2017 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 (AES) and Rhode Island Cooperative Extension (Extension). These are collectively referred to as the land-grant programs at the University of Rhode Island (URI). The AES and Extension are collaborative elements within the College of the Environment and Life Sciences (CELS) at URI. Administrative oversight of the AES 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. 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.
The AES 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: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	20.0	0.0	36.0	0.0
Actual	19.6	0.0	16.0	0.0

II. Merit Review Process

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

- Combined External and Internal University Panel
- Expert Peer Review

2. Brief Explanation

Extension completed a comprehensive strategic planning process in FY 2017. The strategic plan may be viewed or downloaded from the Extension web portal (https://web.uri.edu/coopext/). Members of the strategic planning committee, which combined internal and external experts, examined current Extension programs for impact and relevance as they developed goals and objectives for the strategic plan. Goals and objectives from the new plan will be reflected in URI's next Plan of Work, which will be submitted to

NIFA in spring of 2019. We will also design and implement an evaluation process to document evidence of program merit.
Extension programs are integrated with ongoing university research to provide the most rigorous, up-to-date information to program participants and beneficiaries. Experiment Station-funded research projects undergo institutional peer review prior to submission to NIFA for review and approval. This multiple-step process includes an assessment of the project's fit and relevance to the Plan of Work, an evaluation of the technical merit of the proposed work, and consideration of how well the peer reviewer's comments were addressed in the final proposal. Faculty joining multi-state projects participate in a modified process through which their work is evaluated by the Director for relevance to the Plan of Work, and by leaders of the multi-state project for technical merit and relevance to the goals of the project.

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
- Survey of traditional stakeholder groups
- Survey of traditional stakeholder individuals
- Survey of 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 URI faculty/staff and external partners in roughly equal numbers. The Committee met several times throughout the planning process and considered input collected through a public meeting with stakeholders and a web-based survey open to the public, as well as through interviews with selected "key thinkers."

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
- Open Listening Sessions
- Needs Assessments
- Use Surveys

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 Deans 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. In FY 2017, the URI Cooperative Extension Strategic Planning Committee actively assisted CELS in identifying relevant stakeholder groups and stakeholder individuals to engage in 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
- Survey of traditional Stakeholder groups
- Meeting with traditional Stakeholder individuals
- Survey of traditional Stakeholder individuals
- Meeting with the general public (open meeting advertised to all)
- Survey of the general public
- 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 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 also utilizes input from Rhode Island's CARET representatives, who 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

Stakeholder input was used to establish five focus areas for the new Cooperative Extension strategic plan. They are as follows: 1) food systems and agriculture; 2) water resources; 3) land stewardship; 4) healthy lifestyles; and 5) energy literacy. These priorities will be reflected in Rhode Island's next Plan of Work. As reported last year, food systems and agriculture is a growing area of interest in the state. In FY 2017, URI hosted the Rhode Island Food System Summit that drew hundreds of participants from government, business and community partners to discuss a new state-wide food plan for Rhode Island. Please visit http://dem.ri.gov/relishrhody/ for more information about this state-wide initiative.

IV. Expenditure Summary

1. Total Actual Formula dollars Allocated (prepopulated from C-REEMS)			
Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
{No Data Entered}	{No Data Entered}	{No Data Entered}	{No Data Entered}

2. Totaled Actual dollars from Planned Programs Inputs				
	Extension		Research	
	Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
Actual Formula	1362329	0	1547604	0
Actual Matching	1332038	0	1643188	0
Actual All Other	0	0	0	0
Total Actual Expended	2694367	0	3190792	0

3. Amount of Above Actual Formula Dollars Expended which comes from Carryover funds from previous				
Carryover	292093	0	371307	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: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	1.5	0.0	2.5	0.0
Actual Paid	0.7	0.0	5.2	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**
72528	0	298436	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
33510	0	153588	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
- Host an annual Food Safety Conference for public and private stakeholders
- 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
- Extension education to farmer's market managers
- 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

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

2017	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	1782	573070	3125	365

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

Patent Applications Submitted

Year: 2017

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	0	14	14

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of peer reviewed publications

Year	Actual
2017	14

Output #2

Output Measure

- Number of abstracts published

  Not reporting on this Output for this Annual Report

Output #3

Output Measure

- Number of professional training sessions offered

  Not reporting on this Output for this Annual Report

Output #4

Output Measure

- Number of volunteers trained

Year	Actual
2017	113

Output #5

Output Measure

- Number of conferences hosted
  Not reporting on this Output for this Annual Report

Output #6

Output Measure

- Number of school based training sessions completed
  Not reporting on this Output for this Annual Report

Output #7

Output Measure

- Number of websites developed and/or refined
  Not reporting on this Output for this Annual Report

Output #8

Output Measure

- Number of students trained

Year	Actual
2017	62

Output #9

Output Measure

- Number of intervention studies implemented
  Not reporting on this Output for this Annual Report

Output #10

Output Measure

- Number of workshops completed
  Not reporting on this Output for this Annual Report

Output #11

Output Measure

- Number of scientific/professional presentations

Year	Actual
2017	38

Output #12

Output Measure

- Number of theses/dissertations completed

Not reporting on this Output for this Annual Report

Output #13

Output Measure

- Number of public service announcements

Not reporting on this Output for this Annual Report

Output #14

Output Measure

- Number of social marketing activities

Not reporting on this Output for this Annual Report

Output #15

Output Measure

- Number of fact sheets, bulletins and newsletters

Year	Actual
2017	18

Output #16

Output Measure

- Number of video productions

Not reporting on this Output for this Annual Report

Output #17

Output Measure

- Number of social media activities

Not reporting on this Output for this Annual Report

Output #18

Output Measure

- How many trainings or workshops (including professional, volunteer, industry, school-based, etc.) did you conduct?

