2016 University of Rhode Island Combined Research and Extension Annual Report of Accomplishments and Results

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I. Report Overview

1. Executive Summary

In this report we describe the activities and impacts of programs associated with the Rhode Island Agricultural Experiment Station (RIAES or the Station) and Rhode Island Cooperative Extension (Extension). These are collectively referred to as the land-grant programs at the University of Rhode Island (URI). RIAES and Extension are collaborative elements within the College of the Environment and Life Sciences (CELS) at URI. Administrative oversight of RIAES and Extension is provided by the Dean of CELS. Day-to-day management of the land-grant programs is provided by the Associate Dean for Extension and Agricultural Programs.
The programs and projects supported within URI's land-grant portfolio span a wide range of disciplines, from the natural sciences to the social sciences. Equally important, the solutions that we share with stakeholders are based on solid university research; research that depends on appropriate, modern infrastructure, the cutting edge tools of science, and multi-disciplinary, multi-state, problem-based approaches. URI's land-grant programs are focused around a portfolio of five programs, including: 1) Food Safety and Nutrition; 2) Sustainable Energy, Climate Change and the Environment; 3) Food Production and Sustainability; 4) Youth, Families and Communities; and 5) International Programs.
RIAES and Extension are integral components of the mission of the College and the University. The collaborative relationship with our federal partner, NIFA, has enabled our scientists, staff and students to leverage additional resources that provide contemporary knowledge, essential services, and innovative programming for all Rhode Islanders.

Total Actual Amount of professional FTEs/SYs for this State

Year: 2016	Extension		Research	
	1862	1890	1862	1890
Plan	20.0	0.0	36.0	0.0
Actual	23.5	0.0	18.5	0.0

II. Merit Review Process

1. The Merit Review Process that was Employed for this year

- Internal University Panel
- External University Panel
- External Non-University Panel
- Combined External and Internal University Panel
- Expert Peer Review

2. Brief Explanation

The land-grant programs at URI used several merit review processes during FY 2016. All new Hatch projects were reviewed by external-university or external-non university experts. The selection and solicitation of external peer experts was made by the AES Director. The Director used the nationwide network of Experiment Station Directors to assist in the identification of prospective reviewers. The Director then contacted a minimum of two reviewers to assess the project based on a defined rubric and provide comments to the Director. The Director then provided comments to the faculty that wrote the project. Faculty then revised the project narrative and submitted the project for approval to USDA-NIFA through REEPort.
Faculty who joined multi-state projects submitted a project initiation through REEPort. Prior to initiating a project, the Director assessed the prospective work for fit within the defined objectives of the multistate project. If the fit was sound, a project was initiated in REEPort by a faculty scientist. After the project was undertaken, we assessed the faculty scientist's contributions to the project with an expectation that our investment in the project (an investment beyond travel to the project's annual meeting) yielded academic products like publications, presentations and the like.
Frequently, new Hatch projects are undertaken by faculty that have just joined the University of Rhode Island. For these individuals, there was an initial merit review of the research (prior to development and submission of a Hatch project proposal) made by an internal university panel of disciplinary experts. For instance, if we were seeking a water expert, the panel of internal experts might include a natural resources hydrologist, a civil engineer, a resource economist and an environmental planner.

III. Stakeholder Input

1. Actions taken to seek stakeholder input that encouraged their participation

- Use of media to announce public meetings and listening sessions
- Targeted invitation to traditional stakeholder groups
- Targeted invitation to non-traditional stakeholder groups
- Targeted invitation to traditional stakeholder individuals
- Targeted invitation to non-traditional stakeholder individuals
- Targeted invitation to selected individuals from general public
- Survey of traditional stakeholder groups
- Survey of traditional stakeholder individuals
- Survey of the general public
- Survey specifically with non-traditional groups
- Survey specifically with non-traditional individuals
- Survey of selected individuals from the general public

Brief explanation.

Stakeholder input was captured through a variety of mechanisms throughout the year. Stakeholder feedback was sought after most Extension workshops and meetings to ensure that our programs were meeting stakeholder needs. Research faculty routinely presented the results of their work to interested industry and community groups (as well as the academic community) and used feedback from those groups to inform their future research directions. In addition, Extension engaged in a strategic planning process that sought input from external partners and stakeholders. We assembled a large Strategic Planning Committee comprised of sixteen URI faculty/staff and external partners in roughly equal numbers. The Committee met five times during FY 2016 and considered input provided through one-on-one interviews with 15 "key thinkers" around the state about how

Extension can better address the needs of Rhode Islanders.

2(A). A brief statement of the process that was used by the recipient institution to identify individuals and groups stakeholders and to collect input from them

1. Method to identify individuals and groups

- Use Advisory Committees
- Use Internal Focus Groups
- Use External Focus Groups

Brief explanation.

CELS hosts three committees that play a role in identifying individuals and groups who are stakeholders and in collecting input from them. Two of those committees, the Research Committee and the Cooperative Extension and Outreach Coordinating Committee, are responsible for advising and assisting the Dean and Associate Dean in planning and reviewing programs for the college. A combination of faculty/staff and external partners serve on these committees and are expected to consider the needs of a broad set of stakeholders in formulating their recommendations. The third committee, the Agricultural Industry Advisory Group, advises the Dean on a wide range of issues related to CELS, including its land-grant programs. The College also utilizes Rhode Island's CARET representatives for stakeholder input.
Currently, a third committee, the URI Cooperative Extension Strategic Planning Committee, is actively assisting CELS in identifying relevant stakeholder groups and stakeholder individuals and bringing input from those groups and individuals into the strategic planning process.

2(B). A brief statement of the process that was used by the recipient institution to identify individuals and groups who are stakeholders and to collect input from them

1. Methods for collecting Stakeholder Input

- Meeting with traditional Stakeholder groups
- Meeting with traditional Stakeholder individuals
- Meeting specifically with non-traditional groups
- Meeting specifically with non-traditional individuals
- Meeting with invited selected individuals from the general public
- Survey of selected individuals from the general public

Brief explanation.

As was stated previously, stakeholder input is captured through a variety of mechanisms throughout the year. These include discussions and surveys of participating stakeholders at Extension workshops and meetings, as well as discussions before, during, and after faculty presentations of their research to interested industry and community groups. Input was also collected through the discussions and work of the Research Committee, the Cooperative Extension and Outreach Coordinating Committee, and the Dean's Agriculture Industry Advisory Group. The College utilizes input from Rhode Island's CARET representatives. Rhode Island's CARET representatives are from the green industry and the agricultural community.

3. A statement of how the input will be considered

- In the Budget Process
- To Identify Emerging Issues
- Redirect Extension Programs
- Redirect Research Programs
- In the Staff Hiring Process
- In the Action Plans
- To Set Priorities

Brief explanation.

Stakeholder input was used to inform decisions throughout the year, including priority setting and action planning. Our researchers and Extension experts incorporated stakeholder input into their thinking, planning, and program/project development over time. The Dean and Associate Dean used stakeholder input to inform decisions related to budget development and staffing. All parties use stakeholder input to identify emerging issues, which can result in the redirection of research and extension programs, and the acquisition of extramural resources when available.

Brief Explanation of what you learned from your Stakeholders

As mentioned last year, sustainable agriculture and local/regional food systems are very important in Rhode Island and in all of New England. The 50 x 60 goal described in a report entitled "A New England Food Vision" calls for our region to produce at least 50% of its food by the year 2060. This report has generated a lot of interest across New England and all states are taking steps to address it. One important response from the University of Rhode Island is the launch of a new undergraduate degree program in sustainable agriculture and food systems. We began accepting students into the program last fall. In addition, the state of Rhode Island recently hired a Director of Food Policy to develop a food strategy for the state. This is another strong indication of interest in this area.

IV. Expenditure Summary

1. Total Actual Formula dollars Allocated (prepopulated from C-REEMS)			
Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
1138886	0	1544142	0

2. Totaled Actual dollars from Planned Programs Inputs				
	Extension		Research	
	Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
Actual Formula	1420060	0	1560920	0
Actual Matching	1133489	0	1640084	0
Actual All Other	0	0	0	0
Total Actual Expended	2553549	0	3201004	0

3. Amount of Above Actual Formula Dollars Expended which comes from Carryover funds from previous				
Carryover	593260	0	392145	0

V. Planned Program Table of Content

V(A). Planned Program (Summary)

Program # 1

1. Name of the Planned Program

Food Safety and Nutrition

☑ 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
703	Nutrition Education and Behavior	17%		41%	
704	Nutrition and Hunger in the Population	17%		5%	
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources	33%		9%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	33%		45%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2016	Extension		Research	
	1862	1890	1862	1890
Plan	1.5	0.0	2.5	0.0
Actual Paid	1.1	0.0	2.0	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**
86673	0	248433	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
68281	0	168563	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

Food Safety:
- Continue to implement HACCP training for RI school food service operations
- Provide HACCP and sanitation education programs to a variety of food processors
- Maintain a Good Agricultural Practices (GAP) Program for commercial growers of fruit and vegetables
- Maintain RI Food Safety Manager courses
- Develop internet-based training on Food Safety issues
- Develop Food Safety Curriculum materials for Special Needs students (ages 16-21)
- Evaluate the molecular biology of food borne pathogens.
- Extension on non-thermal technology to shellfish and produce producers
- Update and maintain website and listserve
- Develop and implement food preservation classes for consumers
- Extension education to farmer market managers

Nutrition:
- Data collection.
- Fitness testing and body composition analysis.
- Survey and questionnaire completion.
- Blood analysis and dietary intake calculations.
- Facilitate partnership with diverse communities.
- Refine curricula and teacher training programs.
- Test interventional modalities for health maintenance and obesity prevention.
- Analyze data and evaluate outcomes.

Food Security:
- Assess the diet quality of targeted low-income, vulnerable populations.
- Assess the food security status of targeted low-income, vulnerable populations.
- Assess the food resource management and food safety practices of the target audience.
- Develop and implement assessment tools, curricula, print materials and social marketing campaigns.
- Evaluate the effectiveness of interventions and materials related to behavior change.
- Facilitate and strengthen community partnerships.
- Seek external funds to support program goals.

2. Brief description of the target audience

Food Safety:
Food industry and food service workers and managers, food processors, consumers, agricultural producers, home gardeners, school administrators, school-aged children and their caregivers, special needs students, teachers, community volunteers, Master Gardener volunteers.

Nutrition:
Lean and obese adults; ethnic men and women; low-income school age children and families

Food Security:
Low-income, Food Stamp eligible and participating families, children and older adults.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2016	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	9460	985196	5527	2109

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

Patent Applications Submitted

Year: 2016

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2016	Extension	Research	Total
Actual	4	6	10

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of peer reviewed publications

Year	Actual
2016	6

Output #2

Output Measure

- Number of abstracts published

Year	Actual
2016	18

Output #3

Output Measure

- Number of professional training sessions offered

Year	Actual
2016	50

Output #4

Output Measure

- Number of volunteers trained

Year	Actual
2016	1

Output #5

Output Measure

- Number of conferences hosted

Year	Actual
2016	2

Output #6

Output Measure

- Number of school based training sessions completed

Year	Actual
2016	36

Output #7

Output Measure

- Number of websites developed and/or refined

Year	Actual
2016	3

Output #8

Output Measure

- Number of students trained

Year	Actual
2016	133

Output #9

Output Measure

- Number of intervention studies implemented

Year	Actual
2016	4

Output #10

Output Measure

- Number of workshops completed

Year	Actual
2016	2522

Output #11

Output Measure

- Number of scientific/professional presentations

Year	Actual
2016	16

Output #12

Output Measure

- Number of theses/dissertations completed

Year	Actual
2016	3

Output #13

Output Measure

- Number of public service announcements

Year	Actual
2016	1

Output #14

Output Measure

- Number of social marketing activities

Year	Actual
2016	0

Output #15

Output Measure

- Number of fact sheets, bulletins and newsletters

Year	Actual
2016	43

Output #16

Output Measure

- Number of video productions

Year	Actual
2016	3

Output #17

Output Measure

- Number of social media activities

Year	Actual
2016	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Improved awareness of safe food handling practices by consumers, students, educators, volunteers and/or health care providers. Indicators are number of training sessions offered and attendance at training sessions.
2	Improved knowledge of safe food handling practices among commercial growers of fruit and vegetables, food industry producers/processors, and/or food service personnel. Indicator is the number of training participants who report an increase in understanding of food safety concepts.
3	Increased understanding of motivators and barriers of making healthy food choices and the impact these food choices have on lipoprotein metabolism and metabolic syndrome in young adults. Indicator is number of publications and presentations.
4	Increased understanding and behavior change with regard to decreasing dietary intakes and increasing physical activity level, and the impact of these changes on body fat mass, physical function, and coronary heart disease risk factors in obese older women. Indicator is number of publications and presentations.
5	Improved dietary practices from baseline in one or more domains (diet quality, food security, food resource management, or food safety) in EFNEP and FSNE families and older adults. Indicator is number of people reporting improved practices.
6	Improved dietary choices in young adults. Indicator is number of people reporting improved dietary choices.
7	Improved understanding of the molecular mechanism of bacterial cell division to improve food safety. Indicator is number of publications and presentations.
8	Improved understanding of the contributors to healthy eating among low-income preschool children, especially feeding practices. Indicator is number of publications and presentations.
9	Improved understanding of the metabolism and evolution of Shewanella species to improve food safety. Indicator is number of publications and presentations

Outcome #1

1. Outcome Measures

Improved awareness of safe food handling practices by consumers, students, educators, volunteers and/or health care providers. Indicators are number of training sessions offered and attendance at training sessions.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Food safety issues concerning a variety of foods keep evolving and information to target audiences requires continuous implementation. Training and resource materials need revision as necessary to reflect new information. In addition, the "local" food movement continues to foster a revival of interest in home food preservation. Issues related to quality and safety related to local production and preservation should be addressed.

What has been done
Consumer targeted preservation workshops were offered - both demonstration and hands-on, as well as a preservation workshop for high school students. Master gardener volunteers were trained - from planting to harvesting - regarding home gardening food safety strategies. College students received food safety training as well as URI SNAP ED staff. URI and Brown undergraduates (N=80) were taught about seafood safety/health and food safety as public policy. The URI food safety website section targeting consumers was completely updated.

Results

Home preservation reached 25 consumers and six students at two workshops. Fourteen SNAP ED staff and eight students in the URI dining halls received food service and food safety training. There were 36 college students that received food safety manager certification training via management of on-line courses, review and test oversight. Educators attended the annual Food Safety Conference. The annual Seafood Cook-off for area Career and Technical schools, emphasizing local seafood (mussels) and safe handling, included up to 12 student participants and attracted 57 community participants. Working with the Master Gardener Program, food safety education information was presented at farmers markets tables/kiosks for consumers.

4. Associated Knowledge Areas

KA Code	Knowledge Area
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

Outcome #2

1. Outcome Measures

Improved knowledge of safe food handling practices among commercial growers of fruit and vegetables, food industry producers/processors, and/or food service personnel. Indicator is the number of training participants who report an increase in understanding of food safety concepts.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

There is need for food safety information throughout the diverse RI community of food service workers, food industry personnel and processors and commercial fruit and vegetable growers. Federal and state regulations mandate specific training so that the RI food industry is in compliance. In addition, new federal regulations require outreach efforts to prepare processors/producers for potential implementation or to comply with buyer requirements. Participation in voluntary food safety programs is either becoming mandatory or an expectation for business and non-profits. This program has a regional impact for training.

What has been done

Training sessions and workshops have been offered to RI farmers for the RI Good Agricultural Practices (GAP) initiative, to seafood and meat/poultry processors for regulatory compliance. In addition, food service personnel have attended GAP training. Food safety information was presented at the RI Women in Agriculture conference. A Food Safety Modernization Act (FSMA) update workshop, regarding the new Produce Safety and Preventive Controls rules was presented. Resources/presentations on food safety for Farmers market manager and vendors were developed and implemented.

Results

The food safety website, LISTserves and mailing lists were updated. In collaboration with regional academic partners (e.g. UConn) and RI state agencies, there were 11 workshops conducted and seven fact sheets/bulletins/newsletters developed in an effort to reach the industry. There were 12 and nine participants in RI GAP and food safety plan training, respectively. 35 farms were RI GAP certified during this reporting period. There were 63 participants at the FSMA update and 40 participants at the Women and Agriculture panel on GAP, food safety and HACCP. Market/vendor manager training attracted five participants and the training was recorded and posted on the food safety website. Over 1200 seafood HACCP trained students, those participating in past URI/UConn workshops, received the annual newsletter for updates. There were 102 participants in HACCP classes.

4. Associated Knowledge Areas

KA Code	Knowledge Area
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

Outcome #3

1. Outcome Measures

Increased understanding of motivators and barriers of making healthy food choices and the impact these food choices have on lipoprotein metabolism and metabolic syndrome in young adults. Indicator is number of publications and presentations.

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

Increased understanding and behavior change with regard to decreasing dietary intakes and increasing physical activity level, and the impact of these changes on body fat mass, physical function, and coronary heart disease risk factors in obese older women. Indicator is number of publications and presentations.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Sarcopenia is a multifactorial geriatric syndrome (Cruz-Jentoft et al., 2010) characterized by the natural, aging-related process of the loss of muscle mass and is closely associated with reductions in muscle strength (Metter et al., 1997; Lauretani et al., 2003), physical function (Hughes et al., 2001; Rantanen et al., 1999a; Rantanen et al., 1999b), and increased risk of disability in older adults, particularly in older women (Zamboni et al., 2005). However, establishing optimal intervention strategies that preserve and/or improve sarcopenia-related

health outcomes in women have been elusive. Resistance training (Cadore et al., 2014) and whey protein have been shown to be efficacious to improve strength and muscle mass (Volek et al., 2013). However, no study, to our knowledge, has been published that specifically recruited older women based on newly established sarcopenia identification guidelines (Delmonico & Beck, 2015) and combined these potentially powerful intervention strategies.

What has been done

RESTORE-ME Project is to help determine the efficacy of a periodized Resistance Training (RT) intervention strategy to treat sarcopenia or pre-sarcopenia among older women aged 65-84 years. It took place three times per week on non-consecutive days for 12 weeks using 8-10 exercises for major muscle groups utilizing free weights and machines folloingw American College of Sports Medicine and National Strength and Conditioning Association guidelines for resistance training in older adults.

Results

The results showed that periodized resistance training was effective in retaining appendicular lean muscle mass ($p = .112$, $d = .3$) and improving muscle strength (chest press: $p < .001$, $d = .7$; leg press: $p < .001$, $d = .8$) in older women.

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior

Outcome #5

1. Outcome Measures

Improved dietary practices from baseline in one or more domains (diet quality, food security, food resource management, or food safety) in EFNEP and FSNE families and older adults. Indicator is number of people reporting improved practices.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Rhode Island continues to report a relatively high rate (14%) of food insecure residents with 64% of those living below 185% of the federal poverty level. Overweight and obesity rates(35.5% and 27% respectively) continue to impact disease risk associated with diabetes, hypertension, heart disease and various cancers. More than 10% of the population receives SNAP benefits. Improvement in dietary practices - diet quality, food insecurity, food resource management and food safety - continues to be a leading indicator in the effort to reduce the risk of disease and improve the general nutrition status of targeted populations.

