volunteer Water Quality Monitoring

2. Brief description of the target audience

Public decision makers / Policy makers / NRCS / local, state and federal agencies

Municipal planners

Private sector firms engaged in watershed management, landscaping, onsite waste water treatment and private wells

A variety of NGOs (land trusts, environmental organizations, etc).

Agricultural producers

The general public

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2012	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	1999	43125	86	360

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

Patent Applications Submitted

Year:	2012
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2012	Extension	Research	Total
Actual	0	4	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Peer Reviewed Publications

Year	Actual
2012	4

Output #2

Output Measure

- Fact sheets, bulletins and newsletters

Year	Actual
2012	7

Output #3

Output Measure

- Website development and refinement

Year	Actual
2012	5

Output #4

Output Measure

- Training manuals and Instructional CD's developed

Year	Actual

2012	0

Output #5

Output Measure

- Public service announcements, news releases/articles
  Not reporting on this Output for this Annual Report

Output #6

Output Measure

- Books and monographs
  Not reporting on this Output for this Annual Report

Output #7

Output Measure

- Abstracts

Year	Actual
2012	15

Output #8

Output Measure

- Workshops and Conferences hosted or Co-hosted

Year	Actual
2012	57

Output #9

Output Measure

- Presentations and Short Courses

Year	Actual
2012	46

Output #10

Output Measure

- Student training

Year	Actual
2012	12

Output #11

Output Measure

- MS theses and PhD dissertations
  Not reporting on this Output for this Annual Report

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Increased (%) of the proportion of professionals and the public knowledgeable about maintenance, improvement and challenges of climate variability and climate change related to onsite wastewater treatment.
2	Increased understanding by scientists and decision makers through publications and presentations of the management and risks of watershed nitrogen delivery.
3	Increased (%) development of locally based water resource data for use by communities and the public that can assist in risk assessment and management related to watershed changes, climate variability and climate change.
4	Increase in the proportion of the public and professionals knowledgeable about options for addressing risks related to watershed changes, climate variability and climate change related to storm water management.
5	Increase in targeted households and professionals gaining knowledge of private well management options related to land use, climate variability and climate change, including testing, treatment, siting and protection measures.

Outcome #1

1. Outcome Measures

Increased (%) of the proportion of professionals and the public knowledgeable about maintenance, improvement and challenges of climate variability and climate change related to onsite wastewater treatment.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Onsite wastewater treatment systems serve approximately 30 percent of the Rhode Island population. Old, failed, or improperly functioning onsite wastewater treatment systems cause nitrogen and bacterial contamination which poses a direct public and environmental health risk. Educating practitioners, regulators, decision makers, and system owners about advanced treatment technologies for onsite wastewater and about management approaches is needed to help raise the awareness level, and enable a shift to modern state-of-the-science approaches.

What has been done
During the reporting period, the URI project team delivered 44 workshops to wastewater practitioners in nine states/territories, reaching a total of about 1075 practitioners, providing continuing education credits needed by those licensed professionals to renew their professional licenses. These classes included in-door and out-door hands-on venues and ranged from half-day to two-day venues with qualifying exams. Courses included new classes on wastewater microbiology for OWTS practitioners and the first ever class offered on designing advanced OWTS for designers in the US Caribbean (PR and USVI). URI provided technical assistance to Old Saybrook, CT in their adoption of and state regulatory approval of advanced OWTS in nitrogen sensitive coastal zone. Coordinating with Vermont OWTS regulators, URI developed two 1-day classes to train VT practitioners on how to site, design, install and service advanced OWTS and bottomless sand filters. Conducted three required classes for Rhode Island and Massachusetts wastewater practitioners to enable them to receive regulatory jurisdiction approval to design and install bottomless sand filters.

Results

MA, VT and RI regulatory programs require practitioners to take the URI bottomless sand filter (BSF) training class before designing or installing a BSF. In reporting period 32 wastewater professionals from RI and MA took the class. These classes have enabled licensed practitioners to renew their existing professional licenses and retain their employment. To begin to raise awareness in the industry, a keynote address was delivered to 180 attendees at the 2012 National Onsite Wastewater Recycling Association annual conference that spoke about the issues of climate change and the impact on OWTS. Twenty-one onsite wastewater professionals took the URI inspector training classes, were tested and passed their exams, and received OWTS Inspector Registrations which are required in order to conduct inspections in several Rhode Island communities having wastewater management programs. Approximately 40% of all onsite wastewater treatment system applications to the Rhode Island Department of Environmental Management are for advanced OWTS. Use of advanced OWTS, tested by URI, that denitrify wastewater are now required in state designated watersheds that are nitrogen sensitive. Professionals engaged in design and installation of these systems are trained by URI. This has helped protect these watersheds from further degradation.