Year	Actual
2017	235

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 understanding of the molecular mechanism of bacterial cell division to improve food safety. Indicator is number of publications and presentations.
7	Improved understanding of the contributors to healthy eating among low income preschool children, especially feeding practices. Indicator is number of publications and presentations.
8	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
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The general public, students, volunteers, and to a lesser extent healthcare workers and educators, were targeted through a variety of venues offered such as, but not limited to, hands-on preservation workshops, volunteer training and the seafood cook-off. Additional student involvement came via classroom guest lectures/reviews, and special projects. Finally, the URI Food Safety website, which has a specific site for consumers, was completely updated. In addition, research funded in part by Sea Grant and Land Grant, set out to assess RI consumer knowledge and attitudes toward RI local seafood.

What has been done
A RI consumer survey was very successful with N=968 respondents. This survey gathered a lot of information regarding seafood preferences, attitudes and purchasing habits.

Results
Over 85% of respondents did not recognize or were unsure of the RI Local Seafood Brand. Restaurants, supermarkets and seafood specialty stores were the top choices to purchase seafood; therefore indicating the target venues for future outreach education. This could result in collaborative outreach efforts among key RI stakeholders (i.e. RI Department of Environmental Management, RI Food Policy Council, Seafood Marketing Collaborative) regarding local seafood.

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
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Food Safety Education Program personnel have attended required train-the-trainer classes to be considered lead/supervisory instructors for Food Safety Modernization Act rules related to produce and processed food for human consumption. In addition, personnel have been considered supervisory instructors for seafood and meat/poultry for many years. Training sessions and workshops are being offered, in collaboration with our southern New England food safety colleagues, for 1) RI GAP voluntary on-farm food safety and Produce Safety Alliance (PSA) training (for produce rule compliance) farmer training, 2)Preventive Controls for Human Food for regulatory compliance for processors and 3) Seafood and Meat/Poultry processors for regulatory compliance. In addition, efforts have also targeted food service personnel with the annual Food Safety Task Force Conference and food service training when requested. Resources/presentations on food safety for Farmers Market managers and vendors are on-going.

What has been done
A New England Region farmer survey was conducted that assessed on-farm food safety knowledge and attitudes, implementation of practices, and willingness to invest in on-farm food safety in small and medium size farms. A manuscript has been accepted for publication.

Results
Key results showed higher than expected food safety knowledge in the six New England states (N=301) reflecting the many years of ongoing training. Knowledge scores and practice

implementation were higher in survey participants who had received GAP training, 80% vs 73% and 79% vs 71% respectively. Overall, there appeared to be a positive attitude toward on-farm food safety which indicates farmers are receptive and see the importance of outreach efforts.

Outreach efforts have been extremely successful as reflected in participation and evaluations. This is described in the program evaluation section of this report.

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.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Excessive weight gain is associated with increased risk of developing many serious diseases, including cardiovascular disease, hypertension, and type 2 diabetes. Despite extensive efforts to promote weight management, these efforts only reach a small proportion of the population at risk and even effective programs promoting individual behavior change may have limited effectiveness in environments that promote weight gain. Furthermore, there are limited validated tools used to effectively assess the perception of the environment in which these individuals live. Using the ecological perspective to understand how different factors interact to influence food and physical activity behaviors, we can inform more tailored interventions that lead to lasting behavior change. Therefore, research is needed to elucidate the combination of individual and environmental factors associated with unhealthy weight gain among our targeted population of young adults, including those in under-represented, low-income communities.

What has been done
The previous five years of this multi-state research have been devoted to the development, validation and refinement of tools designed to: 1) evaluate the healthfulness of the environment, 2) evaluate the perceptions of the target community of the healthfulness of the environment, and 3) define the relationship between environmental and behavioral factors that influence excessive weight gain.

The purpose of this renewal is to implement a newly developed model with consideration of cross-sector collaborations and to capture sustainability of change in environments, behavior and perception on college campuses and in low-income communities. Additionally, there will be continued effort on environment and behavioral instrument development, refinement, validation, and translation for under-represented or non-represented settings (e.g. low income communities who qualify for food assistance). There will also be a continued exploration of mechanisms of interaction between lifestyle behaviors and environmental factors in influencing healthy behaviors and health status of young adults using previous and ongoing work. This approach aligns with the U.S. Department of Agriculture's focus on policy, systems, and environmental (PSE) approaches that address the outer levels of the socio-ecological model. It is also the intention of the PSE approach to supplement individual, group, and community-based educational strategies used by nutrition and physical activity educators in a multi-component program delivery model. It is argued that education in combination with PSE is more effective in tackling the prevention of overweight and obesity.

Results
We have refined environmental assessment procedures and conducted assessments at the University of Rhode Island. We have developed and psychometrically validated an instrument assessing college students' perception of the healthfulness of their environment, titled Behavior Environment Perception Survey (BEPS), including different domains of environmental influencers of health. A sequential process of measurement development included item generation using a pool of existing items from previously developed instruments as well as focus groups (n=7), cognitive interviews (n=120), and survey administration (n=3448). Items were generated by experts and sorted based on domain/construct. Items were tested by survey (n=724) at six universities. A separate sample (n=2724) was used for confirmatory factor analysis and reliability testing to construct the final questionnaire. Analyses used SPSS and EQS. Item generation from seven universities resulted in 100 items which was reduced to 93 items based on sorting then tested by survey (n=724) and cognitive interviews (n=120). Items were eliminated based on content analysis of cognitive interviews (misinterpreted items) and exploratory factor analysis (cross-loading >.30 or weak loading <.40). A second sample (n=2724) completed the refined 31-item survey which underwent confirmatory factor analysis and structural equation modeling. A 23-item, 5-factor structure was the best fit for the data (x=3462.15, df=209; CFI=.841; RMSEA=0.076). This instrument measures five constructs related to perceived healthfulness of the environment: physical activity (a= .71; 5 items), healthy eating (a=.85; 5 items), mental health (a=.85; 5 items), barriers to health (a=.70; 4 items), and social influences (a=.73; 3 items).

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior

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
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
One of the goals of multi-state project NE-1439 is to do a lifestyle needs assessment and evaluation of lifestyle interventions that lead to measurable outcomes in older adults. There are a host of chronic diseases linked to exercise and diet whereby epidemiologic research and interventional strategies to promote healthy aging need to be further implemented.