What has been done
The overreaching goal of Cooperative Extension nutrition has been to provide meaningful and actionable food and nutrition-related programming that promotes positive behavior change with respect to these four domains. Education focused on moving to a more plant-based diet emphasizing fruit, vegetables, whole grains and beans and legumes to improve diet quality, reach or maintain a healthy weight, and be cost effective. Programming provided practice or research (evidence) based curricula with consistent nutrition messaging by both SNAP-Ed and EFNEP and their partner agencies. Considerable effort was made to incorporate policy, systems and environmental change interventions with partner agencies.

Results
Over 7500 eligible adults and children received direct nutrition education from SNAP-Ed and EFNEP. Approximately 15,000 children and adults received indirect education, including newsletters, brochures, social media contacts, community and school wide events, etc. Over 2200 community-based workshops were presented, 851 staff of various partner organizations received nutrition training, 52459 English or Spanish handouts were distributed and over 17,000

nutrition education reinforcement items were disseminated during programming. In addition, 1839 text messages were sent to 375 participants and 1830 people viewed our website from May-September.

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior
704	Nutrition and Hunger in the Population

Outcome #6

1. Outcome Measures

Improved dietary choices in young adults. Indicator is number of people reporting improved dietary choices.

Not Reporting on this Outcome Measure

Outcome #7

1. Outcome Measures

Improved understanding of the molecular mechanism of bacterial cell division to improve food safety. Indicator is number of publications and presentations.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Humans are susceptible to a plethora of microbial diseases from pathogenic bacteria. One important source of pathogenic bacteria is the food supply, including food sources, agriculture and production environments. It is essential that the mechanisms that control bacterial cell proliferation are understood to effectively target those mechanisms for disruption using new technologies. Proliferation of microbial populations is controlled at the cellular level by spatiotemporal regulation of the bacterial division machinery and conserved protein interactions; these interactions are strategic targets for anti-proliferative measures to control microbial

population expansion.

What has been done

The molecular mechanism of bacterial cell division was investigated by monitoring specific protein interactions and by performing functional analyses in reconstituted cell-free systems. In live bacteria, the architecture of the division machinery and the roles of key cell division proteins in remodeling that architecture was investigated using advanced fluorescence microscopy techniques. We have identified several proteins in vivo that modify the efficiency and/or dynamics of cell division and would be appropriate targets for further development of anti-proliferative agents.

Results

We have discovered that interactions among several cell division proteins are critical for maintaining the architecture and dynamics of the division machinery. The discovery of these processes uncovers new strategic targets for the development of novel antimicrobial technologies. During the reporting period, the following objectives have been completed: (1) We engineered a new construct of FtsZ fused to green fluorescent protein that expresses in vivo and is competent for polymerization in vitro. (2) We have determined that ClpXP is critical for rapid dynamic exchange of subunits in the cell division ring, since deletion or mutation of clp genes leads to slow exchange. (3) Antagonizers of FtsZ polymerization function to accelerate FtsZ subunit exchange in vivo. (4) The membrane targeting helix at the C-terminus of MinD is critical for regulating ATP-dependent copolymer formation with MinC. We have identified several key residues in this helix that modify protein and protein lipid interactions. (5) Research training has advanced the technical skills of the graduate research assistant assigned to the project. (6) Presentation of scientific results at seminars and conferences has increased the professional development of research-related personnel.

4. Associated Knowledge Areas

KA Code	Knowledge Area
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

Outcome #8

1. Outcome Measures

Improved understanding of the contributors to healthy eating among low-income preschool children, especially feeding practices. Indicator is number of publications and presentations.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Nationally low-income preschoolers are not meeting dietary recommendations, therefore understanding what may be promoting healthier diets in different environments is critical. One possible contributor is feeding practices and how parents and providers interact with children during meal times. It is known that pressuring and rewarding children to eat in a home setting is counterproductive to their diets yet little is known about this in preschool settings including Head Starts and Family Child Care Homes.

What has been done

85 Rhode Island Head Start teachers were observed during meal times to code feeding behaviors using an adapted version of the Environmental Policy Assessment and Observation (EPAO) tool. Following the observation, providers completed a self-report survey of their own feeding practices. They also completed socio-deomographic data as well as surveys about their own diets.

Results

Of the 85 teachers who participated in this study, most were female (n=83; 97.6%) and identified as non-Hispanic, White (88.2%) with a mean age of 40.3±11.7 years . Nearly half of the teachers attended some college (44.7%) or received a college degree (42.4%). Teachers reported on average 14.1±8.4 years of experience and were employed for 7.3±11.7 years at the center in which they were observed. A majority of the time (77.6%), Head Start teachers sat with children during the entire meal. Teachers were always observed encouraging children to sit around the table during meals (100%), and nearly all teachers (92.9%) made fruits and vegetables easier to eat (i.e. offering slices; peeling an orange). However, teachers only talked with the children about the foods that they were eating or encouraged pleasant conversation during approximately half of the meals observed (52.9% and55.3%, respectively). Even fewer Head Start teachers were observed enthusiastically role-modeling (8.2%) healthy eating even though 85.9% of teachers were observed eating the same foods as children during meals. More teachers were observed encouraging children to try the foods on their plate (48.2%). To encourage a child to try the healthy foods on their plate, teachers were observed reasoning (i.e. Drinking milk makes your bones strong!) (63.5%) and negotiating (i.e. You can have more soup if you eat your pear) (75.3%) with children. Praise by teachers when a child tried a new food item on his or her plate was rarely observed (15.3%). Teachers were seldom observed pressuring a child to eat more than they seemed to want (5.9%), praising a child for cleaning his/her plate (1.2%), using food to control a child's emotions (2.4%), allowing a child to take multiple servings (8.2%), or rushing a child to eat (5.9%). Teachers were never observed spoon-feeding a child, but were observed insisting that a child eat a food in nearly half of the observations (47.1%). Seconds were rarely served by the teacher unless the child was observed asking for more (9.4%). However, when a child asked for seconds, teachers were rarely observed asking a child if he/she was still hungry before serving seconds (95.3%).

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior

Outcome #9

1. Outcome Measures

Improved understanding of the metabolism and evolution of Shewanella species to improve food safety. Indicator is number of publications and presentations

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Shewanella is a diverse group of microorganisms that widely occur in soil and water, and are often associated with the spoilage of meat and milk products. It is not clear how this group evolves and what leads to the emergence of pathogenicity. Using computational modeling, in this project we will simulate the evolution and metabolic diversity of Shewanella. Through this project, we expect to develop new methods for the detection and prevention of Shewanella contaminants in meat and agricultural products.

What has been done
In the past year, we have mainly focused on three tasks: (1) metabolic modeling and software development; (2) Phylogenetic reconstruction and evaluation of gene essentiality; (3) model construction of a cold-tolerant Shewanella species. A third-year graduate student and a number of summer undergraduate students have been trained through this project. The graduate student has submitted a first-author manuscript on his research outcomes and is currently revising the manuscript based on reviewers' comments.

Results
In the past year, we have established a new computational pipeline for studying the genome-scale metabolic models. We have examined over 50 existing models and developed new software tools for analyzing these models. The software is applied to the reconstruction of a psychrotolarent Shewanella species to discover principals of energy conservation in this organism during aerobic and anaerobic respiration. This work resulted in a peer reviewed publication from the PI's laboratory with a second-year Ph.D. student as a contributing author and four public presentations at international conferences.

4. Associated Knowledge Areas

KA Code	Knowledge Area
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Appropriations changes
- Public Policy changes
- Competing Public priorities
- Competing Programmatic Challenges

Brief Explanation

We offered fewer preservation workshops in FY 2016 than in FY 2015 due in part to scheduling conflicts, cancellations, and a smaller number of requests for training. In addition, food safety training for farmer's market vendors did not attract many participants, perhaps due to insufficient advertising. We are taking steps to address these issue in the current fiscal year.
We made significant improvements to our SNAP-Ed website, and were able to gain access to the analytics to monitor its useage for only part of the year. Our reporting on the website will be more complete next year.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Below is information related to Cooperative Extension activities that were evaluated:
Outcome #1

- **Did you evaluate your program**? Yes. An evaluation was conducted using a 5-point Likert scale for evaluation, (1=strongly disagree and 5=strongly agree) with statements that reflected key areas of understanding.
- **What were the results?** Master Gardener volunteers (Participants =100, evaluation respondents, N=56) rated the program 4.19 for overall understanding of the food safety concepts. URI SNAP ED and URI dining students working in the dining halls rated the presentations as 4.3 and 4.4 respectively for understanding. The participants in the hands-on preservation workshop (N=16) rated workshop 4.6 for understanding key food safety principles related to home food preservation.

Outcome#2

- **Did you evaluate your program**? Yes. An evaluation was conducted using a 5-point Likert scale for evaluation, (1=strongly disagree and 5=strongly agree) with statements that reflected key areas of understanding.
- **What were the results**? Overall the results obtained from participants showed a high degree of self-evaluation for understanding. For example, in a 3-day seafood HACCP class offered in RI it was 4.7, for RI GAP-related classes it was 4.3.

Meat and poultry workshops were rated highly at good or excellent for key components. There were no evaluations for FSMA workshop but anecdotal feedback was very positive.

Outcome#4

- **Did you evaluate your program?** Yes
- **What were the results?** The results showed that the intervention was successful and

that the older women who were the study participants improved their muscle strength and retained their lean muscle mass.

Outcome #5

- **Did you evaluate your program?** Yes
- **What were the results?**

Adult nutrition practices assessed included increased fruit and vegetable consumption, increased whole grains, and increased plant-based protein sources such as beans. 53% of adults (224) completing a pre and post assessment after attending a series of workshops, increased their behavior of one or more practices.

School-aged children nutrition practices assessed included increased fruit and vegetable consumption, and decreased sugar-sweetened beverages and energy dense snacks. 89.2% of children (454) after attending a series of workshops and completing a pre and post survey increased their behavior of one or more practices.

Child feeding practices assessed included reducing child non-productive screen time, increasing child physical activity, making healthy choices easier, division of responsibility, and modeling healthy food behaviors. 36.6% of parents or caregiver participants (55), after attending a series of workshops and completing a pre and post survey, showed an improvement in two or more child feeding practices.

Regarding EFNEP graduates, 38% improved their intake of fruit and vegetables, increasing their consumption by 1/3 more cups at exit. 63% of EFNEP graduates decreased their intake of solid fats and added sugars. 88% of graduates improved how they managed their food dollar and 77% had better nutrition practices in at least one area or domain.

Key Items of Evaluation

URI Cooperative Extension programs in food safety and nutrition are effective.

V(A). Planned Program (Summary)

Program # 2

1. Name of the Planned Program

Food Production and Sustainability

☑ 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
112	Watershed Protection and Management	23%		0%	
135	Aquatic and Terrestrial Wildlife	8%		0%	
205	Plant Management Systems	30%		7%	
211	Insects, Mites, and Other Arthropods Affecting Plants	4%		3%	
212	Pathogens and Nematodes Affecting Plants	4%		7%	
215	Biological Control of Pests Affecting Plants	15%		4%	
216	Integrated Pest Management Systems	4%		0%	
301	Reproductive Performance of Animals	4%		0%	
302	Nutrient Utilization in Animals	4%		10%	
304	Animal Genome	4%		8%	
305	Animal Physiological Processes	0%		11%	
307	Animal Management Systems	0%		10%	
311	Animal Diseases	0%		11%	
605	Natural Resource and Environmental Economics	0%		7%	
606	International Trade and Development	0%		8%	
609	Economic Theory and Methods	0%		7%	
610	Domestic Policy Analysis	0%		7%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2016	Extension		Research	
	1862	1890	1862	1890
Plan	8.0	0.0	10.0	0.0
Actual Paid	8.7	0.0	3.8	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**
478462	0	232931	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
309191	0	372879	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 activities are described for the areas in the Food Production and Sustainability program.

Aquaculture and Fisheries
Investigate causes of diseases of shellfish and the mechanisms of innate immunity, particularly matrix metalloproteinases in hemocytes.

Develop technologies to reduce by-catch.

Provide consumers, health care providers and fishing industry representatives with accurate information on the handling of seafood.

Develop and share strategies to create sustainable fisheries.

Conduct training programs for key stakeholder groups.

Perform applied aquaculture research.

Health and Well-being of Livestock
Examine the role of nutritional factors on the immune system function in livestock.

Community Gardening
Extension efforts to community decision makers, agricultural, residential and engineering/regulatory community will be conducted.

Outreach to school children and to the urban population center in the state.

Demonstration sites will be established for use in such research and Extension programs.

Development and dissemination of publications, fact sheets, and web sites.

Horticulture
Identify, select or breed species and cultivars of plants that are better adapted for use in the landscapes and environment of Rhode Island and the Northeastern US.

Develop and deliver training for green industry professionals and gardeners emphasizing the use of plants that require less water, labor, nutrients, and pesticides.

Expand markets for resource-conserving products.

Reduce pest-induced damage to horticultural and forest plants, while maintaining environmental quality by minimizing the use of agrochemicals.

Develop novel non-chemical methods of controlling invasive plant species.

Economics, Markets and Policy
Evaluate the impacts of ecolabeling on consumer demand for frozen seafood.

Determine the impacts of consumer concerns of PCB contamination of farmed salmon on US import demand for farmed salmon.

Evaluate the impact of farmed shrimp on the US market and how shrimp aquaculture is changing prices.

Investigate the impact of homogeneous resource modeling in a heterogeneous fishery by synthesizing a stochastic production frontier model with the estimation classification algorithm.

Model spatial decisions of fishermen in the Northeast Atlantic herring fleet.

Run experiments using the game theoretic model.

2. Brief description of the target audience

The target audiences are described for the areas in the Food Production and Sustainability program.

Aquaculture and Fisheries
The RI and New England aquaculture industry, RI State Aquaculture Coordinator, the fishing industry, producers and distributors, scientists and researchers, the RI Department of Environmental Management and Coastal Resource Management Council, and policy makers

Health and Well-being of Livestock
Livestock farmers in the Northeast and 4-H youth

Community Gardening
Community and public decision makers (local, state and federal agencies); general public; agricultural producers; residential and engineering/regulatory community members; school aged children; urban populations; municipal planners; private sector firms engaged in watershed management, landscaping, onsite wastewater treatment and private wells; various NGOs (land trusts, environmental organizations)

Horticulture
Agricultural producers of turf grass and ornamental plants, the RI Nursery and Landscape Association (RINLA) and the New England Sod Producers Association; local nurseries; the RI Golf Course Superintendents Association; nurserymen, landscapers, tree farms and arborists; the Rhode Island Greenhouse Growers Association; the RI Farm Bureau; the New England Nursery Association and New

England Floriculture, Inc; the New England Sod Producers Association (NESPA), and the New England Regional Turfgrass Foundation (NERTF); and individual golf course superintendents and sod producers throughout Rhode Island.

Economics, Markets and Policy
Fishers, environmental economists, and policy makers

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2016	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	20962	600	15000	0

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

Patent Applications Submitted

Year:	2016
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2016	Extension	Research	Total
Actual	4	0	4

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of peer reviewed publications

Year	Actual
2016	3

Output #2

Output Measure

- Number of books and monographs

Year	Actual
2016	0

Output #3

Output Measure

- Number of abstracts published

Year	Actual
2016	2

Output #4

Output Measure

- Number of conference proceedings published

Year	Actual
2016	3

Output #5

Output Measure

- Number of technical documents, fact sheets, bulletins and newsletters produced

Year	Actual
2016	13

Output #6

Output Measure

- Number of training manuals (includes instructional CD's) produced

Year	Actual
2016	6

Output #7

Output Measure

- Number of scientific/professional presentations

Year	Actual
2016	9

Output #8

Output Measure

- Number of workshops (including short courses) completed

Year	Actual
2016	64

Output #9

Output Measure

- Number of conferences hosted

Year	Actual
2016	5

Output #10

Output Measure

- Number of websites developed and/or refined

Year	Actual
2016	5

Output #11

Output Measure

- Number of public presentations

Year	Actual
2016	150

Output #12

Output Measure

- Number of public service announcements

Year	Actual
2016	15

Output #13

Output Measure

- Number of students trained

Year	Actual
2016	46

Output #14

Output Measure

- Number of theses/dissertations completed

Year	Actual
2016	1

Output #15

Output Measure

- Number of biological control agents released

Year	Actual
2016	4

Output #16

Output Measure

- Number of new germplasms developed

Year	Actual
2016	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Increased understanding of immunity and muscle growth in aquacultured species. Indicators are number of presentations and publications.
2	Growth of Rhode Island's shellfish aquaculture industry. Indicators are number of farms, number of farmers employed and farmgate value of the aquaculture crops.
3	Improved strategies for parasite control in small ruminants. Indicator is new, sustainable non-chemical methods of parasite control.
4	Rhode Island citizens adopt sustainable gardening practices. Indicator is number of people reached through the URI Master Gardener program.
5	Food insecure populations in Rhode Island learn to grow their own food. Indicator is number of successful school and community gardens created and supported.
6	Students in grades K-5 increase their knowledge and skills about the environment, horticulture and science. Indicator is number of students trained.
7	Rhode Islanders implement best practices for composting at their homes. Indicators include number of people who complete URI Master Composter training; number of trained URI Master Composters who report intent to implement composting best practices; and number of public education hours completed by URI Master Composters.
8	Improved understanding of landscape management practices related to invasive plant removal for biodiversity and habitat protection in Rhode Island. Indicator is number of green industry, environmental and regulatory professionals trained.
9	Increased understanding of economic and market factors in fisheries and aquaculture management. Indicators are number of publications, presentations, and stakeholder meetings.
10	Rhode Island homeowners plant native trees, shrubs, and grasses. Indicator is number of native trees, shrubs and grasses identified and improved for homeowner use.
11	Improved management tactics for control of plant-parasitic nematodes. Indicators are number of publications, presentations, and stakeholder meetings.
12	Improved biological control of arthropod pests and weeds in the Northeast. Indicators are number of publications, presentations, and stakeholder meetings.

Outcome #1

1. Outcome Measures

Increased understanding of immunity and muscle growth in aquacultured species. Indicators are number of presentations and publications.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Shellfish aquaculture in general, and oyster aquaculture in particular, is one of the fastest growing segments of United States agriculture. In 2014, the US imported oysters in the value of more than $47 million, showing that the approximately $175 million in oysters landed in the US did not fulfill market demand. Furthermore, bivalve shellfish provide important ecosystem services. The bivalve shellfish industry experiences many challenges and opportunities, including impacts from disease. Stakeholders targeted in this research are the shellfish aquaculture, fishing, and restoration industries, represented by the East Coast Shellfish Growers Association and groups involved in bivalve shellfish restoration, such as the Nature Conservancy. Target audiences of this research include researchers in the East Coast Shellfish Breeding and Eastern Oyster Genome Consortiums, the Agricultural Research Services Laboratories in Shellfish Genetics, as well as researchers worldwide interested in improvement of shellfish aquaculture through genetics and increased understanding of physiological traits influencing shellfish performance, including disease resistance and growth.