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources
112	Watershed Protection and Management
131	Alternative Uses of Land
133	Pollution Prevention and Mitigation

Outcome #2

1. Outcome Measures

Increased understanding by scientists and decision makers through publications and presentations of the management and risks of watershed nitrogen delivery.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Modeling for TMDL Development, and Watershed Based Planning, Management and Assessment. The export of nitrogen (N) from coastal watersheds can exert profound effects on the function and value of coastal estuaries. The goal of our research is to characterize the extent of in-stream nitrate removal in low gradient streams
and identify stream attributes that relate to elevated nitrate removal rates. As we gain more insight into in-stream
nitrate removal, we will be able to contribute to the scientific dialog that seeks to target site-specific nitrate control
strategies to locales with high potential for export to coastal waters.

What has been done

We developed a draft of a customized ArcMap document that uses some functions in the ArcHydro data model extension, providing maps of N sources and sinks within a watershed and estimating risk of N movement from sources to the watershed outlet based on sinks within the watershed. We created a guidance document for using the tool and developed several case studies for training and illustrative purposes. We developed an action plan to move N-Sink from a visualization tool to an interactive tool in which users can change inputs and manipulate data to explore the effects of different land use decisions. We assessed the role of intermittent streams as N sinks. We instrumented 6 intermittent streams with data loggers to record stream depth and continued with a detailed assessment of N removal capacity (via slug tests) and stream features. We also have assessed the impact of woody debris and extended retention times on denitrification in three beaver ponds in RI. We completed mesocosm studies of beaver pond sediments looking at N cycling.

Results

We gathered information on our N-Sink model from RI-NRCS and the U.S. EPA that will be used in an action plan for improvements to its usability and functionality. This N-Sink tool will be usable by coastal land use managers in effectively managing land for watershed nitrogen. Through our field assessments of six intermittent streams and scaling up to 250 m reaches of stream with seasonal N removal data and field-based hydroperiod data, between 0.6 to 22.5 kg N could be removed from these streams annually. We provide evidence that intermittent headwater streams serve as hotspots for N removal in watersheds. This argues for the importance of including them in watershed N assessment tools. Also, the protection of the forest cover along streams is important if developments occur since grass riparian zones alter the structure of small streams, i.e., removing pools and debris dams that are central to the extended retention times associated with these sites. Outcomes of this research will contribute to better watershed management by improving the knowledge base for the selection of locales for individual and public investment of pollution control and restoration, thereby advancing stream/riparian restoration and management practices.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management

133 Pollution Prevention and Mitigation

Outcome #3

1. Outcome Measures

Increased (%) development of locally based water resource data for use by communities and the public that can assist in risk assessment and management related to watershed changes, climate variability and climate change.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
URI Watershed Watch. Seasonal droughts, rising nutrient levels, nuisance algae blooms and the spread of invasive aquatic plants have increased awareness that water quantity and quality is a concern for the public local, state and national decision makers. Agency resources, both staff and financial, to monitor water resources in New England have always been insufficient, while the need increases yearly. Monitoring is long-term, with best decisions based on at least 10 years of data. Detecting trends and threats to local waters is increasingly becoming the responsibility of local communities and watershed organizations.

What has been done
Held multiple classroom and field training sessions for WQ volunteers. Presented workshops and talks locally to nationally. Approximately 400 scientist-led volunteer monitors performed weekly or biweekly ecological monitoring on 270 locations in RI, CT and MA, for 40 local to statewide organizations measuring water clarity, temperature, oxygen content, pH and alkalinity. They process samples for chlorophyll analysis. Sites are 1/3 lakes or ponds, 1/3 rivers and streams, 1/3 estuaries, bays, salt ponds. They also collect samples for lab analyses of nutrients and bacteria. Presented workshops and spoke in numerous sessions at 2012 National WQ Monitoring Conf, facilitated scholarships for 32 volunteer monitoring coordinators. Co-hosted annual NE Lakes conference to educate and train lake and watershed organization members about lake and watershed ecology. Invited speaker at Land Trust and Citizen Science conferences. Provided 25 years of data to WI and FL limnologists researching long-term WQ changes.

Results

Because of Extension-led volunteer monitoring an unparallelled record of water clarity, temperature, oxygen content,nutrients and bacteria levels now exists in all NE states. Over 20,000 data points aggregated into site specific monitoring results were posted on the URIWW website and distributed to sponsoring organizations as well as RI DEM & US EPA in this fiscal year alone. Regulatory agencies have used the data to create regulations to protect excellent water quality as well as to document poor water quality, and to help best direct their resources. Extension has used monitoring results to target programs to specific geographic areas. Local groups have used the data to take action to enact local ordinances to promote farm and home owner awareness and action to deal with runoff and erosion. These data are also now being used to document surface water temperature changes and resultant hypolimnetic hypoxia and anoxia, and also to track cyanobacteria blooms.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
131	Alternative Uses of Land
133	Pollution Prevention and Mitigation

Outcome #4

1. Outcome Measures

Increase in the proportion of the public and professionals knowledgeable about options for addressing risks related to watershed changes, climate variability and climate change related to storm water management.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

URI NEMO. Stormwater pollution is a major cause of impaired water quality in Rhode Island, leading to swimming beach closures, shellfishing bans, loss of recreational value, and degraded habitat. Most Rhode Island municipalities operate small Municipal Separate Storm Sewer Systems (MS4s), and are required to comply with the EPA Phase II Storm Water Rule under the RIPDES permit program. These MS4s must enact storm water management programs to reduce pollutants that can enter drainage systems during storm events. This represents a significant burden for most municipalities already struggling with few
staff, shrinking budgets, and in most cases, limited expertise in education and outreach.