What has been done
We had three abstracts/presentations at national and international conferences along with two published based on projects from 2013 and 2015 that 1) examined the impact of diet and exercise on cognitive function in older women, 2) described the sarcopenia classification of a sample of RI women using different sets of international criteria and 3) outlined factors influencing the nutritional risk and food intakes of community-residing older adults.

Results
Our peer-reviewed published research on exercise and cognitive function suggest that Tai Chi and resistance training combined with a diet intervention might be beneficial for community-based programs aiming to improve cognitive function in older, obese women. Next, our sarcopenia project helps to improve the health of older women through addressing sarcopenia classification of Rhode Island women as there was a great deal of variation in how women were classified. This early project may impact future research as further refinement will be necessary in order to prevent misclassification which may have future impacts on sarcopenia interventions or prevention strategies. Finally, the nutritional risk study of 352 older adults indicated that the majority of older adults studied were classified as at possible nutritional risk (53.7%) or at nutritional risk (26.4%). Results indicate that older adults choosing to participate in lifestyle interventions are at nutritional risk. Future needs-based nutrition education programs designed to

reduce nutritional risk should target protein intakes while addressing the role of state, age and gender on food intakes.

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
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The number of obese adults, along with obesity-related diseases and health care costs, are projected to increase dramatically in Rhode Island, with half of adults being obese by 2030. Currently, one-third of RI's youth population is overweight or obese. On average, Americans are eating less than half of the daily intake of fruits and vegetables recommended by the U.S. Department of Agriculture (USDA) Dietary Guidelines and are not meeting the physical activity guidelines set forth by the USDA. By encouraging this population to adopt healthy eating behaviors, the risk of obesity and its related diseases will be reduced resulting in better health across the lifespan.

What has been done
Outreach EFNEP: The Expanded Food and Nutrition Education Program (EFNEP) provides free nutrition education to limited-resource individuals and families throughout the state of Rhode Island. Families with children and youth ages 5-18 are the primary audience. Participants in the EFNEP program receive nutrition-related knowledge and skills to help better manage resources, secure adequate nutrition, and enjoy better health. Children in the school setting receive activity-based learning experiences to positively influence both their own and their family's food choices.

EFNEP is delivered as a series of six or more lessons by trained nutrition educators well versed in the community they serve.

Outreach CYFAR: Integrating Nutrition Education into Full service Community Schools in Providence focuses on encouraging low income 3rd grade students and their parents to reduce the risk of obesity by adopting healthy behaviors and skills. Programming was conducted during the school day, after school and evening workshops for parents. Treatment school: Lima Elementary; Control School: Veazie Elementary.

Results
EFNEP: The collection of pre- and post-data including 24 hour recalls and USDA 10-question behavior food checklists are used to evaluate the effectiveness of our program. 78% of participants showed improvement in one or more food resource management practices, 84% showed improvement in one or more nutrition practices including planning meals, making healthy food choices, preparing food without adding salt, or reading nutrition labels; 49% showed improvement in one or more food safety practices.
CYFAR: Pre and post surveys focusing on reducing sugar-sweetened beverages and snacks, reducing energy dense snacks and increasing fruit and vegetable consumption were collected on all participants, both youth and adult. Within the 3rd grade treatment school, significant ($p<0.05$) decrease in sugary drinks (1.77 to 1.27 times in the previous day), salty snacks (1.63 to 1.13 times in the previous day) and significant increase in fruit (1.79 to 2.50 times in the previous day) from baseline (week 0) to post assessment (week 13) were found. Concerning the parents of the 3rd grade audience, non-significant improvements were found in all areas. After school programming showed significant decrease in sugary sweetened beverages and nonsignificant improvements in salty snacks and fruit and vegetable intake.

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 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

2017 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 previous reporting period, we monitored cell division using a fluorescent fusion protein (Gfp-FtsZ) and determined that ClpXP is critical for rapid dynamic exchange of subunits in the cell division ring. We are currently determining (1) the mechanisms of recognition that promote binding and degradation of FtsZ by ClpXP. Furthermore we are investigating (2) the role of protein degradation in the oscillation of the Min system, which regulates the location of Z-ring assembly in vivo. In addition, during the current reporting period we completed the following additional objectives: (3) Research training has advanced the technical skills of the graduate research assistant assigned to the project. (4) 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
703	Nutrition Education and Behavior
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

Outcome #7

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
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Childhood obesity,especially among low-income racial/ethnic minorities continues to be disproportionately high, especially in the state of Rhode Island. My research group is trying to better understand some of the local risk factors, including what children are eating in child care settings as well as understanding if the city of Providence is ready to create a community coalition to prevent childhood obesity and to work towards a large community based intervention. The high costs and co-morbidities associated with obesity make prevention a critical public health priority.

What has been done
Several research studies have been completed and are still ongoing. First, as part of another study, we are collecting in-depth dietary data about what children are consuming in family child care homes and students are working to enter and analyze those data to better understand if children are meeting the dietary recommendations for their age outside the home. Second, we are conducting key informant interviews with leaders across the state of Rhode Island to better understand the city's readiness to take on a larger scale intervention. In addition to these data, a needs assessment of the city's resources as they relate to childhood obesity is also being conducted.

Results
For the first project, we found that children were not consuming the recommended amount of vegetables (40% of the recommended 2/3 cups of vegetables were consumed; M = 0.27, SD = 0.21), whole grains (37% of the recommended 1 ounce was consumed; M = 0.37, SD = 0.37), and fiber (40% of the recommended 14 grams a day for this age group; M = 5.60, SD = 2.14). Consistent with child care centers, children in family child care homes are not meeting national recommendations for vegetables, whole grain, and fiber. Future programs and policies should continue to find strategies to increase fruit, vegetable and whole grain intake in early child care settings. With regards to the second project, although still ongoing, initial results suggest that

although several key informants believe that the issue of childhood obesity is a priority, the city still needs additional resources and knowledge in order to move forward.