What has been done
Many of the challenges and opportunities facing the bivalve shellfish industry can be achieved through selective breeding and improved understanding of traits of commercial and ecological interest. Many researchers working on these issues have established the East Coast Shellfish Breeding Consortium, and joint efforts of this group with the shellfish industry has resulted in increased collaborative funding for the development of tools and resources for breeding and disease management in bivalve shellfish. Coordination efforts have led to funding from USDA AFRI to sequence the genome of the eastern oyster, an award from NRSP-8 for a Comparative Genomics Workshop, and research funded by several agencies on the use of probiotics for disease management in shellfish hatcheries.

Results

Differences in disease resistance between oyster families and targeted challenge experiments continue to be exploited to investigate mechanisms of disease resistance and immunity in oysters. Our collaborative research involving oyster researchers and industry participants has shown that: 1) available disease resistant oyster lines show differences in performance that are determined by the growing environment, pointing to the need for regional breeding programs; and that 2) oysters have a complex innate immune response involving families of immune and stress genes that are highly diverse and expanded compared to other species. The East Coast Shellfish Breeding Consortium met with the industry to discuss ways in which selective breeding can help the industry, including discussion of traits of interest and discussion of a working model for a Shellfish Breeding Center based on the Aquaculture Breeding Center at the Virginia Institute of Marine Sciences that could provide selected oyster lines to the industry in the Northeast US.

4. Associated Knowledge Areas

KA Code	Knowledge Area
302	Nutrient Utilization in Animals
304	Animal Genome
305	Animal Physiological Processes
307	Animal Management Systems
311	Animal Diseases

Outcome #2

1. Outcome Measures

Growth of Rhode Island's shellfish aquaculture industry. Indicators are number of farms, number of farmers employed and farmgate value of the aquaculture crops.

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

Improved strategies for parasite control in small ruminants. Indicator is new, sustainable non-chemical methods of parasite control.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
There's no relief in sight for small ruminant producers in the battle against gastrointestinal parasites in the Northeast. Drug resistance to GI nematode worms (GIN), especially barber pole worm (Haemonchus contortus) continues to increase for all available dewormers. There is a toolbox of alternative methods of parasite control for small ruminant producers. One of the newer areas that has shown promise is the use of natural plant products with deworming activity - such as the pasture forage, birdsfoot trefoil (BFT) as well as cranberry. Another tool, underutilized by producers, is factoring innate parasite resistance into their breeding decisions.

What has been done
Extension efforts focused on Integrated Parasite Control/FAMACHA© Training and workshops highlighting the use of genetic selection for parasite resistance in breeding animals as well as Field Days highlighting the research program focused on the use of birdsfoot trefoil and cranberry as alternative GI parasite control methods. Characterization of the structural profile of numerous varieties and cultivars of birdsfoot trefoi is ongoing. Ground cranberry vine was fed to lambs experimentally infected with barber pole worm. We have successfully launched an online Integrated Parasite Control/FAMACHA© certification program for producers that are unable to attend face-to-face workshops.

Results
Three Integrated Parasite Control/FAMACHA Training workshops were held in VT (2) and RI (1). Approximately 62 people participated in these workshops. A Field Day was held on the same day as the RI workshop and there were 20 participants. In vitro assays assessing anthelmintic exsheathment efficacy were conducted on an aqueous extract of 45 BFT accessions and 6 commercial varieties of BFT. Commercial varieties and cultivars of BFT differed in their antiparasitic efficacy. Ground cranberry vine, fed to barber pole infected lambs, resulted in a modest suppression of fecal egg counts that was not observed in the control group.

4. Associated Knowledge Areas

KA Code	Knowledge Area
302	Nutrient Utilization in Animals
305	Animal Physiological Processes
307	Animal Management Systems
311	Animal Diseases

Outcome #4

1. Outcome Measures

Rhode Island citizens adopt sustainable gardening practices. Indicator is number of people reached through the URI Master Gardener program.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The URI Master Gardener Program serves to amplify URI Cooperative Extension's ability to address community, environmental, and social challenges related to residential scale gardening practices for the general public. The decisions that residents make in managing their property can have positive or negative consequences for environmental quality and human health. The ability of URI staff to directly educate the public is limited by staff size, funding and time constraints. This volunteer program trains qualified individuals to serve as community-based educators, encouraging residents to adopt science-based horticultural practices and connecting them to the resources of Cooperative Extension.

What has been done

From January to April 2016, members of the general public participated in the 14-week Master Gardener Program core training course. Adult learners were trained as volunteer Extension educators and taught to adopt environmentally-sound horticultural practices and utilize research-based resources when answering gardening questions. Once trained and up to date on continuing education, certified URI Master Gardener volunteers shared their knowledge with residents of Rhode Island and surrounding communities. URI Master Gardener volunteers taught in-depth "learn locally" workshops held at public venues or for specialized groups, and held educational events at over 40 Master Gardener demonstration gardens statewide. Three new demonstration projects were established in Bristol, Warwick and Middletown Rhode Island. Extension volunteers staffed educational services within the Gardening and Environmental Hotline and email service, informational kiosk booths at community events and provided free pH soil testing services. Large public educational events included the full day Gardening Symposium focused on "natives, pollinators and edible gardening," the East Farm Spring Festival complete with a learning walkway of educational booths and gardening walks, and a brand new "Project Open House" event featuring 16 unique in-garden demonstrations statewide in August 2016. Specially trained URI Master Gardener volunteers served as School Garden Mentors with forty schools in twenty-two municipalities. In addition to educational services, seeds and plants raised by volunteers were donated to school gardens, community gardens and educational groups to facilitate student learning via the free seed project and greenhouse donations. Social media, print media, newspaper articles, in-garden interpretive signage and plant tags, websites and fact sheets were all utilized to increase the educational reach of URI Master Gardener Program efforts.

Results

The 2016 survey results will serve as baseline data prior to the anticipated 2017 launch of a multi-year focus area for the URI Master Gardener Program. Our 2016 survey yielded a 21% return rate, with 1059 client emails collected and 220 survey responses recorded. This is an improvement to our 17% response rate in the pilot survey year of 2015, in which the survey was sent to 923 clients. This anonymous survey is distributed via email at year end to gauge changes in knowledge and behavior following client interaction with at least one URI Master Gardener volunteer at an approved event.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
205	Plant Management Systems
216	Integrated Pest Management Systems

Outcome #5

1. Outcome Measures

Food insecure populations in Rhode Island learn to grow their own food. Indicator is number of successful school and community gardens created and supported.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Food security remains a problem in Rhode Island and nationally, with many residents lacking access to fresh, affordable food. This food insecurity is often concentrated in urban areas where the ability to grow food poses a unique set of challenges. In additon, youth are disconnected from nature and the source of their food, causing health issues such as obesity and heart disease. Also, test scores in STEM subjects are consistently below proficiency in Rhode Island schools. School gardens can serve to introduce students to nature and healthy eating, at an early age, and engage them in learning in an outdoor habitat. They can serve as relevant learning environments, a key focus in the new Next Generation Science Standards. While many schools are interested in creating school gardens, school personnel often lack the horticultural knowledge necessary for garden success and long term continuity. Teachers may lack comfort and perceived self-efficacy in using a garden as a teaching platform

What has been done
School Garden Mentors (SGMs), specially trained URI Master Gardener volunteers, provided support and technical guidance to RI school gardens in an effort to foster student understanding and appreciation of natural processes and our food system, and to inspire the next generation of environmental stewards through gardening education. This program, in addition to its accompanying Extension-run School Garden Conference have grown with popularity each year. Each year, teachers and other individuals involved with school gardens take the URI Master Gardener Program Core Training specifically to be trained as SGMs. URI Master Gardener volunteers served as "community garden consultants," answering questions from the beginning gardeners. These Extension volunteers established teaching gardens and grew fresh produce for donation at local food pantries in seven educational gardens located in Providence, Pawtucket, West Warwick, Coventry, Portsmouth, South Kingstown and Kingston (Rhode Island) and Wrentham (Massachusetts). Most of these locations fall in urban areas or serve a pre-defined food insecure population, such as the URI Graduate Village Community Garden which provides

access to garden plots for graduate students and their families or the Thundermist Community Garden located in a "food desert." In addition, targeted public educational workshops were held for people who were interested in growing their own healthy food. Through these projects, URI Master Gardener volunteers worked directly with community gardeners and school gardens as mentors and consultants, bringing the resources and knowledge base of the Land Grant University system to those who required it. SGMs are also part of the newly-launched URI Extension School Garden Initiative (SGI) that seeks to harness children's enthusiasm for the natural world, foster environmental awareness, ecological literacy and wellness, and bolster students' understanding of nutrition and food access through outdoor engagement and applied learning in "living laboratories" - the school garden. URI Extension partners with schools that have (or have an interest in building) a school garden to serve as a platform for applied learning of STEAM (science, technology, engineering, arts, mathematics) concepts. Through K-12 teacher and student engagement in experiential, standards-based learning in the garden and classroom, learning is maximized. URI Extension staff assist in the development of school-tailored, infused curriculum with memorable hands-on investigation, and teacher training to increase comfort levels with garden-based education. The SGI began with a pilot program, the Providence School Garden Initiative (PSGI). The PSGI is a collaborative partnership between the URI Extension Outreach Center (URI) and the Providence Public School District (PPSD) in Rhode Island, that engaged eight schools in 2016.

Results

This year, School Garden Mentor volunteers worked one-on-one in forty school gardens, effectively encouraging 12,000 youth to engage in school garden-based learning and supporting 500 school garden champions (e.g. teachers, administrators, parents, community leaders) in building programs. Additionally, the SGM project won the International Extension Master Gardener Search for Excellence award in the youth category. URI Master Gardener volunteers also worked with eight community gardens statewide as mentors and consultants to the beginning community gardeners, holding over 35 individual workshops for groups of community gardeners and other members of the public. The demonstration gardens produced 8,622 pounds of food for local food pantries. The Providence School Garden Initiative - the pilot program for the URI Cooperative Extension School Garden Initiative - worked with administrators, teachers and students in eight elementary, middle and high schools in Providence. The PSGI includes an expanded initiative, the STEM Academy at DelSesto Middle School, where teachers are producing standards-based lessons in cooperation with URI Cooperative Extension and receiving professional development to build a hands-on STEM curriculum that includes quarterly projects related to siting, designing, installing and maintaining DelSesto's garden.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
205	Plant Management Systems
216	Integrated Pest Management Systems

Outcome #6

1. Outcome Measures

Students in grades K-5 increase their knowledge and skills about the environment, horticulture and science. Indicator is number of students trained.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Proficiency in science for the 5,030 students tested in the Providence Public School District in 2016 was 10.6%. This compares to 29% for the state (Rhode Island Department of Education, NECAP Science Results, 2016). To help boost science proficiency in Providence and other Rhode Island schools, URI Cooperative Extension provides K-5 elementary schools with the opportunity to engage in hands-on environmental science explorations through URI Learning Landscape field trips in Providence and Kingston, RI annually.

What has been done
The Learning Landscape field trips are an environmental education program for elementary school children that aligns activities with Common Core and Next Generation Science Standards. From February - April 2016, URI Cooperative Extension implemented a winter program for Providence grades K - 5 at the Roger Williams Park Botanical Center in Providence from May - June 2016 at the URI Botanical Gardens in Kingston. Learning Landscape field trips are led by URI staff, undergraduate student educators and URI Master Gardener volunteers.

Results
URI staff trained a cadre of undergraduate student educators and Master Gardener volunteers to provide environmental education lessons and hands-on activities for 1,875 elementary school children who participated in the program.

4. Associated Knowledge Areas

KA Code	Knowledge Area

112	Watershed Protection and Management
135	Aquatic and Terrestrial Wildlife
205	Plant Management Systems

Outcome #7

1. Outcome Measures

Rhode Islanders implement best practices for composting at their homes. Indicators include number of people who complete URI Master Composter training; number of trained URI Master Composters who report intent to implement composting best practices; and number of public education hours completed by URI Master Composters.

Not Reporting on this Outcome Measure

Outcome #8

1. Outcome Measures

Improved understanding of landscape management practices related to invasive plant removal for biodiversity and habitat protection in Rhode Island. Indicator is number of green industry, environmental and regulatory professionals trained.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Through ongoing curriculum development, workshop offerings to the general public and provision of certification opportunities for green industry professionals, the integration of native plants, landscape restoration principles, invasive plant management and low impact development practices will be promoted to increase business and consumer demand for ecological sustainable landscape services and general practice.

What has been done
URI Cooperative Extension delivered the Invasive Plant Management Certification Program to educate green industry professionals on best invasive plant management practices on residential and commercial properties to preserve biodiversity and increase climate resiliency.

Results
In cooperation with RI Coastal Resources Management Council, we monitored the number of completed invasive plant management applications and followed the progress of ongoing projects led by "Certified Invasive Managers." In total, 25 permits were obtained and projects restored nearly 50 acres of coastal habitat.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems

Outcome #9

1. Outcome Measures

Increased understanding of economic and market factors in fisheries and aquaculture management. Indicators are number of publications, presentations, and stakeholder meetings.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Seafood ecolabel is a market-based tool to encourage sustainable production of seafood, both for captured fisheries and aquaculture. Many retailers and distributors in the US have publicly announced their commitment to promote ecolabeled seafood products, but previous studies suggest that US consumers are not necessarily demanding such products. Meanwhile, many entities are now coming up with their own 'sustainable' labels and wallet cards and the market for sustainable seafood seems to be in chaos. Understanding who is driving this market trend and for what motives is critical for the future of this market.

What has been done
A Multistate and international research team was formed, representing RI, CA, ID, Norway, and The Netherlands. The team has conducted (1) extensive literature review on the topic; (2) gathered available data on ecolabel schemes for seafood (e.g., fisheries improvement projects database available from Sustainable Fisheries Partnership's website); (3) held a special session in 2015 NAAFE Forum (academic conference for fisheries economists) on the topic; (4) conducted a total of 10 interviews to industry experts; (5) held two workshops where all team members gathered; and (6) one workshop targeted at donor organizations who have a stake in the development of this market.

Results
Two presentations at professional conferences: NAAFE 2015 and NAAFE 2017 (the latter is to be held in March 2017; abstract was accepted for oral presentation).

One academic paper submitted to a peer-reviewed journal (Conservation Biology).

One PhD student mentored as an RA, and now extending the research to Chinese markets as part of his dissertation research.

4. Associated Knowledge Areas

KA Code	Knowledge Area
605	Natural Resource and Environmental Economics
606	International Trade and Development
609	Economic Theory and Methods
610	Domestic Policy Analysis

Outcome #10

1. Outcome Measures

Rhode Island homeowners plant native trees, shrubs, and grasses. Indicator is number of native trees, shrubs and grasses identified and improved for homeowner use.

Not Reporting on this Outcome Measure

Outcome #11

1. Outcome Measures

Improved management tactics for control of plant-parasitic nematodes. Indicators are number of publications, presentations, and stakeholder meetings.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Traditional nematicides are particularly poisonous pesticides and have the ability to cause significant environmental damage. By developing safer alternatives to traditional nematicides and implementing IPM practices, negative environmental and human impacts can be reduced. The work undertaken in Rhode Island is specifically focused on golf course turf and vegetable nematology. Although anyone interested in preserving environmental quality should care, golf course superintendents and vegetable growers are the primary research audience.

What has been done
A variety of different materials and methods have been employed to manage plant-parastitic nematodes in turf and vegetables. In 2016, research focused on newly developed nematacidal compounds with low mammalian toxicity.

Results
Two of the compounds employed have shown significant reductions in nematode populations. Specifically, abamectin has reduced populations of Tylenchorhynchus and Hoplolaimusto by moderate levels while fluopyram has resulted in significant reductions of Tylenchorhynchus populations.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
212	Pathogens and Nematodes Affecting Plants

Outcome #12

1. Outcome Measures

Improved biological control of arthropod pests and weeds in the Northeast. Indicators are number of publications, presentations, and stakeholder meetings.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Non-native plants and insects introduced into North America generally come without the natural enemies that keep them in check in their native habitats. Freed from these natural controls, these species often increase in numbers and distribution, adversely affecting the environment, the economy, and human health. Classical Biological Control, a deliberate process whereby these pests are reunited with their effective natural enemeies, offers a potential for permanent control of these pests over widespread areas. At URI we are cooperating with scientists throughout the Northeast as well as collaborators outside this region in the USA, Europe, and Asia in seeking and evaluating safe and effective biological control agents for exotic insect and weed pests of consequense to our region.

What has been done

Swallow-wort Biocontrol: We continued to provide specimens and expertise to colleagues in Canada and at Cornell University for rearing and release (in Canada). In preparation for eventual release in the USA, we reared 4 generations of H. opulenta in our quarantine laboratory while experimenting with optimizing rearing conditions. We have worked hard to encourage and assist both USDA-APHIS and USFWS in the evaluation of H. opulenta for USA release and we anticipate permission to release in 2017. We are preparing to release this agent in RI, MA, and NY during the upcoming season.

Phragmites australis Biocontrol: We have prepared a release petition for releasing two potential biological control agents against P. australis in the USA, the culmination of 18 years of cooperative research with colleagues at Cornell and in Switzerland. This permit is out for review by colleagues and will be submitted to the USDA before the 2017 field season.

Other Biocontrol Programs: We provided parasitoids of the lily leaf beetle to colleagues in CT for release at 16 sites and we are assising colleagues in NY, VT, and NJ in obtaining permits prior to sending them parasitoids for release in their states.

We released Rhinoncimimus latipes weevils for mile-a-minute vine at two additional sites in RI including Block Island during the past season, bringing our total to 12 sites and 65,000 weevils released. We continue to monitor these sites for control of this invasive plant.

We released Larinus obstusus at four sites in RI against knapweeeds and began monitoring these sites and one control site for establishment and impact.

We conducted preliminary experiments with Liloceris cheni, the agent released against air potato in Florida to determine the possible impact of parasitoids released against L. lilii in the Northeast.

Results

Through a collaborative effort with biocontrol practitioners throughout the world, we have encouraged UDSA/APHIS and USFWS to review their procedures and expedite review of release permits for weed biocontrol. As a result, several applications have been approved in recent months, including ours for swallow wort biocontrol. Agents released against mile-a-minute vine are established and causing defoliation. We are monitoring long-term results for this program.

Through our efforts, lily leaf beetle and parasitoids are now established in RI, MA, CT, NH, ME and Ontario, Canada. This beetle has been reduced to non-pest status in the vicinity of many of our release sites and parasitoids are spreading at 1.5 to 4.5 km per year.

Experiments conducted to date include that air potato biocontrol agents in FL should be safe from lily leaf beetle parasitoids. This work continues.

4. Associated Knowledge Areas

KA Code	Knowledge Area
211	Insects, Mites, and Other Arthropods Affecting Plants
215	Biological Control of Pests Affecting Plants

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges

Brief Explanation

Outcome #10: The primary challenge in meeting milestones was the composition of the regional project. While RI milestones were met, rearrangements among the participants in the project ranging from retirements to change in focus made it impossible to complete some of the milestones.
Outcome #12: The annual bluegrass weevil has developed cross and multiple resistance to several insecticide classes. This has resulted in more insecticide applications at a greater cost to the environment and most golf courses. The damage caused by annual bluegrass weevils can be so extensive that quite a few superintendents have lost their positions.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Outcome #3

- **Did you evaluate your program?**

Yes, pre and post quizzes to measure changes in knowledge about integrated parasite management were completed by participants of two of the Integrated Parasite Control workshops.