What has been done

RI NEMO provided education and outreach to municipal officials, watershed groups, the public and K-12 teachers on managing stormwater. We organized 9 new workshops for municipal officials; conducted 2 rain garden design courses with construction of 3 demonstration rain gardens at public libraries, co-sponsored a bioretention training workshop which included construction of a bioretention facility and inspection and maintenance guide, and served on a technical review committee working to update the RI Soil Erosion and Sediment Control Handbook. We continued to provide municipal stormwater managers and watershed groups with educational materials for their use in educating and involving the public in preventing stormwater pollution. These materials are widely used education on prevresulting in 23 articles on stormwater topics appearing in state and local news papers. We continued to update the state stormwater website, RIStormwateSolutions.org.

Results

Stormwater workshops for municipal officials reached more than 700 stormwater managers, design engineers, environmental educators, and others. At least 98 percent of RI stormwater managers, representing 34 of RI's 39 municipalites and 6 institutions (MS4s) regulated under the Phase II permit program, have been trained in the 2010 RI Storm Water Manual and related topics. Muncipalities thoughout the state used or customized URI materals to educate residents and others about actions they can take to prevent stormwater pollution, enabling them to develop effective stormwater managment programs and meet permit requirements. This training and outreach is conducted under the RI Stormwater Solutions project, which is managed by RI NEMO in cooperation with the RI Department of Transportation, the RI Department of Environmental Management, and the state's municipalities. In recognition of this progress, the US Federal Highway Administration awarded the 2012 Exemplary Human Environment Initiative award for Educational and Training Activities to the RI Stormwater Solutions project. Website: www.fhwa.dot.gov/environment/ehei/awards/2012/rhode_island.cfm

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
133	Pollution Prevention and Mitigation

Outcome #5

1. Outcome Measures

Increase in targeted households and professionals gaining knowledge of private well management options related to land use, climate variability and climate change, including testing, treatment, siting and protection measures.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
URI Home-A-Syst. Ten percent of Rhode Islanders depend on private wells for drinking water. In New England private wells serve 40 percent of the population. These residents are responsible for the quality of their own drinking water and need to be aware of contaminant risks to their drinking water sources and how to protect against such risks. Changing property laws and regulations in the region have increased demand for well water testing and educational materials. Education about protecting private sources of drinking water is critical to the health and safety of families relying on private wells. Audiences include private well owners, scientists and researchers, educators, federal, state, and local policymakers, and non-profit organizations.

What has been done
With RI Department of Health and state certified testing labs, developed promotional well testing discount postcard that was mailed to more than 60,000 RI households. Will continue to work with state certified labs to revise and offer promotional testing package.
Held 3 private well water workshops for 90 people in communities throughout Rhode Island. Annually the webpage receives over 40,000 visits, including private well protection, landscaping for water quality protection, and small acreage livestock management on residential properties. Hosted the regional 2011 Northeast Private Well Water Symposium in Southbury, Connecticut, November 14 & 15, 2011 for 124 professionals involved in private well water protection. Program evaluations indicate that attendees will apply what they learned at this event to improve the protection of private drinking water supplies.

Results

Post workshop evaluations show that workshop participants are taking action to protect their private well, most notably, 51% of workshop participants had their well water tested. Paper published in the Journal of Extension summarizing outcomes of private well education and training program 2004 - 2009. Evaluation of the promotional well testing discount was conducted and summarized for poster presentation at the 2011 Northeast Private Well Water Symposium. During this reporting period, more than 100 households have taken advantage of this promotional well water testing discount.

4. Associated Knowledge Areas

KA Code	Knowledge Area
133	Pollution Prevention and Mitigation

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges

Brief Explanation

The tumultuous economy has had a negative effect on hiring new faculty and staff. Uncertain state budgets and budget cuts continue to have a negative effect on service delivery.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

· Workshops and training programs use pre and post assessment vehicles to evaluate change in stakeholder knowledge.

· Behavior change of stakeholders is assessed through longitudinal tracking of participant behaviors compared to behaviors identified prior to participation in programs.

· Extension and research outputs are subject to peer evaluations before publication.

· Citations of published works are quantified through services such as the ISA Web of Science and Google Scholar.

· Google analytics tracking software is used to generate detailed information about website use. Information includes the number of views and downloads per webpage and the numbers and types of visitors (.gov, .edu, .org, .com) to each portion of the websites.

Key Items of Evaluation