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior

Outcome #8

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
2017	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 focused on applying our modeling software to simulate the anaerobic carbon metabolism of a cold-tolerating Shewanella species. This study was published in the ASM journal mSystems and a graduate student was trained in this research.

Results
Our study revealed key metabolic features conserved among the species belonging to two distinct groups of the Shewanella genus. In the meantime, metabolic flux modeling also revealed intrinsic differences in the carbon utilization and energy conservation pathways of the two groups. Taken together, our study provides a foundation for the further investigation of metabolic marker genes in the Shewanella genus and offered new tools for establishing the genotype-phenotype connections of diverse Shewanella species.

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
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

Outcomes #1 and #2:

• Due to limitations with time and effort, educators and health providers are not specifically targeted at this time but included in other outreach efforts - such as the Food Safety Task Force annual conference or other training efforts.
• It has been difficult reaching Farmers market vendors. We hope to partner with other stakeholders to reach this very important group due to their potential impact on the safety of fresh fruits and vegetables.

Outcome #5

• EFNEP: We did not meet our goal of increasing the number of graduates by 5% last year due to staff reductions from 6 to 3 Community Nutrition Assistants.
• CYFAR: Sustainability of programming in elementary schools was reached in only one school. Teacher turnover and lack of continuing interest and/or curriculum timing prevented us from achieving sustainability in the other school presented with the curriculum.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Outcome #1:
We evaluate our outreach activities using a 5 point Likert scale for evaluation (1= strongly disagree; 5= strongly agree) with statements that reflect key areas of understanding. In some cases, we also ask about intent to change practices and usefulness. There is also room for comments.
Results: Master Gardener core volunteer training for food safety and home gardening (N= 110 participants and N=72 respondents) rated understanding at 4.43 +/- .61 with 78% indicating that they will be changing some practice and 3.92 +/- 0.98 for usefulness. Participants rated the hands-on food preservation class (N=16) 4.8+/- 0.1.

Outcome #2:
We evaluate our outreach activities using a 5 point Likert scale for evaluation (1=strongly

disagree; 5=strongly agree) with statements that reflect key areas of understanding or knowledge gained. In some cases, we asked about usefulness. There is also room for comments. Since these programs are highly collaborative, other program leaders have their own evaluations. In addition, the national training programs, Produce Safety and Preventive Controls, also have their own formats. The results of the evaluations reflected training that was extremely successful. For Seafood HACCP training, of 99 participants we had evaluations (N=41) for understanding key concepts of 4.38-4.69 out of 5. For RI GAP/PSA training hosted at URI, knowledge rating was 4.1 out of 5 and 4.2 out of 5 for implementation of practices (31 participants, with N=24-27 respondents). For Preventive Controls for Human Food Training, key understanding was rated at 4.7-4.8 (N=79) with another evaluation tool rating of 3 out of a 3 point scale (N=24). For the annual food safety conference, which attracts many in the food service industry, the overall rating regarding information usefulness was 4.5+/- 0.3 out of a 5 point scale (71 participants, N=51 for evaluation).

Key Items of Evaluation

Evaluations of our Food Safety Education workshops and training programs demonstrate high satisfaction by participants in usefulness of knowledge and understanding of key concepts conveyed through program activities.

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	24%		0%	
135	Aquatic and Terrestrial Wildlife	8%		0%	
205	Plant Management Systems	32%		12%	
212	Diseases and Nematodes Affecting Plants	0%		6%	
215	Biological Control of Pests Affecting Plants	4%		3%	
216	Integrated Pest Management Systems	16%		0%	
302	Nutrient Utilization in Animals	4%		9%	
304	Animal Genome	0%		6%	
305	Animal Physiological Processes	4%		9%	
307	Animal Management Systems	4%		15%	
311	Animal Diseases	4%		9%	
605	Natural Resource and Environmental Economics	0%		6%	
606	International Trade and Development	0%		6%	
609	Economic Theory and Methods	0%		12%	
610	Domestic Policy Analysis	0%		7%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	8.0	0.0	10.0	0.0
Actual Paid	3.8	0.0	3.6	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
289417	0	225031	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
380004	0	299612	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 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 education for community decision makers, agricultural, residential and the engineering/regulatory community.

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

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

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

Agriculture/Horticulture
Study and promote commercial farm viability.

Promote responsible stewardship of agricultural lands.
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 farmers, 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 agricultural, horticultural and forest plants, while maintaining environmental quality by minimizing the use of agrochemicals.

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

Develop guidance on use of forage crops to improve soil health.

Economics, Markets and Policy
Evaluate economic and market factors in fisheries and aquaculture management.

Develop behavioral economic models to predict interaction with federal policy and statistical methods to facilitate agricultural economic research.

Evaluate the effects of financial management on agricultural operations.

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)

Agriculture/Horticulture
Agricultural producers of fruits and vegetables, turf grass and ornamental plants, the RI Department of Environmental Management (RI DEM) Division of Agriculture, 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

2017	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	30923	1174690	20067	1000101

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

Patent Applications Submitted

Year: 2017
Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	0	7	7

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of peer reviewed publications

Year	Actual
2017	7

Output #2

Output Measure

- Number of books and monographs
  Not reporting on this Output for this Annual Report

Output #3

Output Measure

- Number of abstracts published
  Not reporting on this Output for this Annual Report

Output #4

Output Measure

- Number of conference proceedings published
  Not reporting on this Output for this Annual Report

Output #5

Output Measure

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

Year	Actual
2017	33

Output #6

Output Measure

- Number of training manuals (includes instructional CD's) produced
  Not reporting on this Output for this Annual Report

Output #7

Output Measure

- Number of scientific/professional presentations

Year	Actual
2017	50

Output #8

Output Measure

- Number of workshops (including short courses) completed
  Not reporting on this Output for this Annual Report

Output #9

Output Measure

- Number of conferences hosted
  Not reporting on this Output for this Annual Report

Output #10

Output Measure

- Number of websites developed and/or refined
  Not reporting on this Output for this Annual Report

Output #11

Output Measure

- Number of public presentations
  Not reporting on this Output for this Annual Report

Output #12

Output Measure

- Number of public service announcements
  Not reporting on this Output for this Annual Report

Output #13

Output Measure

- Number of students trained

Year	Actual
2017	80

Output #14

Output Measure

- Number of theses/dissertations completed
  Not reporting on this Output for this Annual Report

Output #15

Output Measure

- Number of biological control agents released
  Not reporting on this Output for this Annual Report

Output #16

Output Measure

- Number of new germplasms developed
  Not reporting on this Output for this Annual Report

Output #17

Output Measure

- How many trainings or workshops (including professional, volunteer, industry, school-based, etc.) did you conduct?