- **What were the results of that evaluation?**

Pre- and Post-test average of the VT and the one RI workshop was 58/78% and 57/76% respectively. Results from 44% of respondents at the RI workshop indicated that they planned to implement at least one new practice as a result of the workshop. A program evaluation was administered to field day participants and indicated that over 75% of the information presented was new to participants. 47% of participants are very likely to start growing BFT for grazing/feeding on their farms, with another 29% being somewhat interested.

Outcome#4

- **Did you evaluate your program?**

Yes, in 2016 we distributed a year end client survey designed to determine demographics and changes in knowledge and behavior of people who learned from URI Master Gardeners throughout the year. URI Master Gardener volunteers collected emails from 1059 clients and received a 21% return rate of a year-end client survey. In addition, evaluation forms are distributed to attendees at the "learn locally" public workshops and Symposium to garner feedback and change in knowledge and behavior. This year's East Farm Festival employed an informal written "banner" to garner knowledge gained and behavior change of visitors.

- **What were the results of that evaluation?**

The 2016 survey results will serve as baseline data prior to the anticipated 2017 launch of a multi-year focus area for the URI Master Gardener Program. Our 2016 survey yielded a 21% return rate, with 1059 client emails collected and 220 survey responses recorded. This is an improvement to our 17% response rate in the pilot survey year of 2015, in which the survey was sent to 923 clients. This anonymous survey is distributed via email at year end to gauge changes in knowledge and behavior following client interaction with at least one URI Master Gardener volunteer at an approved event.

The URI Master Gardener Program was successful in educating members of the general public in Rhode Island, with 94% of respondents reporting that they learned something new from a URI Master Gardener in 2016. Given the fact that 56% of survey respondents called or emailed the Gardening Hotline, it is no surprise that 52% reported that URIMG's helped

them solve problems in the garden. See Figure 2 for more details. One major reason for surveying clients at the end of year is to determine if they did anything differently after interacting with URI Master Gardeners. Then we can decide if the activities of the URIMGP are causing positive behavior change and successfully meeting our mission.

We were most successful in encouraging people to adopt the following new behavior or increase the practices they were already doing: Identify plant problems before taking action against them (47 ppl, or ~21%); Grow food plants (32 ppl, or ~15%); Amend soils correctly for vegetables, garden beds or lawn (31 ppl, or ~14%); Use research-based resources to answer gardening questions (30 ppl, or ~14%); and Choose plants/trees according to site conditions (26 ppl, or ~12%).

In 2017 we plan to begin addressing a trend toward increased drought during the growing season, and water quality as a persistent issue in local watersheds as two areas for increased education in future years. To set a baseline, we asked people about changing behavior around using efficient irrigation methods and encouraging people to use plants/gardens to reduce stormwater runoff: 24 and 23 people, respectively, mentioned that they did not learn these practices, indicating an area of opportunity for us.
The group responding to the survey tends to be highly educated (79%, or 147 ppl with college and/or advanced degrees), white (84%, or 155 ppl) with an intermediate gardening level (60%, or 113 people). 25% of respondents, or 50 people, identified as beginning gardeners. In terms of age distribution, 79% of respondents were 51 or older. While this profile certainly reflects some sampling error from self-selection, it is consistent with the channels through which we reach the public. You can also infer from the map that we could reach a broader geographic distribution than we currently do. We are making a concerted effort to reach low income individuals, of all ages, from diverse demographic backgrounds in our community garden connections, new offerings that focus on gardening for food (quality and savings), and more extensive partnerships including food banks and public libraries.

Outcome #5

- **Did you evaluate your program?**

Yes, in 2016 we distributed a year end client survey designed to determine demographics and changes in knowledge and behavior of people who learned from URI Master Gardeners throughout the year. Individuals involved in the school garden mentor activity, as well as those who attended workshops in community gardens were included on the distribution list. The School Garden Initiative was launched in 2016 and a pre-program survey was distributed to teachers to better understand their knowledge, attitudes, beliefs, intentions and actions related to school gardens. This will be compared to a post-program survey in spring, 2017.

- **What were the results of that evaluation?**

The URI Master Gardener Program was successful in educating members of the general public in Rhode Island, with 94% of respondents reporting that they learned something new from a URI Master Gardener in 2016. Given the fact that 56% of survey respondents called or emailed the Gardening Hotline, it is no surprise that 52% reported that URIMG's helped them solve problems in the garden. One major reason for surveying clients at the end of year is to determine if they did anything differently after interacting with URI Master Gardeners. Then we can decide if the activities of the URIMGP are causing positive behavior change and successfully meeting our mission. The school contacts (teachers, parents, administrators) reported that their interactions with school garden mentors resulted in

increases in their ability to develop and maintain a successful school garden program at their school (27 reported increases, 11 reporting "stayed the same", 0 reporting decrease). People reported that School Garden Mentors helped to increase the number of people using the garden at their school (6 increased; 5 stayed the same; 0 decreased).

We were most successful in encouraging people to adopt the following new behavior or increase the practices they were already doing: Identify plant problems before taking action against them (47 ppl, or ~21%); Grow food plants (32 ppl, or ~15%); Amend soils correctly for vegetables, garden beds or lawn (31 ppl, or ~14%); Use research-based resources to answer gardening questions (30 ppl, or ~14%); and Choose plants/trees according to site conditions (26 ppl, or ~12%). What people learned, by category (includes multiple responses by individuals):
1. Solving problems in the garden. 113
2. Information about soil, compost, amending soil, fertilizer. 81
3. Growing trees, shrubs, ornamentals. 72
4. Growing food plants. 65
5. Other. 50

Outcome #6

- **Did you evaluate your program?**

Yes, an evaluation form was provided to teachers to complete for the program and instructors. They were also asked about program follow-up in the classroom.

- **What were the results of that evaluation?**

The program received high results (5 on a Likert-type scale of 1-5) from the few returned surveys. Given the low return rate, we do not know for certain if this program has met its objectives based on survey results. Anecdotal response also indicated the teachers were pleased with the program content, instruction, and location. We believe that we achieved our outcomes as planned. However, completed evaluations must be collected on-site to better ensure data collection and affirm this assumption.

Key Items of Evaluation

We completely restructured the URI Master Gardener program over the last couple of years and have been focusing closely on mission and achievement of measurable outcomes. I believe we are seeing good results from those efforts.
Cooperative Extension's Learning Landscape program is very popular with students and school teachers. We are taking steps to better evaluate learning outcomes in the future.

V(A). Planned Program (Summary)

Program # 3

1. Name of the Planned Program

Sustainable Energy, Climate Change and the Environment

☑ 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	2%		9%	
112	Watershed Protection and Management	17%		14%	
123	Management and Sustainability of Forest Resources	9%		7%	
131	Alternative Uses of Land	7%		2%	
132	Weather and Climate	5%		7%	
133	Pollution Prevention and Mitigation	19%		4%	
135	Aquatic and Terrestrial Wildlife	9%		13%	
136	Conservation of Biological Diversity	11%		9%	
605	Natural Resource and Environmental Economics	4%		17%	
608	Community Resource Planning and Development	5%		10%	
721	Insects and Other Pests Affecting Humans	4%		4%	
722	Zoonotic Diseases and Parasites Affecting Humans	4%		4%	
803	Sociological and Technological Change Affecting Individuals, Families, and Communities	4%		0%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2016	Extension		Research	
	1862	1890	1862	1890
Plan	4.0	0.0	15.0	0.0
Actual Paid	3.4	0.0	3.8	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**
315813	0	514261	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
152254	0	615087	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

Vector Borne Diseases
Use surveillance data accumulated over a dozen years to develop new tools to pinpoint risk, both spatially and seasonally.
Use computer models to view disease patterns in Rhode Island and to develop models for disease risk.
Determine landscape patterns that present the greatest risk for encountering a tick bite.
Formulate landscape plans to reduce the chances of encounters between ticks and people.
Create a web-based decision support system. Using this system, people will be able to compile a customized risk index and then follow links that will help them devise short- and long-term disease prevention action plans.
Reduce tick abundance community-wide by using USDA-designed 4-posters, which are devices that attract deer with corn dispensed in small amounts.
Study the salivary glands of ticks to find compounds from ticks with potential pharmacological value, formulate novel vaccination strategies to prevent tick-transmitted infections, develop bio-molecular assays for tick-borne pathogens, elucidate transmission dynamics of pathogens among tick vectors and vertebrate hosts, and discover and evaluate natural enemies of ticks.

Climate Change
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 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 continue development, delivery, training and application of proven water quality management tools and techniques such as:

- Curricula and training on best management practices (BMPs) for conventional and alternative and innovative onsite waste water treatment
- Public outreach and training on storm water management
- Curricula and training regarding private wells
- Volunteer Water Quality Monitoring

The Environment and Adaptive Agro-ecosystems

Sustaining wildlife through habitat management is a critical issue for RI. Migrating song birds require suitable food sources to complete their migration, and coastal lands have undergone extreme changes in vegetation, potentially imperiling migration success and fecundity for many native species. Ruffed Grouse are of particular concern in southern New England because they are a native gamebird species that is currently too rare to sustain a hunting season and they serve as a "sentinel species" for the response of many species to the success or failure of management of early successional forests.

Although vernal ponds in forested watersheds provide essential habitat for a host of organisms, the fecundity of these organisms is highly linked to forest disturbance and management, requiring a careful understanding of the underlying ecology.

Invasive plants threaten the integrity of New England habitats and could affect biodiversity within the state. Research and extension programs are planned to assess invasives and develop strategies for mitigation.

Sustainable Energy

- Feasibility and implementation of energy efficiency and renewable energy technologies
- Municipal energy training for municipal officials and employees
- Residential Energy Education:
  - Participants pledge 10% energy savings
  - Trained volunteers conduct locally-based education and outreach
  - Sustainable energy page on local websites
  - Community workshops
  - Traditional and web media

2. Brief description of the target audience

Vector Borne Diseases
The target audience is diverse and represents all Rhode Islanders, especially those at greatest risk of contracting vector borne diseases. This audience includes community members, grassroots agencies, municipal and state policy makers, home owners and educational institutions.

Climate Change
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; NGOs (land trusts, environmental organizations, etc), agricultural producers, the public.

The Environment and Adaptive Agro-ecosystems
A mixture of public policy personnel (federal and state agencies as well as town conservation, planning and management officials), local nonprofit groups involved in land management, such as conservancies, interested and involved citizens, and private landowners and high school students (through training and participation in the Rhode Island Environthon).

Sustainable Energy
Municipal officials, building and utility managers, financial administrators, mayors/town managers, municipal employees, residential energy consumers, school systems.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2016	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	22977	2011922	1375	333

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

Patent Applications Submitted

Year: 2016

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2016	Extension	Research	Total
Actual	1	31	32

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of peer reviewed publications

Year	Actual
2016	35

Output #2

Output Measure

- Number of books and monographs

Year	Actual
2016	0

Output #3

Output Measure

- Number of abstracts

Year	Actual
2016	58

Output #4

Output Measure

- Number of conference proceedings

Year	Actual
2016	13

Output #5

Output Measure

- Number of fact sheets, bulletins and newsletters

Year	Actual
2016	50

Output #6

Output Measure

- Number of training manuals (includes instructional CDs)

Year	Actual
2016	16

Output #7

Output Measure

- Number of scientific/professional presentations

Year	Actual
2016	132

Output #8

Output Measure

- Number of workshops (including short courses)

Year	Actual
2016	90

Output #9

Output Measure

- Number of conferences hosted

Year	Actual
2016	1

Output #10

Output Measure

- Number of websites developed and/or refined

Year	Actual
2016	21

Output #11

Output Measure

- Number of public presentations

Year	Actual
2016	127

Output #12

Output Measure

- Number of public service announcements

Year	Actual
2016	18

Output #13

Output Measure

- Number of students trained

Year	Actual
2016	81

Output #14

Output Measure

- Number of theses/dissertations completed

Year	Actual
2016	7

Output #15

Output Measure

- Number of postdoctoral scientists trained

Year	Actual
2016	1

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Improved understanding of risk for vector tick encounters and tick-borne disease. Indicator is number of tick adverse moisture events (TAME) each year.
2	Improved public understanding of how to prevent tick bites and reduce risk of tick-borne illness. Indicators include number of unique users of the TickEncounter website; number of email inquiries responded to; and number of views on TickEncounter's Youtube channel.
3	Increased capacity of practitioners to design, install, maintain and improve onsite wastewater treatment systems. Indicator is number of people receiving training.
4	Enhanced capacity to manage and protect local water quality. Indicators include number of data points added to the URI Water Watch database, data useage by regulatory agencies and citizen groups, and presentations to local organizations.
5	Private landowners adopt best practices in testing, treatment, and protection of private well water. Indicators include percentage of workshop participants that have their water tested; percentage of workshop participants who inspect their wellhead area for possible pollution problems.
6	Enhanced capacity in Rhode Island to effectively manage storm water. Indicators include number of people (public, professionals, municipal officials) attending workshops; number of municipalities using our content to educate residents; other actions taken to prevent storm water pollution.
7	Enhanced capacity to manage coastal lands and forested lands to improve habitat for song birds and other wildlife species. Indicator is number of people (wildlife biologists, land managers, the public) who attend presentations; number of people who view, download or cite reports produced by the project.
8	Natural resource managers use vernal pool soil maps for management and restoration. Indicators include number of publications, workshops, and presentations. Integrated; NE-1438
9	Geospatial information is used by government organizations, NGO's and the public for natural resource management and conservation. Indicator is number of contacts (hits) and the amount (Tb) of geospatial data downloaded from RREA-supported online data services.
10	Increased understanding of resistance and tolerance to hemlock wooly adelgid (HWA) in eastern hemlock. Indicator is number of publications, presentations, and procurement of external funding to continue/expand the work.
11	Increased adoption of energy conservation behaviors and implementation of efficiency practices by RI residents, small businesses, municipalities, school districts, water suppliers and state agencies. Indicators are number of energy audits scheduled with the local utility; number of implemented efficiency projects.
12	Upon completion of the Energy Fellows program, URI undergraduate and graduate students demonstrate increased capacity to address real-world energy issues. Indicator is number of students completing the programs.
13	Increased environmental sustainability in fuel choice decisions by consumers, and both public and private fleets. Indicators are the number of gallons of petroleum displaced; number of people reached through events.
14	Improved capacity for coastal managers to predict greenhouse gas emissions resulting from changes in nitrogen loading and coastal marsh restoration. Indicator is number of research discussions held with coastal managers and peer-reviewed publications.

15	Increased understanding of how wildlife populations may respond to ongoing climate change. Indicator is number of publications and presentations.
16	Increased understanding of how plant genome size influences competitive ability and susceptibility to herbivory. Indicators are number of publications and presentations.
17	Advance understanding of demand and supply of ecosystem services from watersheds in the rural-urban fringe at a policy-relevant scale. Indicator is number of publications and presentations.
18	Increased understanding of the economic valuation of air quality and greenhouse gas emissions. Indicator is number of publications and presentations.
19	Enhance capacity of land use managers to identify effective strategies for minimizing watershed nitrogen export. Indicator is number of publications and presentations.
20	Enhanced capacity of land trust organizations and agency personnel to manage and protect amphibian and reptile populations from the effects of forest loss and pollution. Indicators are number of peer-reviewed scientific publications and presentations to conservation organizations and at scientific meetings.
21	Enhanced capacity of land trust organizations, government agencies, and private landowners to manage and protect turtle populations from the effects of forest fragmentation. Indicators are number of peer-reviewed scientific publications and presentations to the public and conservation organizations and at scientific meetings.
22	Improved understanding of seismic hazards along the coastlines of North America to improve assessment of this hazard to coastal environments, including coastal communities and coastal agriculture.
23	Improved understanding of the factors that influence public acceptance of the Block Island Wind Farm. Indicator is number of publications and presentations.
24	Enhance understanding of the tradeoffs between alternative groundwater management regimes to improve decisions by irrigators and policymakers. Indicator is number of publications and presentations.

Outcome #1

1. Outcome Measures

Improved understanding of risk for vector tick encounters and tick-borne disease. Indicator is number of tick adverse moisture events (TAME) each year.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year **Actual**

2016 0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The high incidence of Lyme disease, now infecting >300,000 people each year in the United States, along with increasing rates of other dangerous tick-transmitted infections, is a critical and growing public health problem for communities across Rhode Island, the rest of the Northeast, and mid-Atlantic states. In the United States, estimated costs for the impact of Lyme disease alone exceeds $1.3 billion annually. Moreover, the tick problem in the U.S. is continuing to grow in geographic scope, scale, and costs.

What has been done

We have continued our research on the role of atmospheric moisture in relation to blacklegged tick distribution. Additionally, we have continued to operate the nation's largest crowd-sourced tick encounter survey (TickSpotters). One unique feature of TickSpotters is the reply which is a timely (usually within 24 hrs) tailored response based on the type of tick and its stage of engorgement.

Results

New studies are suggesting that blacklegged tick nymphs in the hotter and drier southeastern U.S. (southern ticks) survive lower in the forest and forest edge leaf litter than the same type of ticks occurring in the northern portion of their range (northern ticks). The impact of this finding is that people and disease reservoir-competent hosts encounter southern ticks less frequently than in the north, and risk for tickborne disease is less in the southeastern U.S. than in the north. Assessment of crowd-sourced tick encounter data supports this hypothesis, but further, crowd-sourcing tick encounters on a national scale has revealed numerous regional locations where tick risk appears to be exceptional and where tick bite protection and disease prevention programming should be implemented. There were over 10,000 TickSpotters submissions and tailored responses during 2016.

4. Associated Knowledge Areas

KA Code	Knowledge Area
721	Insects and Other Pests Affecting Humans
722	Zoonotic Diseases and Parasites Affecting Humans

Outcome #2

1. Outcome Measures

Improved public understanding of how to prevent tick bites and reduce risk of tick-borne illness. Indicators include number of unique users of the TickEncounter website; number of email inquiries responded to; and number of views on TickEncounter's Youtube channel.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The high incidence of Lyme disease, now infecting >300,000 people each year in the United States, along with increasing rates of other dangerous tick-transmitted infections, is a critical and growing public health problem for communities especially across Rhode Island, the rest of the Northeast, and mid-Atlantic states. In the United States, estimated costs for the impact of Lyme disease alone exceeds $1.3 billion annually. Moreover, the tick problem in the U.S. is continuing to grow in geographic scope, scale, and costs.

What has been done

We have continued to operate the TickEncounter website and its Facebook, Twitter and YouTube social media channels. We also added a bi-monthly newsletter that is sent to a mailing list of over 3,700 and growing. In addition, we have developed a dedicated mobile-friendly web presence for TickSpotters, our crowd-sourced tick survey for America, and have developed a ticket-based response system for replying to submissions that will allow us to better manage and distribute the workload of responding to such a large and growing volume of submissions.

Results

In 2016, traffic on TickEncounter.org reached about 1 million visitors, with over 820,000 new, unique visitors, and >2.5 million page views for the second year in a row. The proportion of returning visitors to total unique visitors increased by about 5% over 2015 indicating growth in the rate of returning users. Our highly interactive TickSpotters program had about 10,000 submissions and responses. In addition to TickSpotters submissions, our Frequently Asked Questions and Comments interactive sections generated 1,845 emails that were responded to.

4. Associated Knowledge Areas

KA Code	Knowledge Area
721	Insects and Other Pests Affecting Humans
722	Zoonotic Diseases and Parasites Affecting Humans

Outcome #3

1. Outcome Measures

Increased capacity of practitioners to design, install, maintain and improve onsite wastewater treatment systems. Indicator is number of people receiving training.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Approximately 30% of Rhode Islanders rely on onsite wastewater treatment systems (OWTS) to treat wastewater, and rural and suburban communities, lacking municipal sewers, rely on them entirely. As a result of climate change, the humid northeast US is expected to experience wetter and warmer climatic conditions which will result in poorer treatment potential in conventional OWTS. Sea level rise in densely developed coastal areas of RI also causes a rise in groundwater tables in those areas and will result in a reduction in separation distance between the OWTS drainfield base and water tables; resulting in a reduction in treatment potential, and an expected reduction in ground and surface water quality, as well as an increased risk to public health. RI Department of Environmental Management and local community decision makers need research data and outreach support to develop regulations and policy that will protect public and environmental health as climate change progresses.

What has been done
During the reporting period, the URI project team published five peer-reviewed papers (an additional one is in review), one doctoral dissertation, and 11 abstracts.
In addition, we delivered 16 talks (6 of which were invited), six posters, and one webinar to academic and professional audiences in RI, CT, MA, CA, MN, and VA; reaching scientists, wastewater practitioners, board of health officials, regulatory decision makers and coastal resource managers. The team delivered a total of 38 workshops/ classes in 4 states in the region, reaching nearly 514 practitioners, decision makers and students. These classes provided continuing education credits needed by over 383 licensed professionals to renew their professional licenses.

Results
URI project staff educated wastewater practitioners about advanced OWTS, helping to improve their knowledge base, increase the proficiency of these wastewater designers, and raise their awareness of climate change impacts on OWTS. During the reporting period approximately 30% of all OWTS permit applications that these designers submit to the RI Department of Environmental Management are for advanced OWTS. Use of advanced OWTS that denitrify wastewater are now required in state-designated watersheds that are nitrogen sensitive. This has helped protect groundwater and surface waters in these watersheds from further degradation and may help to mitigate the impacts of climate variability and climate change.

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 #4

1. Outcome Measures

Enhanced capacity to manage and protect local water quality. Indicators include number of data points added to the URI Water Watch database, data useage by regulatory agencies and citizen groups, and presentations to local organizations.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Seasonal droughts, periodic deluges, rising nutrient levels, nuisance & harmful algae blooms (HABs) 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 RI (and New England) are 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. Even the simple measurement of water temperature has become recognized as valuable, not just in documenting climate change, but in its role in nutrient cycling, plant and algae proliferation, and potential and actual effects on people and animals. Monitoring for HABs, and in particular, cyanobacteria (blue-green algae) blooms have become a hot-button issue both because of their potential harmful health effects on recreational users and their seeming intractability. Having years of hard data & accessible data to back up plans and decisions is an essential building block for successful resolution of environmental problems and protection of environmental assets.

What has been done

URI Watershed Watch is the largest and premier long term volunteer water quality monitoring and citizen science program in RI, and is a model for other states and organizations. We have held multiple trainings for new and returning volunteers. This year approximately 350 citizen scientists conducted ecological monitoring on ~270 locations primarily in RI, sponsored by more than 45 local organizations, measuring water clarity, temperature, oxygen content, pH and alkalinity, processing samples for chlorophyll and collecting samples for lab analyses of nutrients and bacteria during the six month monitoring season. Sites are 1/3 lakes or ponds, 1/3 rivers and streams, 1/3 estuaries, bays, salt ponds. We co-hosted NE Lakes conference to educate lake and watershed organizations about lake and watershed ecology. In FY 2016 we made 17 public presentations. This year we were able to put to use our $100,000 relational database which houses decades of data and can be accessed by program volunteers, their program coordinators, environmental and agency professionals with a simple call or email to us. We are active at the local to national scale in lake-related efforts. We are on the RI DEM-DOH Cyanobacteria Task Force, as well as the EPA-NE and NEIWPCC ones. Our Coastal Fellow has also participated in these meetings and implemented the second year of EPA-NE effort in RI. We recruited existing volunteers from nine sites with documented cyanobacteria blooms to conduct supplemental monitoring as part of EPA-NE efforts and also helped assess monitoring procedures and equipment.

Results

New England boasts a number of very long-term volunteer monitoring or citizen science programs, with ones in NH, VT and ME more than 30 years old. URI WW is approaching 30 years. With each passing year the value of the long term data and results of water clarity, temperature, oxygen content, nutrients and bacteria levels increases. In this 2016 FY over 22,000 data points were added to our database and also aggregated and posted on the URIWW website and then distributed to sponsoring organizations as well as RI Department of Environmental Management (RI DEM) & US EPA. We downloaded and sent large data sets in response to 8 specific requests, ranging from URI students to watershed groups, to municipalities to UCONN, RI DEM and EPA Office of Research and Development. Regulatory agencies used the data to create and/or support regulations to protect excellent water quality as well as to document poor water quality, and to help best direct their resources. WW results are used for 303d listing. Cooperative 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 local runoff and erosion issues. These data are also now being used to document surface water temperature changes and also track cyanobacteria blooms as well as deep water hypoxia and anoxia. With funding from RI Airport Corp we run a multi-year winter monitoring program on urban Buckeye Brook in Warwick to monitor airport de-icing runoff. This third year showed significant decrease in glycol, documenting results of the airport's significant investment in stormwater improvements and runoff treatment. We have worked extensively with the City of Warwick and other concerned citizens to share the 25+ year monitoring results and discuss what the results mean. This was prompted by their first documented blue-green algae bloom and lake closure and also by unusually high lake level when

there were lowered lake levels elsewhere in this year of drought. One outcome was formation of a new local group, Friends of Warwick Pond, and their conducting a neighborhood campaign to decrease residential fertilizer use.

4. Associated Knowledge Areas

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

Outcome #5

1. Outcome Measures

Private landowners adopt best practices in testing, treatment, and protection of private well water. Indicators include percentage of workshop participants that have their water tested; percentage of workshop participants who inspect their wellhead area for possible pollution problems.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Protection of municipal drinking water receives increased attention as water suppliers are now required to test, report and treat for numerous water quality contaminants. Surprisingly, private wells, which serve 10% of the state's population, are not protected under the Safe Drinking Water Act or other federal programs. Private well owners are largely responsible to ensure that their well water is safe for them and their families to drink. These residents 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 state have increased demand for well water testing and

educational materials. Education and technical assistance 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. Given the large number of Rhode Islanders (100,000 - 150,000) who rely on private wells, this Extension program has used a variety of methods to educate and provide technical assistance the state's private well owners.

What has been done

Education and Technical Assistance to RI Private Well Owners
Total number of clientele contacts (workshops, face-to-face interactions at community events): 1,383 including:
- Nine community workshops across the state attended by 353 private well owners. In January 2014, we began facilitated well water testing in conjunction with our workshops. During the workshop, participants can sign out well water test kits for the RI Dept of Health. Two days after the workshop, we return to the community to pick up test kits and take them to the RI Dept. of Health testing lab. Annual program evaluation indicates a 25% increase in the number of workshop attendees who report having their well water tested as a result of attending the workshop.
- Partnered with the RI Dept. of Health's Private Well Program, the RI State Laboratories, our clear communications expert, Sue Stableford, and graphic designer, Bruce Hooke to develop and audience test instructions for collecting a well water sample. Seven instruction sheets and a new order form were developed and are currently being used in our program and educational activities. In addition, we developed a new Tip Sheet as part of the Private Well series entitled, Buying a home with a private well? Test the water before you buy.
- Continued and expanded upon Community Intercept Campaign at RI Farmers Markets, RI Home Show and other community events. In a continuing effort to meet private well owners in their own community, we continued and expanded upon the Program's Intercept Campaign to provide education and technical assistance to private well owners. Two URI Coastal Fellows attend the vast majority of these events, trained and supervised by both staff and our graduate student.

Results

Post workshop evaluations conducted annually show that workshop participants are taking action to protect their private well, most notably, 76% of workshop participants had their water tested. This is an increase in the percentage of workshop participants who had their water tested as a result of attending a workshop since we began facilitating testing at the RI Dept. of Health lab. In addition, 77% of workshop attendees inspected their wellhead area for possible pollution problems and 67% shared workshop information with others.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management

Outcome #6

1. Outcome Measures

Enhanced capacity in Rhode Island to effectively manage storm water. Indicators include number of people (public, professionals, municipal officials) attending workshops; number of municipalities using our content to educate residents; other actions taken to prevent storm water pollution.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Stormwater pollution is a major cause of impaired water quality in RI, leading to swimming beach closures, shellfishing bans, loss of recreational value, and degraded habitats. Most RI municipalities are at least partly urbanized and own storm sewer systems which contribute to the problem. Under EPA Rules and the RI Storm Water Discharge Permit program, municipalities are required to implement storm water management programs to reduce stormwater pollution. To demonstrate compliance, the municipal programs must address several minimum standards including: education and outreach to the public about stormwater pollution and actions citizens can take, and involving the public in a local stormwater management program. These requirements, while necessary, represent 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

We provided education and outreach to municipal officials, agency staff, watershed groups, and the public on managing stormwater runoff. We delivered presentations on stormwater management topics for local officials and environmental professionals. We conducted a national review of training programs in soil erosion and sediment control, interviewed training managers,

summarized results and made recommendations to RI Department of Transportation (RI DOT) and RI Department of Environmental Management (RI DEM) to develop online training for agency staff, consultants and contractors. We proceeded to develop training materials in conjunction with StormwaterOne LLC. We assisted RIDEM with updates to the RI stormwater standards manual focusing on bioretention specifications to improve nutrient removal and infiltration. We worked with Professor Mark Stolt and Jim Turenne, USDA NRCS, to expand site specific mapping procedures to address suitability for stormwater system planning and design. We supported adoption of landscape care guidelines to protect Charlestown's groundwater and reduce runoff to coastal ponds from lawn fertilizers and overwatering. This included assessing nitrogen sources in wellhead areas, researching best management practices for landscape care to protect water quality, presentations at public meetings, work sessions with RI Nursery and Landscape Assocation and town officials, and preparing recommendations for the town council regarding their proposed "Charlestown Recommended Landscaper Process." We also responded to requests for information on water quality issues and updated and maintained the RINEMO and RIStormwaterSolutions.org websites.

Results

At least 80% of RI municipalities used or customized URI educational materials to educate residents about stormwater pollution using flyers, town hall notices, adding content to their own websites or linking to ours, posting stormwater cartoons and other notices in newspapers, and sponsoring educational events and cleanups, enabling them to develop effective stormwater management programs. RI DOT demonstrated compliance with public education and involvement requirements based on URI outreach. Online training in soil erosion and sediment control for DEM, DOT and Coastal Resources Management Council staff is planned for March, 2016. RI DEM is proceeding with manual updates in 2017 based on priorities identified in 2016. In February 2016, the Charlestown Town Council voted to adopt the "Charlestown Recommended Landscaper Process" which sets guidelines for lawn care to protect water quality based on regional recommendations developed by UConn Cooperative Extension and by NEIWPCC. Landscape care providers voluntarily agree to follow the guidelines and the town encourages homeowners to hire these businesses. Charlestown's program is a first in RI and model for other communities.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management

133 Pollution Prevention and Mitigation

Outcome #7

1. Outcome Measures

Enhanced capacity to manage coastal lands and forested lands to improve habitat for song birds and other wildlife species. Indicator is number of people (wildlife biologists, land managers, the public) who attend presentations; number of people who view, download or cite reports produced by the project.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Migrating song birds require suitable food sources to complete their migration, and coastal lands have undergone extreme changes in vegetation, potentially imperiling migration success and fecundity for many native species. Many forest owners, including private forest owners, land trusts, NGOs, and state and federal agencies, are interested in managing their forests to improve habitat for songbirds and other wildlife species. However, there are still many outstanding questions about the most effective methods for achieving this. Furthermore, there have been few attempts to date to assess the impact of forest management on wildlife.

What has been done
Graduate and undergraduate students and research technicians conducted field experiments that determined (a) how variation in refueling rates of migratory birds at different coastal New England sites is related to fruit resource abundance, (b) the fruit preference of birds during migration, and (c) how body condition of migratory birds affected their movements at stopover sites that differed in the abundance of fruits. A series of outreach events have been conducted to increase awareness of forest owners about how habitat quality and management practices affect populations of migrating song birds. Studies have been conducted on how to create habitat for wildlife and assess various approaches to monitoring the quality of the resulting habitat.

Results
Increased understanding by wildlife biologists, land managers, and the general public through presentations and publications about how habitat quality and management practices affect

populations of migrating song birds. Awareness about the relationship between forest management and wildlife habitat has been increased for many landowners as a result of the outreach activities. Undergraduate students and research technicians have demonstrated that Photo Analysis (using ImageJ software) is a promising new approach to monitor the quality of habitat created through forest management.

4. Associated Knowledge Areas

KA Code	Knowledge Area
123	Management and Sustainability of Forest Resources
135	Aquatic and Terrestrial Wildlife
136	Conservation of Biological Diversity

Outcome #8

1. Outcome Measures

Natural resource managers use vernal pool soil maps for management and restoration. Indicators include number of publications, workshops, and presentations. Integrated; NE-1438

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Vernal pools are one of the most ecologically valued types of inland wetlands. These ecosystems provide habitats for numerous rare and endangered plants and animals and provide numerous ecosystem functions within upland landscapes. Many of these functions are dependent upon the hydrology of the systems. Since hydrology is driven by climatic conditions, which may vary wildly from year to year, a tool that can predict typical hydrologic conditions would be instrumental in the conservation and management of vernal pools for a number of their related functions. Regional and national hydric soil regulatory groups, such as the National Technical Committee for Hydric Soils, will use this information to assess the need for additional hydric soil indicators for identifying jurisdictional wetland boundaries under Section 404 of the Clean Water Act.

What has been done
Four vernal pools have been instrumented to monitor hydrology, redox chemistry, and carbon accounting across three transects in each from the basin to the surrounding upland. Hydrology

and hydroperiods have been measured since August 2015. Soils have been sampled and described at every point along the transects. Hydric soil indicators are being evaluated along with the need for additional indicators. Soil samples are being analyzed for carbon accounting purposes. Hydrology and temperature are being related to organic matter decomposition and associated carbon dioxide efflux to test for changing climate effects on carbon storage and sequestration in these wetlands.

Results
This is a 5 year project. We have a little more than 1.5 years of hydrology and hydroperiod data. We will continue to collect these data and analyze the data against our soil morphology. We expected less organic matter decomposition and lower carbon dioxide losses in the basin (wetland portion of the system) than associated upland. Summers in 2015 and 2016 were drier than normal, and thus, we did not see this relationship. We are continuing to monitor organic matter decomposition.

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources
135	Aquatic and Terrestrial Wildlife

Outcome #9

1. Outcome Measures

Geospatial information is used by government organizations, NGO's and the public for natural resource management and conservation. Indicator is number of contacts (hits) and the amount (Tb) of geospatial data downloaded from RREA-supported online data services.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Rhode Island natural resource management professionals and conservation-minded community volunteers alike rely on geospatial data and information shared by RI CE-supported programs. Lead by the URI Renewable Resources Extension Act Program, datasets ranging from aerial photographs, forest habitat, land use, roads, building locations, and more are used to inform

natural resource decisions throughout Rhode Island. Classes, presentations, workshops, technical assistance, and blog posts by URI CE staff promote the use of these resources.

What has been done
Of special note this year, URI RREA collaborated with the RI Conservation Stewardship Collaborative (CSC) to support a new URI Natural Resources Science undergraduate course that taught students how to develop baseline documentation reports that guide natural resource management decisions. Each student worked with a landowner and a natural resource manager to develop a baseline documentation report customized for a given parcel of land. URI RREA staff also continued offering its proven and successful combination of Geographic Information System short courses, supporting the Rhode Island Geographic Information System (RIGIS) website, and maintaining the NOAA CORS GPS Base Station hosted at URI.

Results
Over the course of FY2016 URI RREA training and professional development opportunities have resulted in approximately 2,500 direct and indirect contacts who have increased awareness about natural resource management techniques that leverage geospatial technology. Baseline documentation reports were developed for 20 individual forested properties throughout Rhode Island. Three instructor-led classes were offered to a total of 36 students. The RIGIS online data clearinghouse distributed 3.7 TB of data, and 182 GB of correction files were downloaded from the GPS Base Station. The 144 map services affiliated with the Rhode Island Digital Atlas responded to over 3.9 million requests.

4. Associated Knowledge Areas

KA Code	Knowledge Area
123	Management and Sustainability of Forest Resources
131	Alternative Uses of Land
135	Aquatic and Terrestrial Wildlife
136	Conservation of Biological Diversity

Outcome #10

1. Outcome Measures

Increased understanding of resistance and tolerance to hemlock wooly adelgid (HWA) in eastern hemlock. Indicator is number of publications, presentations, and procurement of external funding to continue/expand the work.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

This work is intended to address public concern over the continued loss of eastern hemlocks from the east coast of the US. This is a problem for wildlife lovers, foresters, property owners, land managers, park superintendents - as well as the many species affected by the loss of this foundational tree species.

What has been done

We have made great strides in figuring out why eastern hemlock succumbs so quickly to the adelgid, in contrast to other hemlock species that appear to tolerate this insect. This work has been accomplished using a combination of intra- and interspecific comparisons that explored the chemical and physiological responses of hemlocks to this insect. This work involved analyses of plant-derived volatile terpenoids, hygrogen peroxidases, and phenolics, as well as the quantification of mobile and immobile nitrogenous compounds and structural molecules.

Results

We have a series of papers, either published/in press or in review, that provide the first holistic description of the adelgid's impact on hemlock above ground and below ground processes. Specifically, the adelgid appears to 'trick' hemlocks into thinking that they're undergoing drought stress, which causes the plants to re-mobilize nitrogen-rich compounds in the foliage for storage in 'safer' areas located within reach of the adelgid's feeding stylet. This creates a food-rich pocket for the adelgid, at the expense of foliar growth - which explains why even a small number of adelgids cause foliar production to essentially cease. The lack of aboveground biomass production leads to the reallocation of belowground resources to compensate, leading affected hemlocks to have far fewer fine roots and a much lower rate of mycorrhizal colonization - which, even if the adelgids are removed, would substantially slow plant recovery. We have reported on this work to members of both scientific and management-oriented communities, and anticipate continuing to do so.

4. Associated Knowledge Areas

KA Code	Knowledge Area
123	Management and Sustainability of Forest Resources
136	Conservation of Biological Diversity

Outcome #11

1. Outcome Measures

Increased adoption of energy conservation behaviors and implementation of efficiency practices by RI residents, small businesses, municipalities, school districts, water suppliers and state agencies. Indicators are number of energy audits scheduled with the local utility; number of implemented efficiency projects.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Costly, non-renewable fuel sources such as natural gas, fuel oil and gasoline supply the vast majority of Rhode Island energy services to municipalities, businesses and homeowners. Energy prices in RI are also among the highest in the country, leaving RI homeowners, small businesses, municipalities, and state agencies with the need to manage energy and costs. By empowering individuals through education and access to science-based resources, widespread implementation of energy conservation behaviors and support, and purchase of diverse and alternative sources of energy will follow.