Year	Actual
2017	243

Output #18

Output Measure

- How many volunteers did you train?

Year	Actual
2017	1259

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	Increase knowledge about agricultural finance and risk management, including the role of Federal farm policy, commodity markets, and farmer risk management choices. Indicators are number of publications and presentations.
13	Improved understanding of biophysical and geochemical factors affecting shellfish-seaweed integrated multi-trophic aquaculture in Rhode Island. Indicator is number of publications and presentations.
14	Improved biological control of arthropod pests and weeds in the Northeast. Indicators are number of publications and presentations.
15	Improved understanding of how using forage crops improves soil health. Indicator is number of publications and presentations.
16	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.

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
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Shellfish (clams, oysters, scallops, mussels) 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 at a 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 addressed 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. Funding was used to nurture the relationships between shellfish researchers at a variety of institutions, the USDA Agricultural Research Service's Laboratory in Shellfish Genetics, and the shellfish aquaculture, restoration, and shellfish

industries. Initiatives included: 1) organization of a workshop on Oyster Breeding in collaboration with the University of Maine, and the USDA ARS Shellfish Genetics Laboratory held at the 2017 Northeast Aquaculture Conference and Exposition in Providence, RI in January 2017. In this workshop,we informed the industry of the latest research efforts on the development of selectively bred strains for oyster aquaculture. It was attended by about 20 researchers and 10 members of the shellfish industry. 2) organization, in collaboration with the University of Washington and the USDA ARS Shellfish Genetics Laboratory, of a Workshop in Comparative Genomics in Shellfish held at the Annual Meeting of the National Shellfisheries Association in Knoxville, TN, March 2017. This workshop, funded with contributions from the USDA NRSP-8 Aquaculture Genomics program, was attended by 31 researchers and students from a variety of institutions in the United States of America and Mexico.

Results

The industry workshop solidified the relationship between the East Coast Shellfish Breeding Consortium and the shellfish industry, helping researchers in the Consortium refine future goals and plan of work. For example, input from industry indicated the importance of adaptation to a changing environment as a trait to be included in the breeding programs. The shellfish industry is embracing the development of oyster lines with improved performance through selective breeding, and is willing to participate in research testing the performance of those lines. The Comparative Genomics workshop has focused on how to best exploit the recent sequencing of the Eastern Oyster Genome (funded by a USDA AFRI grant) and led to the growth of the Eastern Oyster Genome Consortium, which has now enlisted new researchers. The workshop led to the submission of a large collaborative proposal to USDA AFRI on the functional annotation of the eastern oyster genome with participation of researchers from University of Rhode Island, Stony Brook University, University of Maryland, Virginia Institute of Marine Sciences, and Florida International University.

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
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Gastrointestinal nematodes (GIN), especially Haemonchus contortus, limit small ruminant (SR) production on pasture. All grazing SR become infected with GIN by ingesting larvae on pasture.The species responsible for the majority of parasite induced deaths in small ruminants in the eastern U.S. is Haemonchus contortus (barber pole worm), a blood-feeding abomasal parasite that may cause fatal anemia. 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 as well as cranberry vine. Another tool, underutilized by producers is factoring innate parasite resistance into their breeding decisions. The overall goal of our research is to identify alternative anti-parasitic plant compounds as well as factoring parasite susceptibility into breeding decisions and promotion of the National Sheep Improvement Program (NSIP) to seedstock producers interested in generating estimated breeding values targeting superior performance traits and parasite resistance.

What has been done
In addition to face-to-face integrated parasite control (IPC) workshops, efforts continued in the advertisement and administration of the online training of small ruminant producers on best management practices for IPC that included FAMACHA© training and certification, valuable tools for the detection of barber pole worm infection in sheep and goats. Additionally, workshops were conducted in conjunction with the National Sheep Improvement Program (NSIP) to educate interested producers on the NSIP program which enables producers to factor parasite susceptibility into breeding decisions and use estimated breeding values to balance parasite resistance with other important production traits. Expansion of current research evaluating the anti-parasitic effects of cranberry vine and birdsfoot trefoil on gastrointestinal nematode infection

in lambs continued.

Results
Eighty-five new participants began the online training program with 53 completing it and receiving certification representing a 62% completion rate. Participants live among 33 states and three Canadian provinces with the highest participation being from VT, Ontario Canada, MO, TX, MA, NY and VA. The online presence has generated inquiries from veterinarians who have obtained more information and resources to train, certify and provide FAMACHA cards to clients. We have also had interest in group participation in the form of a facilitated workshop, or within a 4-H club. Producers participated in six integrated parasite control workshops. Participating producers are adopting or improving upon on-farm parasite control strategies. Producers, students and professionals participated in eight workshops that provided detailed information about the NSIP program and the benefits and resources available to producers as part of enrollment and membership. In addition, presentations on integrated parasite control and selective breeding for parasite resistance were emphasized. These workshops were conducted in VA, WV, PA, NY and in Wooster, OH as part of the Eastern NSIP Sheep Sale. At least five producers enrolled in the NSIP program as a result of project workshops and outreach, at least 17 producers are planning to enroll, and at least five producers are utilizing or plan to utilize NSIP breeding stock. Work continued on the in vivo characterization of the possible anti-parasitic effects of feeding birdsfoot trefoil or cranberry vine on different stages of the life cycle of the barber pole worm.