What has been done
We executed delivery of the 2015 Plugged into Energy Research lecture series, which included lectures and discussion facilitated by seven URI faculty and staff members, one graduate student and two undergraduate Energy Fellows. Themes for the lectures included energy and the ocean, energy efficiency measurement and promotion in URI Extension programming, and energy use in the transportation sector. Using feedback from the attendee evaluations collected at the 2015 lectures, we updated our inventory of ongoing URI energy research projects to inform our selection of energy topics that would be most beneficial to our audience in 2016. We researched, developed and implemented the 2016 lecture series during FY16, engaging three URI faculty and

staff members, one URI graduate student speakers and six URI alums working in policy and industry positions as presenters on energy research and relevant policy initiatives currently being conducted at the University and in state government, respectively. Over the course of three lectures, we covered topics within the following themes: 1) ocean energy generation in Rhode Island; 2) Rhode Island's push for energy efficiency at the state level; and 3) natural gas generation and distribution in the Northeast. Each lecture was accompanied by a targeted action that attendees were encouraged to adopt, included having an in-home energy assessment of energy consumption and associated efficiency retrofits and engagement in community-level efforts to reduce energy consumption in municipal and school buildings.

Results
The 2015 Plugged into URI Energy Research lectures were attended by 93 attendees (an average of 31 attendees per lecture), who identified themselves as URI faculty and staff, industry professionals, state policymakers, and members of the general public. --The 2016 lectures were attended by 196 attendees, double the number from 2015, and identified themselves as members of the general public (41%), URI undergraduate and graduate students (39%), industry professionals (17%), and URI faculty and staff (3%).

4. Associated Knowledge Areas

KA Code	Knowledge Area
133	Pollution Prevention and Mitigation
605	Natural Resource and Environmental Economics
608	Community Resource Planning and Development
803	Sociological and Technological Change Affecting Individuals, Families, and Communities

Outcome #12

1. Outcome Measures

Upon completion of the Energy Fellows program, URI undergraduate and graduate students demonstrate increased capacity to address real-world energy issues. Indicator is number of students completing the programs.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Many students enrolled at URI are passionate about sustainability and are interested in energy topics, including energy conservation, efficiency and renewables technology and deployment. Students seek out opportunities beyond the classroom to explore their interest and gain professional experience. Rhode Island also has a growing need for a well-trained energy workforce and energy companies are looking for new graduates with experience and training in the energy field.

What has been done
Our 2016 program saw five undergraduates engaged in projects with URI Extension Outreach Center staff, URI Department of Environmental and Natural Resource Economics faculty, and long-time industry partners Wind Energy Development, LLC and CommerceRI. URI Energy Fellows received training in general energy topics through presentations from energy professionals at the RI Office of Energy Resources, field trips, and conference attendance as well as specialized training in leadership skills and communications. Fellows actively participated in outreach events and presented their work to the URI community and general public at an academic presentation at the end of the year. In 2016, in an effort to streamline the leadership and communications professional development training URI Energy Fellows receive, a seminar was added to the program requirements. The seminar was developed as a result of reviewing the development training components of the program with the URI Center for Career and Experiential Learning. The seminar includes modules in leadership, resume writing, interview skills, interpersonal communications, and public speaking among others.

Results

All students successfully completed the Energy Fellows program.

4. Associated Knowledge Areas

KA Code	Knowledge Area
132	Weather and Climate
133	Pollution Prevention and Mitigation

Outcome #13

1. Outcome Measures

Increased environmental sustainability in fuel choice decisions by consumers, and both public and private fleets. Indicators are the number of gallons of petroleum displaced; number of people reached through events.

Not Reporting on this Outcome Measure

Outcome #14

1. Outcome Measures

Improved capacity for coastal managers to predict greenhouse gas emissions resulting from changes in nitrogen loading and coastal marsh restoration. Indicator is number of research discussions held with coastal managers and peer-reviewed publications.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Coastal marsh restoration is important to local communities that depend on the ecosystems for storm abatement, water quality protection, and habitat provision for fish and wildlife. Our research is helping restoration practitioners to better understand how their activities impact C and N cycling while producing models that can be used to relate C sequestration (uptake of CO2) to cost effective proxies, such as plant biomass (weight).

What has been done

We have been using our data to publish peer reviewed publications (additional 2 in review, 1 in press) and presented our research at numerous local, regional and national meetings. The publications during this reporting period are:

Moseman-Valtierra SM, Abdul-Aziz O, Tang JT, Ishtiaq KS, Morkeski K, Mora J, Quinn RK, Martin RM, Egan K, Brannon EQ, Carey J, and KD Kroeger. 2016. Carbon dioxide fluxes reflect plant zonation and belowground biomass in a coastal marsh. Ecosphere 7(11):e01560.10.1001/ecs2.1560.

Brannon, EQ, Moseman-Valtierra SM, Rella CW, Martin RM, Chen X and J Tang 2016. Evaluation of laser-based spectrometers for greenhouse gas flux measurements in coastal marshes. Limnology and Oceanography: Methods. http://onlinelibrary.wiley.com/doi/10.1002/lom3.10105/pdf

Results
We have found that CH4 and N2O emissions from salt marshes are generally small relative to those from other (freshwater) wetlands and under high anthropogenic N loads. We identified plant biomass and salinity as two strong potential proxies (simplified metrics) that coastal managers could use to predict C sequestration and CH4 emissions, respectively. With help from collaborators, our publications include a new, user-friendly model (Excel based) that can help coastal managers predict GHG emissions from salt marshes from these basic proxies.

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources
135	Aquatic and Terrestrial Wildlife
605	Natural Resource and Environmental Economics
608	Community Resource Planning and Development

Outcome #15

1. Outcome Measures

Increased understanding of how wildlife populations may respond to ongoing climate change. Indicator is number of publications and presentations.

Not Reporting on this Outcome Measure

Outcome #16

1. Outcome Measures

Increased understanding of how plant genome size influences competitive ability and susceptibility to herbivory. Indicators are number of publications and presentations.

Not Reporting on this Outcome Measure

Outcome #17

1. Outcome Measures

Advance understanding of demand and supply of ecosystem services from watersheds in the rural-urban fringe at a policy-relevant scale. Indicator is number of publications and presentations.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Our economy and quality of life depend on ecosystem goods and services from watersheds. Marine transportation, commercial and recreational fishing, shellfishing, hospitality industries, sociocultural benefits and aesthetic beauty are just a few of those benefits. Despite the restoration and preservation efforts by citizens, legislators and regulators, indicators show that the environmental quality of the bay is deteriorating due to urbanization, sewage treatment, storm water, agricultural runoff, and other sources of pollution. Understanding demand and supply of ecosystem services may support regulators such as EPA and RI Department of Environmental Management (RI DEM) in finding effective policies to improve water quality. Conservation districts, water supply boards, land trusts and other nonprofits may explore voluntary programs to improve local water quality. Private sectors, such as lawn care companies, are interested in knowing whether participating in voluntary programs to improve water quality add premium to their services.

What has been done
1) We identified and quantified the economic impacts of the Narragansett Bay Watershed and its importance to sustained economic development. We synthesized various secondary data sources to understand the values and magnitude of consumptive uses (agriculture and forestry,

aquaculture and commercial fishing, water supply (drinking, industrial and agricultural use), non-consumptive direct uses (marine, coastal and freshwater recreation, recreational fishing and boating, beach use, aesthetics, birdwatching), ports and marine transportation. Building on this research we were awarded a new EPA grant to model and value nonmarket benefits of the Narragansett Bay Watershed, which will complement the efforts through the RI Agricultural Experiment Station.
2) We conducted two economic laboratory experiments to understand how weather variation and information about other polluters' actions might affect nonpoint source polluters' behavior and the effectiveness of ambient-based policies.
3) We made progress in designing a field experiment to test and measure causal impact of (a) better information, (b) social nudges, (c) financial incentives on lawn care decisions. This is collaborative research with the Rhode Island Nursery and Landscape Association (RINLA) and several member landscaping businesses.

Results
1) From our work on the Narragansett Bay Watershed (RI/MA), we are finding that the watershed supports a number of industries, jobs, recreation, and other benefits. We are currently compiling a report to be shared with the public. 2) The laboratory experiments are demonstrating that uncertainty affects performance of water quality management policies, and that better environmental quality information helps improve the quality to a certain extent. 3) The field experiment is currently under way.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
605	Natural Resource and Environmental Economics

Outcome #18

1. Outcome Measures

Increased understanding of the economic valuation of air quality and greenhouse gas emissions. Indicator is number of publications and presentations.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Effective balancing of economic forces and unwanted byproducts of economic activity is critical for sustaining human health and wellbeing. Insights into the valuation of energy extraction and production byproducts will generate a new understanding of how our economy should evolve and will evolve if left unchecked.

What has been done
Analyzed how attention to climate change, as measured with online search activity, responds to hurricane events. Analyzed data on housing prices, hydraulic fracturing, and the New York State Moratorium on fracking. Acquired Colorado data on hydraulic fracturing and housing transactions and am building statistical models to estimate impact of proximate drilling on housing prices.

Results
Results indicate that climate change engagement increases in the months following a hurricane, not only in the area that was directly hit, but also in areas of high risk. Results suggest that housing prices in New York fell relative to Pennsylvania following the moratorium on fracking, which suggests that the expected financial gains to fracking exceed the expected costs.

4. Associated Knowledge Areas

KA Code	Knowledge Area
132	Weather and Climate
605	Natural Resource and Environmental Economics

Outcome #19

1. Outcome Measures

Enhance capacity of land use managers to identify effective strategies for minimizing watershed nitrogen export. Indicator is number of publications and presentations.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The export of nitrogen (N) from coastal watersheds can exert profound effects on the function and value of coastal estuaries. Elevated nitrate concentrations in drinking water can also be a human health concern. The goal of our research is to characterize the extent of nitrate removal within watersheds and identify stream, reservoir, wetland, or riparian attributes that relate to elevated nitrate removal rates. We also examined some engineered systems that can help reduce nitrate loads in coastal watersheds. This will enable us to contribute to the scientific and management 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 completed the first quantitative synthesis of denitrifying woodchip bioreactors, a nitrate abatement system that is of great interest to local, state and federal decision makers, producer organizations and extension specialists; the meta-analysis assessed nitrate removal across environmental and design conditions from 26 published studies, representing 57 separate bioreactor units across the globe. The paper was published in the Journal of Environmental Quality. Results were shared with researchers and practitioners at national and international meetings. We also have a listserv and website on this project (artificialnsinks.org) that contains a google maps atlas of systems across the globe, fact sheets, case studies, videos, workshop presentations, and literature cited.

We completed three years of high frequency water quality sensor deployment (including nitrate sensor) in three streams of watersheds of different dominant land use. These large data sets are undergoing QA/QC and assessment; preliminary data was shared with the public at Salve Regina University's Watershed in Focus public workshop and in meetings with RI Department of Enrivonmental Management. We conducted a day-long training with 20 students from URI, UDel and UVM on watersheds, assessment, and TMDLs.

We also developed a New England Dams database, including data from all state databases and the Nature Conservancy's database. This dataset included geoprocessing with ArcGIS to include NHD+ river and lake coverages, watershed delineations, and other geospatial data. We published a paper on nitrate removal flux under dam removal scenarios to highlight locations where dams and their associated reservoirs serve as a watershed management practice that can reduce the risks of nitrate pollution from other sources such as agriculture or urban development. We have shared this database with colleagues around the region and are working to make it available via a website.

Results
Overall, our efforts in 2016 contributed to the knowledge of land use managers, decision makers and Extension professionals in making decisions to minimize nitrogen export from watersheds. Results of the bioreactor meta-analysis suggest improvements to denitrifying bed designs, especially extending the hydraulic retention time to increase nitrate removal under low temperatures and high flow conditions. This practical information was shared with researchers, designers, agricultural service providers, and NRCS. Our dam paper introduced the concept of nitrate retention by dammed reservoirs as a watershed scale practice that can minimize the effects of various land-based sources on downstream waters and suggested an approach to ranking dams in order of importance to nitrate retention. We expect this approach to give decision makers one more tool in the consideration of dam removals; we will continue to explore avenues to distribute this information.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management

Outcome #20

1. Outcome Measures

Enhanced capacity of land trust organizations and agency personnel to manage and protect amphibian and reptile populations from the effects of forest loss and pollution. Indicators are number of peer-reviewed scientific publications and presentations to conservation organizations and at scientific meetings.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Globally, nearly 30% of amphibians and 40% of reptiles are threatened due to a number of factors, but forest loss and degradation are considered to be the greatest contributors. This study examines three important types of forest impacts--outright loss, partial development, and contamination by pollutants--for their effects on amphibian and reptile populations. These issues are important to the public, scientists, and land managers as they affect our ability to sustainably manage natural resources.

What has been done
We quantified the amount of forest needed to protect stream-breeding amphibians by studying their movements and habitat use adjacent to streams, as well as survival rates in each habitat type. We studied how partial development of forest habitats affects snake populations by tracking their movements and survival in habitats impacted and unimpacted by humans. We are finishing the final project examining how pollutants from roads impact wetland amphibians by documenting transport of salts to wetlands and the status of amphibian and reptile populations in those wetlands. We have published several papers now and have given presentations to multiple public groups, scientists at multiple universities, and land managers in the state.

Results
We are completing our final analyses on each of these studies. We determined that stream-breeding amphibians spend the majority of their time in adjacent forested landscapes within 113 m of their breeding habitats suggesting that terrestrial habitats are essential for maintaining viable populations. Survival is positively associated with the extent of intact forest cover around a breeding site, and loss of 50% of forested habitat adjacent to streams was associated with lower survival and smaller population sizes. Snake populations in partially developed areas exhibit high levels of mortality compared with those in undeveloped areas, because of human-wildlife conflict and road mortality. Finally, salt concentrations in wetlands appear to affect the distributions of amphibians on the landscape, but we suspect that distributions are more closely linked to road density and associated mortality than to pollution from road salt. Turtle distributions do not seem to be affected by road salt. We expect that this work will be used by land trust organizations and state agency personnel to adjust the ways that amphibian and reptile populations are managed.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
135	Aquatic and Terrestrial Wildlife
136	Conservation of Biological Diversity

Outcome #21

1. Outcome Measures

Enhanced capacity of land trust organizations, government agencies, and private landowners to manage and protect turtle populations from the effects of forest fragmentation. Indicators are number of peer-reviewed scientific publications and presentations to the public and conservation organizations and at scientific meetings.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
There is a need to create more early-successional habitats in southern New England for species dependent upon this habitat type, yet increased forest management activities may negatively impact wildlife species that require large contiguous patches of mature forest, such as some turtles and amphibians. The objective of this project is to evaluate the impacts of forest fragmentation, caused by residential development and creation of early-successional habitats, on turtle populations. This project has been expanded to include amphibians. We will use the results of this study to help guide forest management in Rhode Island by working with natural resource agencies, land conservation trusts, and private landowners.

What has been done
We are finishing analyzing the original dataset and have submitted one paper for publication and have given a number of presentations to scientists and land managers within the state and nationally, as well as to interested public groups. We completed genetic sequencing (from internal funding leveraged against this USDA funding) for over 800 blood samples from two different turtle species, one common and widespread and the other rare and declining, to quantify gene flow among populations and identify barriers to gene flow that may include fragmented forests and roads.

Results
We found that creation of early successional habitats may be compatible with mantaining populations of the rare spotted turtle. Spotted turtles occur only in areas with higher forest cover and lower forest fragmentation, but eastern painted turtles and common snapping turtles are not influenced by forest fragmentation. Presence of the invasive red-eared slider was positively associated with road density. Preliminary results of the gene flow study suggests that forest fragmentation and roads are not barriers to gene flow in painted turtle populations, but may be for spotted turtle populations. We anticipate that this information will be used by land managers and state regulators to protect turtle populations.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
123	Management and Sustainability of Forest Resources
135	Aquatic and Terrestrial Wildlife
136	Conservation of Biological Diversity

Outcome #22

1. Outcome Measures

Improved understanding of seismic hazards along the coastlines of North America to improve assessment of this hazard to coastal environments, including coastal communities and coastal agriculture.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Earthquakes pose a risk to the maintenance of agriculture through the subsidence experienced during megathrust earthquakes (up to 1m along the Oregon coast and perhaps 1.5-2.0m in Washington) and the threat from tsunami inundation. Depending on the magnitude, sudden subsidence combined with tsunami inundation will likely destroy levees used in coastal Oregon to protect agricultural land that has been reclaimed from coastal marshes. Tsunami inundation will transport significant salinity and contaminants into the low-lying agricultural land that may compromise its use without significant remediation. A prime example is the Tillamook Estuary ($117 million dollars of agricultural products sold in 2012), where almost all the agricultural land lies within inundation zones based on worst-case scenario modeling but further understanding of recurrence intervals and magnitudes will enable more accurate forecasting of likely inundation and the threat to agriculture. Total coastal agriculture production is estimated at $213 million for coastal Oregon alone.

What has been done

We have undertaken fieldwork at sites in Washington and Alaska to better understand the seismic hazard. Research in Washington in Summer 2016 focused on sites in northern Washington from Neah Bay on in northwestern Washington to Discovery Bay near Seattle and Tacoma. Samples

are back at URI and in the process of being analyzed. Research in Alaska focused on a possible seismic gap in the Shumagin Islands at Unga. We have continued to analyze samples from prior seasons from southern Washington, Oregon, northern California, as well as Kodiak Island, Alaska. The research has involved at myself, one graduate student working directly on a thesis related to the project, and two graduate students who were exposed to the project through fieldwork.

Results

We published three papers. Two focused on seismic hazard through time in Alaska at two sites, Chirikof Island (Nelson et al., 2015) and Sedanka Island (Witter et al., 2016). A particularly interesting result from both these papers was tsunami recurrence intervals much shorter than suggested by seismic hazard maps. The third paper focused on seismic hazard through time in southern Oregon at South Slough (Milker et al., 2016). In this paper, we estimated the amount of land subsidence during at least six previous earthquakes recorded at this site. We show that the amount of subsidence varies and that not all earthquakes appear to show the same amounts.

4. Associated Knowledge Areas

KA Code	Knowledge Area
132	Weather and Climate
608	Community Resource Planning and Development

Outcome #23

1. Outcome Measures

Improved understanding of the factors that influence public acceptance of the Block Island Wind Farm. Indicator is number of publications and presentations.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Around the world, countries have turned to the ocean for the generation of energy, particularly through the placement of wind turbines offshore. The U.S. has finally entered this market with the completion of the Block Island Wind Farm, a 30-MW demonstration project located three miles off the coast of Rhode Island. A federal strategy document released last fall sets a lofty goal of producing 86 GW of offshore wind energy in the U.S. by 2050. It is widely acknowledged that the widespread deployment of renewable energy technologies requires social acceptance as much as technical know-how. Therefore, it is critical to understand public responses to offshore wind energy projects. This project builds on a growing literature on public acceptance of renewable energy, seeking to understand how various social-psychological factors influence support for the Block Island Wind Farm.

What has been done
An intercept survey was conducted with visitors, seasonal residents, and full-time residents on Block Island in the summers of 2015 and 2016. More than 1,000 surveys have been completed to date.

Results
"Analysis is ongoing. Preliminary results have been presented in public lectures and professional academic meetings. These include: Bidwell, D. 2016. "Wind farm

support among Block Island visitors and seasonal residents in 2015 and 2016." Poster. American Wind Energy Association, Offshore Wind Conference, Warwick, Rhode Island, October 25-26, 2016.

Bidwell, D. 2016. "Ocean meanings and support for offshore wind farms in the United States." Energy and Society Network: Transforming Energy for Society. Leipzig, Germany, September 12-14, 2016.

Bidwell, D. 2016. "Ocean meanings and support for an offshore wind farm." Social Coast Forum, Charleston, SC, February 10, 2016.

4. Associated Knowledge Areas

KA Code	Knowledge Area
605	Natural Resource and Environmental Economics

Outcome #24

1. Outcome Measures

Enhance understanding of the tradeoffs between alternative groundwater management regimes to improve decisions by irrigators and policymakers. Indicator is number of publications and presentations.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Groundwater managers and farmers and anyone dependent on shared aquifers have vested interests in how that shared resource is managed and allocated. Many aquifers are being

depleted and some irrigators and municipal supplies must look to additional supplies of water in arid locations. We evaluate potential policies for groundwater management to understand where there can be large increases in welfare by changing institutions, and understand what the causal forces are to improve welfare of water users.

What has been done
Faculty and co-authors that include graduate students, including members of other disciplines(Hydrology) have written four papers relevant to this issue. We have developed a new analytic framework to understand how groundwater usage and technology adoption affects groundwater quality. We have run experiments to understand the value of water relative to current standards, or the endowments related to water quality. We used agent-based models to test a variety of simple policies in a spatial explicit aquifer.

Results
We found a number of important and interesting dilemmas. We found that simple water markets perform very poorly compared to other simple tax or quota policies in a spatially explicit model and that value for water quality improvements diverges greatly relative to current standards. We also found that the value of information for regulating water quality affects outcomes in expected ways, and that more information leads to better social outcomes and more efficient policy.

4. Associated Knowledge Areas

KA Code	Knowledge Area
605	Natural Resource and Environmental Economics
608	Community Resource Planning and Development

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
- Populations changes (immigration, new cultural groupings, etc.)
- Other (human behavior)

Brief Explanation

1. Tom Mather (CoopExt)
We have not had the personnel or financial means to assess the impact of our crowd-sourced tick encounter survey. Anecdotally, we receive back email replies from 5-10% of recipients of our tailored response; these email replies frequently report the person's intention to modify their tick prevention practice or behavior based on our outreach material.
Outcome #2
We expected to see greater growth in web-based traffic but the analytics reveal an

increasing trend in mobile access. Our TickEncounter web-site and some of the most popular tools are not completely mobile friendly and this has increased the bounce rate from our site by the increasing number of mobile-only web users.

Outcome #3

Individuals attend our classes on a pay fee basis, and these received funds are used to fund our outreach activities. Although we've achieved our outcome, the RI building economy has been in a slump since 2008. This has placed a financial strain upon OWTS practitioners who must take continuing education classes so they can continue to maintain their professional wastewater licenses. An upswing in the Rhode Island building economy will likely result in more wastewater professionals seeking continuing education credits to maintain their professional licenses. This will likely increase our training class attendance.

Outcome #4

Outcomes were generally as expected. It is proving more and more difficult to garner external grants. Program Director Linda Green is now 0.8 FTE, partially due to this situation, and partly for personal reasons. We have noticed that since the economic downturn and reduction in newspaper readership it is becoming more challenging to reach potential volunteers. Many potential (and actual) volunteers are not social media savvy.

Outcome #11

External grant funding to support the development of the lecture series would significantly impact our ability to reach a broader audience with dedicated staff working on publicity and networking.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Outcome #3

- **Did you evaluate your program?**

Our indicators of impact (noted below) help us gauge our program's effectiveness.

- **What were the results of the evaluation?** Practitioners trained and professional licenses maintained - We trained 450 wastewater practitioners in the New England region enabling them to gain a new wastewater license or retain their existing one. Expansion of employment opportunities - Twenty-five onsite wastewater professionals took the URI wastewater 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. Nine professionals passed their inspector class and exam in Suffolk County, NY. Thirty-six professionals took required classes needed to receive RI or MA regulatory agency permission to design and install bottomless sand filters. Twelve onsite wastewater professionals took the URI installer preparation course to prepare them for the RIDEM installers licensing exam - 9 passed the exam and received an installer's license, required to install OWTS in RI. Four onsite wastewater professionals took the URI course to prepare them for the RIDEM designer licensing exam, of which 3 passed the exam and received a designer's license, required to design OWTS in RI.

Outcome #4

- **Did you evaluate your program?** We did not conduct a formal evaluation this year.
- **What were the results of the evaluation?** Although we did not conduct a formal evaluation, we do so informally. We track how many people attend our training sessions and as a result become bona fide volunteer water quality monitors. It is 75-80%. We do

annually track the retention of our volunteers and know how many, and who, have been monitoring for X years. We have an average 66% retention rate for volunteers between their first and second years. It is 88% by their fifth year, 92% for their tenth year, 92% for their fifteenth year. We have 25 twenty-plus year volunteers. Indirect evidence of success is that URIWW Program Director Linda Green received the 2016 RI Natural History Survey "Distinguished Naturalist" award. Additionally, she was designated a CELS "Big Thinker" award and featured on the website.

Outcome #5

- **Did you evaluate your program?**

Yes, we evaluated the program and program development in several ways during this reporting period:
1. We ask workshop participants to complete a program evaluation at the end of the workshop. The evaluation tells us how they "liked" the program, what topics we discussed were important or not important to them; and what actions they may take at home to protect their drinking water quality based on what they learned. We compile and review the workshop evaluations and make changes to our workshop presentation and format based on this review.
2. Conducted annual mail survey of workshop participants to determine what actions they took to protect their drinking water quality as a result of coming to Program's community workshop. These results are summarized on our website here:
http://web.uri.edu/safewater/files/Workshop_ImpactSummary.pdf.
3. We use an IRB-approved audience testing procedure when developing educational tip sheets and other materials related to the project. Our method assures that we provide our audience with information that is clear, easy to understand and that they can act on.

- **What were the results of the evaluation?**

Mail survey evaluation results indicate that workshop participants are taking action to protect their private well. Most notably:
1. Results for 2015 indicate that 76% of workshop participants had their water tested and 77% inspected their wellhead area for possible pollution problems. See impact summary here:
http://web.uri.edu/safewater/files/Workshop_ImpactSummary.pdf
2. In 2014, we began to facilitate private well water testing at our educational workshops by arranging to pick up participant water samples a day or 2 after the workshop. We transport the samples to the RI Department of Health State Laboratories for the homeowner, thereby eliminating one of the identified barriers to testing. As a result, we have found an increase in testing among our workshop participants. During this reporting period 146 workshop participants had their well water tested via our facilitated testing process.

Outcome #6

- **Did you evaluate your program?** Yes, evaluations are conducted for all workshops. In addition, we evaluate effectiveness of E-news communication using open rate and click throughs.
- **What were the results of that evaluation?** Workshop attendees typically report satisfaction with workshops in the range of 4-4.5 on a scale of 1-5. The open and click through rate for E-news to municipal officials ranges from 20-26% for general informational notices such as webinars on municipal storm water topics, but is much higher for RI-specific information such as local workshop notices at 44- 50%.

Outcome #7

- **Did you evaluate your program?** Only informally

- **What were the results of that evaluation?** The fact that the articles that we wrote were published in peer-reviewed journals that focus on applied issues is an indicator that our research program is producing valuable results. Our forestry and wildlife outreach program resulted in 47 applications being submitted to URI for technical and financial support through our Regional Conservation Partnership Program (funded by USDA NRCS).

Outcome #9

- **Did you evaluate your program**? Participant evaluations were sought after each GIS training workshop. Feedback regarding the quality of the data and map distribution services is received through email and an online feedback form. Pertinent website statistics are accrued throughout the reporting period and compiled on an annual basis.
- **What were the results of that evaluation**? The primary indicators for our efforts are the number of contacts (hits) and the amount (Tb) of geospatial data downloaded from RREA-supported online data services. Since the release of the new RIGIS website on April 6, 2016, it served 10,248 new and returning users over the course of 17,380 browsing sessions. In comparison, the old RIGIS website served 10,694 users over 18,189 sessions during the time period April 6, 2015 - September 30, 2015. Feedback shared by our target audience mostly highlight how the new website is easier to use. Feedback also compliments the new "Maps" section that helps the website engage a broader audience, namely those who are not familiar with manipulating GIS data and simply want a map. Participant evaluations of the instructor-led GIS workshops have also been positive and we continue to use any constructive criticism to improve these workshops.

Outcome #11

- **Did you evaluate your program?** Each attendee at each of the six lectures offered in 2015 and 2016 were given an evaluation to complete following the lecture. In 2015, of the 93 attendees, we received 21 evaluations back (return rate of ~22.5%). In 2016, of 196 attendees, we received 60 evaluations back (return rate of ~30.6%).
- **What were the results of that evaluation?** --21 attendees who completed an evaluation after the 2015 lectures reported that the knowledge they gained was encouraging towards a shift in their own behaviors related to sustainable transportation behaviors, seek out academic opportunities in energy, and pass on information about efficiency to their peers. --60 attendees who completed an evaluation after the 2016 lectures reported on behavioral changes they'd make as a result of the information they gained at each lecture. This feedback was sorted into three categories: knowledge gained, awareness raised, and intent to change behavior. 30% of attendees reported gaining new knowledge, 17% reported an increase in awareness as a result of the lecture they attended and the information introduced, and 20% reported that they intended to change their behavior related to the lecture topics (e.g. using Energy Star Portfolio Manager to track energy consumption). The lecture series sought to encourage one or all of these changes in attendees, and evaluation results prove our marginal success in doing so. Overall, attendees reported interest in future programming around solar, geothermal and hydroelectric energy generation technologies and their applicability in Rhode Island.

Outcome #12

- **Did you evaluate your program?** In 2015 and 2016, the Energy Fellows Program evaluation sought to collect data about job placement in energy post-fellowship. Seeking additional information about the effectiveness of the professional development-related elements of the program was also designed for implementation in 2017. The pre- and post-tests seek to measure student confidence before and after the fellowship in a number

of soft skill categories including professionalism, leadership and working in a team.

- **What were the results of that evaluation?** Of the eleven 2015 Energy Fellows Program graduates, seven took full-time jobs in energy-related positions including at Newport Solar, Commerce RI, WegoWise, Brainjuicer, RI Department of Environmental Management and RI National Guard. Additionally, the graduate student completed his degree with an energy benchmarking and consumption analysis-themed thesis.

Key Items of Evaluation

Our Cooperative Extension programs focused on water quality are very successful. Our GIS extension program supports the work of land managers across the state.

V(A). Planned Program (Summary)

Program # 4

1. Name of the Planned Program

Youth, Family and Communities

☑ 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
601	Economics of Agricultural Production and Farm Management	12%		25%	
602	Business Management, Finance, and Taxation	13%		25%	
802	Human Development and Family Well-Being	0%		50%	
806	Youth Development	75%		0%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2016	Extension		Research	
	1862	1890	1862	1890
Plan	3.0	0.0	0.0	0.0
Actual Paid	3.1	0.0	0.2	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**
168089	0	49513	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
94006	0	42335	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

4-H
Forge academic connections to strengthen 4-H curricula, provide undergraduate experiential learning opportunities, increase program research base and utilize evaluation expertise to measure impacts and improve programs.
Connect target audience to 4-H educational programs though workshops, web-based training and newsletters, 4-H volunteer training and curriculum guides (train the trainer).
Develop resources and information to connect youth and families to community and land-grant resources (4-H to serve as portal).

Expansion of the 4-H club system into currently underrepresented, urbanized areas of the state and creation of a state-wide network of 4-H science enrichment after school programs that serve as a catalyst for improving the science based knowledge, skills and academic motivation among urban elementary and middle school students.

Sustainable Communities
Study and promote commercial farm viability.

Promote responsible stewardship of agricultural lands.

Work with municipalities and community members to manage natural and economic resources wisely.

Teach and promote sustainable development techniques and management to communities.

2. Brief description of the target audience

4-H
Youth 5-18 years of age, parents of targeted youth, community-based family-serving agencies and organizations, volunteers

Sustainable Communities
Farmers/ farm organizations, RI Department of Environmental Management (RI DEM) Division of Agriculture, RI Center for Agricultural Promotion and Education, Rhode Island Agricultural Partnership, other agricultural service providers, tourism councils and tourism businesses, land trusts, policy makers and municipal leaders, grassroots and community organizations

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2016	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	4230	518730	3045	7400

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

Patent Applications Submitted

Year: 2016

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2016	Extension	Research	Total
Actual	0	1	1

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of workshops (including short courses)

Year	Actual
2016	165

Output #2

Output Measure

- Number of volunteers trained

Year	Actual
2016	710

Output #3

Output Measure

- Number of 4-H record books

Year	Actual

2016	142

Output #4

Output Measure

- Number of youth reached through programs

Year	Actual
2016	1882

Output #5

Output Measure

- Number of community/family serving groups reached

Year	Actual
2016	45

Output #6

Output Measure

- Number of community service projects

Year	Actual
2016	86

Output #7

Output Measure

- Number of activities and programs

Year	Actual
2016	113

Output #8

Output Measure

- Number of students trained

Year	Actual
2016	154

Output #9

Output Measure

- Number of websites developed and/or refined

Year	Actual
2016	6

Output #10

Output Measure

- Number of curricula developed and delivered

Year	Actual
2016	8

Output #11

Output Measure

- Number of professional training sessions completed

Year	Actual
2016	21

Output #12

Output Measure

- Number of public presentations

Year	Actual
2016	57

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	RI 4-H club members demonstrate increased knowledge and skills related to science and health. Indicator is percentage of 4-H club members participating in science and health projects who demonstrated increases in knowledge and skills.
2	RI 4-H club members demonstrate increased commitment to, and understanding of, their communities. Indicators are number of 4-H club members participating in community service projects and number of community service hours completed by 4-H club members.
3	RI 4-H Club members apply leadership skills (e.g. public speaking, project leadership) to make a positive difference in their schools and communities. Indicator is percentage of 4-H club members who exhibited increased leadership skills.
4	Viability of agriculture in the state of Rhode Island and in southern New England is strengthened. Indicators are number of training sessions conducted that address issues related to sustainable agriculture, value-added products and/or agri-tourism and percentage of participants that report intent to implement new ideas, behaviors or practices.
5	Improved understanding of how American households make financial decisions.

Outcome #1

1. Outcome Measures

RI 4-H club members demonstrate increased knowledge and skills related to science and health. Indicator is percentage of 4-H club members participating in science and health projects who demonstrated increases in knowledge and skills.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Out-of-school educational programs provide youth with a safe, supportive environment for developing academic and life skills. Research shows that structured learning, encouragement and adult mentoring that young people receive through their participation in 4-H, plays a vital role in helping them achieve success in life. Research also shows that children of underrepresented audiences do not excel in math and science classes. Science and Healthy Lifestyles programming is a major focus of the RI 4-H club system, after school programming through SPIN (special interest) groups and military 4-H Clubs

What has been done
A significant number of 4-H programs, workshops, activities and events focus on science and health enrichment programs including animal science, sustainability, horticulture, science and healthy lifestyles. Volunteer trainings and youth-adult workshops in science and healthy lifestyles provide youth with opportunities to increase their knowledge and skills and apply them in informal, adult-mentored settings where they receive positive feedback and reinforcement. In FY16, we increased the use of 4-H Kits, resulting in the expansion of our 4-H special interest programs. Kits are very popular with libraries, teachers and after-school providers.

Results
47.7% of 4-H Club members participating in science and health projects/programs, competitions, education series and workshops demonstrated an increase in knowledge. Spin Clubs expanded in FY16. Staff trained volunteers to use the Science and Healthy Lifestyles Kits in under-served communities resulting in 1215 additional youth participating in 4-H project work. Club Leaders were surveyed in FY16 and reported that "Due to 4-H activities," 45% of their club members increased their science skills.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #2

1. Outcome Measures

RI 4-H club members demonstrate increased commitment to, and understanding of, their communities. Indicators are number of 4-H club members participating in community service projects and number of community service hours completed by 4-H club members.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Many of today's youth lack opportunities to engage in positive out-of-school educational programs under the mentoring of caring adults who guide them in developing valuable life skills while aiding them in creating positive connections to the larger community and assisting them in successfully making the transition to becoming productive, contributing young adults.

What has been done
RI 4-H Clubs and after-school programs are expected to plan and conduct at least one community service project during the 4-H year as part of the Citizenship mission mandate. 4-H volunteers are provided with community service opportunities through the 4-H Listserv and connected to requests from citizens and community groups requiring assistance. 4-Hers may apply for financial support through the RI 4-H Foundation Club Grant program for their projects. Beyond serving their communities, 4-Hers document their individual community service hours through their 4-H Record Books.

Results
4-H Club Leaders from approximately half (17/35) of registered, active 4-H clubs (average 18 members per club) reported that their clubs completed four or more community service projects in FY16 resulting in 306 documented 4-H youth participating in four or more community service projects or a 49.8% (change in action) of the FY16 4-H club enrollment. This percentage only includes clubs who reported their end-of-year results. 142 4-Hers who submitted record books

(23% of 4-H club enrollments) in FY16 reported 4863 community service hours or an average of 34 hours per 4-H member (no results are available on 4-Hers who did not submit record books to the State 4-H Office).

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #3

1. Outcome Measures

RI 4-H Club members apply leadership skills (e.g. public speaking, project leadership) to make a positive difference in their schools and communities. Indicator is percentage of 4-H club members who exhibited increased leadership skills.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Many youth are lacking in school and family-centered opportunities and support to increase their communications and leadership skills. Youth need a safe and nurturing environment to test their abilities and receive constructive and supportive feedback. Encouragement by caring adults and positive peer support enable youth to develop confidence and incorporate these life skills into their school and community.

What has been done
4-H members are strongly encouraged to participate in the RI 4-H Public Presentations program at the club, district and state level. 4-H volunteers and staff provide training, competitive and noncompetitive speaking opportunities for 4-H youth of all ages. Besides District and State competitions, 4-H members participate in local events to educate the public including 4-H Foundation Events, District 4-H Fairs, Washington County Fair Farm School and local festivals. 4-H youth practice and improve their leadership skills in their 4-H clubs and at 4-H events and programs on the State level and at Eastern States Exposition.