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

2017 0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The Master Gardener Program creates a more informed public, enabling people to be better stewards of their private property for the benefit of human health and environmental quality. This program reaches over 30,000 individuals each year with science-based information and resources disseminated by over 600 trained volunteer educators. With increased knowledge, the public clients who have learned from Master Gardener volunteers adopt sustainable gardening practices that establish habitat for pollinators and other beneficial wildlife and introduce fewer pollutants (pesticides, fertilizer) to the landscape. Our client survey indicates that after interacting with the URI Master Gardeners, people seek answers to their gardening questions with research-based resources, successfully grow more of their own healthy food, teach youth about environmental stewardship in school garden settings, and adopt more ecologically sound pest management practices, etc.

What has been done

The URI Master Gardener Program volunteers provide grassroots education for the public in a variety of settings throughout the year at community events such as farmers markets and health fairs, lectures at libraries, at demonstration gardens in local communities, etc. The public is educated through the URI Gardening and Environmental Hotline and email service, demonstration garden projects, answering questions at community events, testing soil pH and making recommendations for soil amendments. The audience for the national-award winning School Garden Mentor Program are the teachers, parents and school personnel involved in growing and teaching from gardens in schools, as well as all of the youth that benefit from these living laboratories. Large public outreach events educate hundreds of adults through lectures by subject matter experts or by demonstrating sustainable gardening techniques on residential property. In 2017, this included the Master Gardener Core Training, the Spring Festival and the Gardening with the Masters Tour.

Results

The 2017 year-end survey indicated knowledge gain, attitude and behavior change, with 375 respondents for a 15% response rate. We were more successful in gathering client emails, with over double the amount of clients contacted as in years past. The survey was also designed in a more effective manner to gather maximum data and testimonials, while parsing out responses from public versus Master Gardener volunteers. 88% of clients learned something new after interacting with Extension Master Gardener volunteers, a slight decline from the 94% increase in knowledge in 2016.

The testimonials indicated success in meeting our educational and behavior change goals related to the program's current land stewardship focus area:

Goal 1: Increased Biodiversity

"Made my yard & garden more friendly to bees & butterflies, provides pollinators for veggies. I learned more about native plants, beneficials, invasive plant removal guides, etc. I was able to send photos of plants in my backyard and they helped me identify native, non-native and invasive plants and between garden plants and weeds."

Goal 2: Improved Soil Health and Composting.

"I needed a soil test which was performed immediately in my presence. Results answered a lot of questions and gave me ideas. Well done. I had a really informative, enjoyable conversation with the master gardener when I had my soil tested. I definitely want to use more URI resources and gain more knowledge. Thank you! I learned more about composting and uses of biochar."

Goal 3: Reduce pesticide use/adoption of Integrated Pest Management
"I sent photos of a vine that I feared was poison ivy. The master gardener helped me determine that it was unlikely to be poison ivy. He sent me a link to a guide showing rather subtle differences between my vine and the poisonous one.This gave me confidence to carefully dispose of it myself, rather than using Roundup. Right place right plant. The Master gardener researched and identified an uncommon weed taking over my lawn. He was persistent, professional, and helped me solve my lawn problem. We communicated by phone and by e-mail. What a great service the Master Gardener Program is!"
Goal 4: Water Quality
"Learned more about value of rain gardens in protecting clean bay water, more about drought tolerant harbor grasses, designs of soft structures in protecting water line, and more."
Goal 5: Serving as research-based resource
"I work for a school where we get seeds each year to educate our campus community and work with student groups to help get the word out. A student of mine and I also attended one of the growing seminars when we came to grab our seeds. We have also visited the gardens and greenhouses a few times throughout the year and have enjoyed our interactions and being able to ask questions."
This year, we were most successful in encouraging people to reduce the amount of harmful pesticides applied in residential garden settings by adopting the steps of Integrated Pest Management. The top three behaviors that were newly adopted or increased included: identifying plant problems before taking action (44%), using research-based (university/extension) answers to gardening questions (42%) and finding alternatives to pesticides whenever possible (32%).

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

2017 0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Demand for locally produced food has grown in recent years due to consumers' interest in where and how their food is grown and raised. Food security remains a major problem in Rhode Island where 12.8% (56,320 households) are food insecure and 6.1% (26,840 households) report very low food security (hunger). Introducing young people to sustainable agriculture raises awareness of its importance to human well-being. Home gardens and school gardens teach families and children to grow their own food, leading to increased consumption of fresh fruits and vegetables and improvements in food security. Gardens serve as outdoor classrooms, connecting people of all ages to nature and the experience of watching a plant grow.

What has been done

The URI Master Gardener Program teaches adults to grow their own fresh, healthy food while introducing youth to food growing through school gardens. Through programming within community gardens and at corporate health fairs, we are able to reach individuals with a vested interest in learning. The School Garden Mentor Program helps improve the success of school gardens to serve as laboratories, teaching youth about the food system and plant science.

Vegetable seed and seedling donations to educational community groups enable thousands of individuals to learn while growing. In addition, one time workshops are held at various locations through the state related to vegetable growing.

In 2017, many of our demonstration gardens made special efforts to reach low-income audiences through unique programs and partnerships. Produce is grown in demonstration gardens and in private gardens through the "Plant a Row Program" and donated to local food pantries.

The URI Master Gardening On-Ramp Series: From Seed to Table was a new partnership between the URI Master Gardener Program and the Providence Public Library, enabling us to reach a new and urban audience.

This season, the East Farm Demonstration Garden team was involved in three activities to draw diverse groups to East Farm. A summer camp from a church in Johnston brought their campers ranging in age from 3 years old to 16 years old and several adults to East Farm to visit the Demonstration Garden, the Vertical Garden with Kathy Jenal and the Apple Orchard with Susan Axelrod.

In September the team held a special program that was an idea of team member Claire Dalidowitz, an expert dietitian. Titled Color Me Healthy the East Farm projects worked with the Johnny Cake Center, Healthy Minds, Healthy Bodies and Thundermist to conduct a program focusing on families in South County with food insecurity issues.