Results

307 4-H youth or 50% of active 4-H club members participated in district and state public presentation programs, 4-H Farm School, Eastern States Exposition and other state level public events promoting 4-H (numbers are not available for local level). 4-H teens demonstrated their leadership ability by assuming major roles at 4-H Fairs, and at state and New England animal science programs. 4-Hers also actively participated in communication and leadership training. 4-H club volunteers from 49% of active clubs reported that in FY16, 54% of their youth exhibited increased leadership skills as a result of their 4-H experience and 85% of the clubs reporting had active Club youth officers. 142 4-H members who submitted recorded books reported a total of 3126 4-H leadership hours or an average of 22 hours per member

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #4

1. Outcome Measures

Viability of agriculture in the state of Rhode Island and in southern New England is strengthened. Indicators are number of training sessions conducted that address issues related to sustainable agriculture, value-added products and/or agri-tourism and percentage of participants that report intent to implement new ideas, behaviors or practices.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Farmers care about the quality and safety of their farm products, and availability of information that will support their efforts to operate viable businesses now and in the future. The 2012 Ag Census reported 243 vegetable farms in RI, with 2,217 acres in vegetables. Consumers care about having the ability to obtain fresh, safe, locally grown agricultural food and non-food products. They also value open space, environmental quality, and the working landscape.

What has been done

We engage in ongoing efforts to establish new relationships and deepen existing ones with the commercial agricultural producers of Rhode Island. We accomplish this through a combination of local industry group organizing, seasonal workshops, broadcast announcements via email, direct consultation (on-farm, telephone, email), on-farm collaborations, partnering with in-state agricultural service organizations, and Northeast regional networking.

We address the needs of individuals working in all sectors (vegetables, small fruit/berry, tree fruit, forage crop and pasture, nursery and landscape, and urban growing enterprises) regarding pest management, production practices, and soil health, and direct them to appropriate resources or individuals concerning business management, marketing, financing, insurance, land acquisition/leasing, and food safety regulations. We are members of committees that regularly update New England-wide Cooperative Extension Production Guides (Vegetable, Small Fruit, Tree Fruit).

We provide weekly Pest Updates (via email) to vegetable and fruit producers, along with notifications of workshops in RI and throughout New England, opportunities for financing and program participation, and other notices useful to our stakeholders. We also maintain websites for fruit IPM and the RI Fruit Growers Association.

We present several workshops yearly on timely production issues in all sectors that we engage. For specific issues, we recruit experts in various fields, but we also share our own expertise in several subject areas using original presentation materials. We also present at workshops put on by various organizations and institutions when requested.

Partnering within RI, we are involved in the following organizations, committees, and programs: the RI Agricultural Partnership, the RI Agricultural Council, the RI Farm Bureau, the NRCS State Technical Committee, the Young Farmers Network, Southside Community Land Trust, Groundworks Providence, the African Alliance of RI, the RI Fruit Growers Association (and its Farm Scavenger Hunt), the RI Greenhouse Growers Association, the GAP Certification Advisory Committee, RI Agricultural Energy Program (RIAgE), RI Envirothon, Cooperative Agricultural Pest Survey (CAPS), the RI Invasive Species Council, and the RI Nursery and Landscape Association (RINLA). We also maintain contact with staff of the three Conservation Districts in the state.

Regionally, we serve on the steering committees of the biennial Northeast Vegetable and Fruit Conference and the Northeast Region Certified Crop Advisers. We participate in the Northeast IPM Pest Scouting Network, Northeast SARE, Spotted Wing Drosophila Working Group, Small Fruit Working Group, and Tree Fruit Working Group.

We regularly attend workshops and conferences to deepen our knowledge in some fields and to expand expertise in other areas in order to address the needs of more RI producers."

Results

Selected results specifically from the past year: 1) Started holding annual meeting specifically for small fruit topics; 2) Began working with RI Christmas Tree Growers Assn; 3) Reestablished relationships with the potato farming community, comprised of over 750 acres of crop land; 4) Developed and delivered a new pest management curriculum in four class sessions for small scale urban growers; 5) Established new working relationships with several young farm operators; 6) Over 35,000 new views (over reporting period) of Youtube videos uploaded in 2014; 7)Total of

21 appearances in public media (newspaper, radio, television); 8) Variety trial reports published on our digital commons website were downloaded 2,225 times.

4. Associated Knowledge Areas

KA Code	Knowledge Area
601	Economics of Agricultural Production and Farm Management
602	Business Management, Finance, and Taxation

Outcome #5

1. Outcome Measures

Improved understanding of how American households make financial decisions.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

American households face a great number of complex and crucial financial decision affecting their present and future wellbeing. Factors such as financial knowledge, cognitive biases, and availability of information affect the quality of these financial decisions. This research project is designed to develop a better understanding of motivators and barriers affecting family financial decisions and strategies to improve financial well-being. During the fiscal year of 2016, the team focused on student loans, a topic of increasing relevance in the financial lives of many households.

What has been done

The fiscal year of 2016 was dedicated to the Student Loan Experimental Group. This group developed an online survey with an experimental design component aimed at understanding how people value college and student loans. Five subgroups were created based on the topic, all of which would analyze the over 1,600 experimental data collected in 2015. They are Main, Methodology, Gender, Race, and Cohort. I am actively involved with both the Methodology and Race subgroups while also having limited participation with the Main subgroup.

Results

1. A symposium presentation was given at the 2016 annual conference of the American Council on Consumer Interests.
2. An invited presentation was given at the April 2016 Georgia Consortium for Financial Literacy meeting in Atlanta, GA.
3.Paper published in the Family & Consumer Sciences Research Journal
4. New data set was created on Housing and Retirement Decisions of Young Adults 5. Annual meeting in Arlingont, VA. 6. Retirement and housing decisions will be the focus for the next fiscal year

4. Associated Knowledge Areas

KA Code	Knowledge Area
802	Human Development and Family Well-Being

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
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

Outcome #1

It is difficult to measure the learning that occurs within the 4-H club setting and through adult mentoring with 4-H members especially within the 4-H animal science programs - in gathering data for the calculation of the percent increase in knowledge, only data collected by 4-H Staff at state level programs and events was used. It is likely that the percent increase would be larger if there were measurements at the club level.

Outcome#2

It is difficult to obtain accurate data from all 4-H clubs since some club leaders chose not to respond to State Office surveys. It is true in this case where only 17 clubs out of 35 responded to the survey which as for number of club community service projects for their club in FY16 - we have chosen the low number of 1 community service project per non-reporting club when calculating results for this outcome.

Outcome #3

As previously stated in Outcome #1, it is difficult to measure the learning that occurs within the 4-H club setting and through adult mentoring with 4-H members - in gathering data for the calculation of the percent increase in leadership skills , only data collected by 4-H Staff at state level programs and events were used. It is likely that the percent increase would be larger if there were measurements at the club level.

Outcome#4

While we usually have a field meeting at the Agronomy farm in late summer to show demonstration and research plots, we had to cancel this year's meeting because of a combination of difficult growing conditions and some unforeseen pest and technical problems. Nevertheless, we did publish some results in our RI Agricultural Experiment Station Digital Commons web portal. Conversely, our direct, on-farm contact with growers was stronger than ever this year.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Outcome #1

- **Did you evaluate your program for effectiveness this year?**

Yes, the increase of Knowledge (and skills) was documented through evaluations, observation and parent/leader/teacher surveys and feedback. Learning Lab Evaluations were given to teachers and others who used 4-H Science Kits - these results were not used in calculating the percent knowledge gained but are reported under evaluation results. Also a Common Measures tool was use at the Natural Science Night - results of survey are reported in the evaluation results.

- **What were the results of that evaluation?**

Additional Evaluation Results utilizing Common Measures items. Teachers using the 4-H Science Learning labs survey results: 88% of teachers reported an increase in student knowledge and that this program was very effective in improving student attitudes towards science. Youth survey results at the 4-H Natural Science Nights: 51% of youth wanted to learn more about science as a result of this 4-H experience; 100% stated they like experimenting and testing ideas as a result of this program: 64% said they were interested in jobs related to science and 100% were able to demonstrate 3 new things they learned as a result of this 4-h experience.

Outcome#2

- **Did you evaluate your program for effectiveness this year?**

No in-depth evaluation studies were conducted for citizenship - 4-H club leaders were surveyed and record books were evaluated to determine level of participation in citizenship/community service project.

Outcome #3

- **Did you evaluate your program for effectiveness this year?**

Yes, the increase in knowledge and skills was documented through evaluations, observation documentation through record books and parent/leader/teacher surveys and feedback. In addition to the data collected on 4-H club members**.**

- **What were the results of that evaluation?**

No additional data are available except for what is reported in the Results Section.

Outcome#4

- **Did you evaluate your program?** --Educational meetings were evaluated individually
- **What were the results of that evaluation?** - All meetings that we present result in overwhelmingly positive reviews. In general, all attendees at our programs report increased knowledge from information presented. It is, however, difficult for us to determine if the knowledge gained is applied in the use of improved practices, though we sometimes do observe their application during farm visits.

Key Items of Evaluation

The use of 4-H Science Kits by teachers and other after school program administrators is an effective mechanism for increasing interest in science by youth.
Programs offered to Rhode Island agricultural producers are valued by our stakeholders.

V(A). Planned Program (Summary)

Program # 5

1. Name of the Planned Program

International Programs

☑ 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
606	International Trade and Development	50%		50%	
611	Foreign Policy and Programs	50%		50%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2016	Extension		Research	
	1862	1890	1862	1890
Plan	0.5	0.0	0.5	0.0
Actual Paid	1.0	0.0	0.4	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**
52287	0	0	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
57129	0	53642	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

Develop a demonstration nursery and associated practices for production and maintenance of saline tolerant landscape and food crop plants in Tianjin China and associated ecotone regions.

Plan and implement programs for expanded phytoremediation applications to other disturbed soils and regions where foundry or manufacturing have added complex heavy metal and salinity environmental compromises.

Develop and promulgate a sustainable fisheries programs in the Gambia and Senegal.

Assist international fishers; increase value of fishing products in domestic foreign markets.

Create scientist and student exchange programs with foreign institutions, countries, agencies and companies.

Assist partners in international projects.

2. Brief description of the target audience

Foreign universities; governments; government officials; policy makers; international business collaborators and producers; international students; RIAES scientists; RICE extension educators; URI students

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2016	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	86	250	0	0

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

Patent Applications Submitted

Year:	2016
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2016	Extension	Research	Total
Actual	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of technical documents, fact sheets, bulletins and newsletters

Year	Actual
2016	5

Output #2

Output Measure

- Number of training manuals (includes instructional CDs)

Year	Actual
2016	0

Output #3

Output Measure

- Number of scientific/professional presentations

Year	Actual
2016	2

Output #4

Output Measure

- Number of workshops (including short courses)

Year	Actual
2016	3

Output #5

Output Measure

- Number of conferences hosted

Year	Actual
2016	0

Output #6

Output Measure

- Number of websites developed and/or refined

Year	Actual
2016	1

Output #7

Output Measure

- Number of public presentations

Year	Actual
2016	2

Output #8

Output Measure

- Number of students trained

Year	Actual
2016	1

Output #9

Output Measure

- Number of theses/dissertations completed

Year	Actual
2016	4

Output #10

Output Measure

- Number of postdoctoral scientists trained

Year	Actual
2016	0

Output #11

Output Measure

- Number of volunteers trained

Year	Actual
2016	0

Output #12

Output Measure

- Number of intervention studies

Year	Actual
2016	0

Output #13

Output Measure

- Number of social marketing actions/activities

Year	Actual
2016	0

Output #14

Output Measure

- Number of video productions

Year	Actual
2016	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Chinese farmers apply new knowledge and technology to improve local food production. Indicator is number of new salt-tolerant vegetables and grasses grown by local farmers.
2	Artisanal fisheries ecosystems in the Gambia and selected stocks shared with Senegal are managed more sustainably. Indicator is number of new sustainable fishery management plans.
3	Artisinal fisheries ecosystems in selected African countries are managed more sustainably. Indicator is number of new sustainable fishery management plans.

Outcome #1

1. Outcome Measures

Chinese farmers apply new knowledge and technology to improve local food production. Indicator is number of new salt-tolerant vegetables and grasses grown by local farmers.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Farmers and other land managers recognize the need to improve soil stewardship and productivity. Party and government officials along with University colleagues have visited demonstrations and held meetings as they have clear obligations under 5 year planning process

What has been done
Demonstration plantings have continued in Tianjin and at Caofeindian sites to allow parties to visualize under attainable management practices how the introduced materials survive and thrive. Additional management protocols have been implemented to increase performance beyond the minimum. These include variation in fertilizer types and implementation of different mowing conditions and equipment.

Results
Some practices are being applied in nursery areas other than the demonstration sites. I believe this reflects adoption and use. Turf grasses shown to be successful have been repeatedly harvested for sprig source and planted at locations elsewhere. These materials have been reported as doing well but I have not been able to affirm or rate them directly.

4. Associated Knowledge Areas

KA Code	Knowledge Area
606	International Trade and Development
611	Foreign Policy and Programs

Outcome #2

1. Outcome Measures

Artisanal fisheries ecosystems in the Gambia and selected stocks shared with Senegal are managed more sustainably. Indicator is number of new sustainable fishery management plans.

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

Artisinal fisheries ecosystems in selected African countries are managed more sustainably. Indicator is number of new sustainable fishery management plans.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The worldwide fisheries sector struggles to balance the need for food with sustainable fishing practices. Over the past decade, more than 100,000MT of high quality, low-cost animal protein that was traditionally available to poor and vulnerable coastal and inland households has been lost. Local demand for fish outstrips supply, increasing the pressure on already overexploited fish stocks. With open access fisheries, overcapacity among fishing fleets, and little or no fisheries management controls or effective enforcement of regulations, individual fishermen and women are losing economic ground while regional and national food insecurity increases. A weak institutional framework limits the ability to implement strong co-management and use rights.

What has been done
Research was conducted in the Gambia to explore the value of modifications to the supply chain for sole, specifically the use of ice and ice coolers on fishing boats. Leadership training was conducted in Ghana to develop competencies and a stronger team of leaders to improve the small pelagics fishery in that country. Collaborative research was also conducted to survey local knowledge of cuttlefish. Leadership training was conducted in Malawi around usipa management. A survey of local knowledge and stock assessment of usipa was conducted in

Malawi.

Results

Evidence suggests that, on average, ice onboard fishing vessels reduces post-harvest loss of fish, but for most fishermen, the cost of ice exceeds the difference in income earned creating no economic incentive to purchase ice. However, non-monetary benefits are valued by fishermen and others within the supply chain. Ice and ice coolers contribute to overall boat cleanliness and hygiene, prevent injuries on deck, make off-loading fish quicker, and increase overall work efficiency. Leadership training for 27 individuals in Ghana resulted in new knowledge and insights for fisheries management. At the conclusion of the course, participants drafted a vision for eliminating chemicals from fishing and processing, created strategies for developing participatory fisheries management plans in the Ankobra and Pra estuaries, and committed to working as a team informally to build from their unique positions throughout the fishery system. Surveys of local knowledge and stock assessments will be used to develop fisheries management plans going forward.

4. Associated Knowledge Areas

KA Code	Knowledge Area
606	International Trade and Development
611	Foreign Policy and Programs

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Public Policy changes
- Government Regulations
- Competing Public priorities
- Populations changes (immigration, new cultural groupings, etc.)
- Other (International travel)

Brief Explanation

1. Outcome #1

Cultural differences and communication barriers prevented progress in as timely fashion as I might have hoped for in initial stages.

1. Outcome #2

The Gambia has had a difficult transition from the presidential dictatorship previously in place. A new president will take office in 2017, and once the situation has normalized, we will travel to complete the work.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Outcome#2

- **Did you evaluate your program (or project) for effectiveness this year?**

Yes.

- **What were the results of that evaluation?**

Two fisheries management plans have been developed in the Gambia for sole and catfish and oysters; A management plan was developed in Senegal for sardinella; A management plan was developed for sardinella stocks in Ghana and management options are being discussed; a draft management plan for usipa is under review.

Key Items of Evaluation

URI is contributing to global food security by providing leadership development and training to fisheries managers in Africa. Many of these countries are at risk due to overfishing and depletion of fisheries.

V(A). Planned Program (Summary)

Program # 6

1. Name of the Planned Program

CELS CARES

☑ 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
902	Administration of Projects and Programs	100%		100%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2016	Extension		Research	
	1862	1890	1862	1890
Plan	3.0	0.0	8.0	0.0
Actual Paid	6.3	0.0	8.3	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**
318736	0	515782	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
452628	0	387578	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

- RIAES and RICE staff work with faculty to develop innovative, integrated approaches that meet the

needs of state stakeholders.
- Proposals are evaluated by internal university teams and external peers.
- Resources are distributed using a merit based system.
- RIAES and RICE staff track and monitor investments for maximum impact.

2. Brief description of the target audience

Academic faculty, university staff, graduate students, undergraduate students, university administrators, RIAES scientists, RICE personnel.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2016	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	0	0	0	0

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

Patent Applications Submitted

Year:	2016
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2016	Extension	Research	Total
Actual	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of proposals submitted

Year	Actual

2016	160

Output #2

Output Measure

- Number of proposals funded

Year	Actual
2016	104

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	University of Rhode Island scientists, faculty, and staff supported by CELS CARES will leverage the investment of Land-Grant funds to attract extramural funding.

Outcome #1

1. Outcome Measures

University of Rhode Island scientists, faculty, and staff supported by CELS CARES will leverage the investment of Land-Grant funds to attract extramural funding.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
CELS CARES was developed as an administrative program for the allocation of land-grant funds within the University of Rhode Island. The expected outcome was to build human capital and research infrastructure to boost competitiveness for external funding and expand the scope of integrated activities.

What has been done
Faculty, University scientists, and staff were allocated Land grant funds that supported the Rhode Island Plan of Work. Land grant funds were also dedicated to administrative staff who support and oversee our Planned Programs. These investments were used to ensure quality and impact of funded activities and to leverage external, competitively-funded grants.

Results
In the past year, CELS scientists, faculty and staff submitted 160 grant proposals and had 104 grant proposals funded from state, federal and private sources. These proposals were valued at $17.3 million.

4. Associated Knowledge Areas

KA Code	Knowledge Area
902	Administration of Projects and Programs

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
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

Reductions in the federal research budget has increased the competitiveness for grant funds while decreasing the success faculty and staff have in securing extramural support. Uncertain state budgets and federal budget cuts continue to have a negative effect on service and program delivery. Last, the Land Grant allocation to the institution has not changed substantively in over 20 years. The buying power of this allocation has decreased 35% during the past two decades.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

We have reported evaluation results under each of our Planned Programs.

Key Items of Evaluation

n/a

VI. National Outcomes and Indicators

1. NIFA Selected Outcomes and Indicators

Childhood Obesity (Outcome 1, Indicator 1.c)	
454	Number of children and youth who reported eating more of healthy foods.
Climate Change (Outcome 1, Indicator 4)	
0	Number of new crop varieties, animal breeds, and genotypes whit climate adaptive traits.
Global Food Security and Hunger (Outcome 1, Indicator 4.a)	
0	Number of participants adopting best practices and technologies resulting in increased yield, reduced inputs, increased efficiency, increased economic return, and/or conservation of resources.
Global Food Security and Hunger (Outcome 2, Indicator 1)	
0	Number of new or improved innovations developed for food enterprises.
Food Safety (Outcome 1, Indicator 1)	
0	Number of viable technologies developed or modified for the detection and
Sustainable Energy (Outcome 3, Indicator 2)	
0	Number of farmers who adopted a dedicated bioenergy crop
Sustainable Energy (Outcome 3, Indicator 4)	
0	Tons of feedstocks delivered.