Results

In addition to education, the URI Master Gardener Program donates healthy food to the hungry, and seeds and seedlings to educational organizations to enable education around growing your own food. In 2017, 11,621 pounds of fresh vegetables and fruits were grown by URI Master Gardener volunteers and donated to local food pantries and soup kitchens. URI Master

Gardeners grew seedlings for donation to 90 school gardens and demonstration gardens, the value of vegetable seedling donations equaling $9,553.00. 684 educational groups such as schools, scouting troops, 4-H groups and individuals received seed donations totaling 126,864 seed packets through the free seed program.

Our year-end client survey indicated the URI Master Gardener Program's success in improving the public's comfort level and ability to grow their own food through our various public education services. 18% of clients began or increased their gardening for food crops, with 25% striving to increase the amount of food grown in the garden. 42% of clients were influenced to seek out research-based resources to answer their gardening questions. In addition, a large number of the testimonials from the survey indicated success in meeting Cooperative Extension's food security goals, educating clients in techniques to increase yield and improve soil:

"I yielded better crops this year. I sowed different veggies this year. I hope to use my compost pile this spring. I hope to have my soil tested again, follow through with the master gardeners recommendations. I had attempted growing vegetables in my backyard for two years before I attended the Providence Library/Roger Williams Park workshop series. I am overjoyed to report this year; I had amazing results using the skills that I learned through the direction of the Master Gardeners' expertise. I have come to realize that I need to pay particular attention to the quality of my soil! I am breathlessly anticipating how my soil will test in the spring with the steps that we discussed in class. I represent a community garden that grows food for the RI Community Food Bank. We got great advice about insect control and increasing yield for tomatoes. URI Master Gardeners are a fantastic asset for the Middletown library community garden. They are valued added throughout the year and I look forward to seeing them again next season. Thanks for the effort. Helped great with plans to improve our community garden. Helped us reach decisions regarding composting methods best suited to our situation which we plan to take forward in 2018. Also provided much help in directing us toward improving and funding our deer fencing- another project for 2018. The generosity of the master gardeners with their time and the knowledge which they shared so impressive and appreciated! I coordinated a workshop and kiosk with the URI Master Gardeners. The workshop was well attended with great feedback. The kiosk at our health fair was always busy and the feedback was great as well. Plan on inviting back for events in 2018.Square foot gardening was a new idea for me - I now have adopted its tenets to all of my raised beds."

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
2017	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. Reduced program fees were provided for schools that qualify as Title 1.

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 2017, URI Cooperative Extension implemented a winter program for Providence grades K - 5 at the Roger Williams Park Botanical Center in Providence and from May - June 2017 at the URI Botanical Gardens in Kingston. Learning Landscape field trips are led by URI staff, undergraduate student educators and URI Master Gardener volunteers.
URI staff trained a cadre of undergraduate student educators and Master Gardener volunteers to provide environmental education lessons and hands-on activities for 1,000 elementary school children who participated in the program.

Results
As a result of Learning Landscape field trips, students were exposed to a variety of environmental topics, ranging from (but not limited to) native plants, birds, mammals and insects to Rhode Island and their associated adaptations, soils and plant health, hydrology and transport of human-derived non-point sources of pollution, energy sources and sinks. Each lesson topic was aligned with instructional standards in an effort to increase knowledge relative to testing requirements. In addition to student-related outcomes, teachers in attendance were provided with lesson plans to deliver in the classroom and outdoors following their field trip in an effort to reinforce concepts presented through the program and increase student success.

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
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Rhode Island's coastal regulatory agency is charged with maintaining the quality of habitat in coastal edge environments to preserve biodiversity and promote climate resiliency for future generations. Invasive plants threaten the ecological quality and diversity of coastal areas. Much of the work conducted in coastal edge environments is done through the acquisition of permits by green-related industry and environmental professionals. The Invasive Plant Management Certification Program seeks to empower these professionals with science-based information so that their invasive plant management work enhances coastal edge environments and increases biodiversity.

What has been done
URI Cooperative Extension delivered the two-day Invasive Plant Management Certification Program on campus to thirty green industry, environmental and regulatory professionals. The training included information on best invasive plant management practices for residential and

commercial properties to preserve biodiversity and increase climate resiliency. Case study examples were presented to show the principles delivered through lecture in action, and participants were encouraged to share their work examples with program organizers for distribution among those certified through the program (a broader group of over 300 individuals).

Results
Green-related industry and environmental professionals were equipped with science-based knowledge useful for preparation of permit applications for coastal invasive management projects that will increase biodiversity on coastal landscapes through the incorporation of native plant revegetation, invasive plant removal and best practices for landscape management.

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
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Oyster farmers face two kinds of food borne disease-related risks: an outbreak risk in his own farm, and negative influence they face through markets when an outbreak occurs in a neighboring farm. Our project focuses on the latter risk, and asks what RI oyster farmers can do to shield themselves from such adverse impacts. This could also encourage RI farmers to pursue the Best Management Practice in reducing the outbreak.

What has been done
We designed experimental auction sessions where participants recruited from across the state were asked to make a series of bids for a dozen of oysters. Information on food borne disease and prevention methods were given during the session to measure any difference in participants' bids before and after such information was given. During this reporting period, about half of total

number of sessions were completed.

Results
During this reporting period, we were still collecting data and do not have results to report. That said, we were pleasantly surprised at the level of interest among RI consumers on the topic and their willingness to take part in this study.

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 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Nematodes cause significant damage to crop plants. In particular, turfgrasses are extremely susceptible to these pathogens. Work was undertaken to find new ways to manage turfgrass nematodes.

What has been done
Research: We examined multiple recently developed nematicides for their efficacy against nematodes on golf course turfgrasses. Extension: Seminars were given to golf course superintendents in Maine, at the Maine Turfgrass Conference in January 2017. Approximately 100 people were in attendance. A seminar to golf course pesticide distributors was given in March 2017 in Michigan. Approximately 30 people attended.

Results
One of the nematicides was determined to be extremely effective at killing a limited number of nematodes. This material has low mammalian toxicity and will allow golf courses to manage nematodes in a more environmentally friendly manner, with less impact on human health.

4. Associated Knowledge Areas

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

Outcome #12

1. Outcome Measures

Increase knowledge about agricultural finance and risk management, including the role of Federal farm policy, commodity markets, and farmer risk management choices. Indicators are number of publications and presentations.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Work conducted through participation in two USDA multi-state projects contributes to this outcome.

(a) Agricultural and Rural Finance Markets in Transition: The modern agricultural production system is critically dependent upon the financial management of agricultural operations. Producers need cost-effective access to capital and sound government policy to continue to meet the food, fiber, and bio-energy demands of the United States. The use of credit by farmers, rural businesses, and agribusinesses has a critical impact on their long-term sustainability and competitiveness. Insights will be gained to ultimately improve the functioning of agricultural and rural financial markets.

(b) Economics and Management of Risk in Agriculture and Natural Resources: Risk and uncertainty are pervasive in agriculture and other natural resource industries. Much progress has been made in understanding decision-making under uncertainty, but the knowledge base is incomplete. There is a continuing need to examine both short-term and long-term effects of risk in agriculture and other natural resource based industries.

What has been done
Research progress was made primarily in evaluating sustainability of firms (farms) as a function of management strategies. Specific progress includes developing behavioral economic models to predict interaction with federal policy, and statistical methods to facilitate agricultural economic research.

Results
The project in 2017 with the most progress was modeling farmer overconfidence about future yields, with sweeping implications for farm risk management and for farm interaction with the federal crop insurance program. For example, we examined the evidence of systematic overconfidence among rural Chinese wheat and corn farmers in the form of overly optimistic subjective beliefs about the probability distribution of potential yield outcomes relative to what historic outcomes would suggest. We found that among our sample, 15% can be classified as being roughly unbiased while 20% are both pessimistic and more uncertain, widening the range of potential outcomes. The remaining 65% are found to be more optimistic of potential outcomes. Our results have important implications regarding the effectiveness and implications of crop insurance subsidies to induce participation. More specifically, our research suggests that a large portion of the population is unlikely to participate in such programs even at substantially subsidized prices. These results were presented at multi-state project SCC76 Annual Meeting 2017.

4. Associated Knowledge Areas

KA Code	Knowledge Area
609	Economic Theory and Methods

Outcome #13

1. Outcome Measures

Improved understanding of biophysical and geochemical factors affecting shellfish-seaweed integrated multi-trophic aquaculture in Rhode Island. 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
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
To meet future demands for seafood in the U.S., expansion and development of environmentally sustainable domestic aquaculture is required. The long-term goal of this project is to better understand what biophysical and geochemical parameters constitute an optimal site for shellfish-seaweed integrated multi-trophic aquaculture (IMTA) in Rhode Island, a potentially viable emerging food production system. My supporting objectives are to: (1) correlate water quality, temperature, and hydrodynamic conditions with kelp and oyster growth using field-based IMTA experiments; (2) determine the associated crop yield for kelp and oysters in field-based IMTA experiments; (3) partner with oyster farmers and assist them with establishing locally-relevant methods to grow kelp as an additional crop on their existing oyster lease sites.

What has been done
I have partnered with oyster farmers and assisted them in establishing methods tailored for Rhode Island to grow kelp on their existing oyster lease sites over the winter (Obj 3). This has just begun and after the growing season ends in May 2019, we will begin to work on Obj 1 and 2.

Results
Preliminary results indicate there are areas in Rhode Island with the environmental characteristics that allow seaweed aquaculture to flourish.

4. Associated Knowledge Areas

KA Code	Knowledge Area
307	Animal Management Systems

Outcome #14

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Classical biological control addresses the problems of exotic insects and introduced invasive plants by reuniting these pests with their natural enemies. It offers the potential for long term sustainable management of pests across widespread areas and may reduce pesticide usage.

What has been done
SWALLOW-WORT BIOCONTROL: We focused our research on swallow-wort biological control on the biocontrol agent, Hypena opulenta. Swallow-worts are the only host plant for this moth species, and the caterpillar feeds on swallow-wort foliage. We developed new rearing methods for H. opulenta to be able to conduct field release experiments. We also investigated the induction of defensive chemicals in swallow-wort plants when H. opulenta caterpillars are feeding on the plants. We received our USDA permit to release H. opulenta in the US, and released approximately 2,000 larvae in cages in MA in Aug 2017 and 1,000 larvae into cages in Rhode Island in Sept. of 2017. LILY LEAF BEETLE BIOCONTROL: We collaborated with research and outreach personnel from Connecticut and New York to introduce three biocontrol agents for lily leaf beetle to these states. Each year undergraduate researchers collect parasitized larvae of these biocontrol agents from Rhode Island and Massachusetts and rear them until parasitized cocoons are removed from rearing containers. These are kept overwinter in incubators, and in the spring, adult parasitoids can be sent to our collaborators for release. In 2017 we sent lily leaf beetle biological control agents to six sites in NY and three sites in CT. We also received larvae from both states to dissect to detect parasitism. A URI Science and Engineering Fellow conducted an experiment to determine if any of the three lily leaf beetle parasitoids will accept Lilioceris cheni as a host, which is a weed biological control agent in Florida. PHRAGMITES BIOCONTROL: We received pupae of two species of biological control agents, Archanara neurica, and Archanara geminipuncta, from our colleague in Switzerland, Patrick Háfliger, to begin rearing these species for our Phragmites australis biological control program. Adult moths

emerged from the pupae, we allowed the moths to lay eggs, and the eggs are now overwintering. We have set up the eggs in a diapause experiment in incubators to determine their phenology under different temperature/photoperiod conditions. WINTER MOTH BIOCONTROL: Winter moths were first detected in RI in 2004 in Warwick. Winter moths continued to spread throughout RI and were found throughout the state by 2012. Heather Faubert from URI and Joe Elkinton's lab from the UMass released adult flies of a biological control agent, Cyzenis albicans, in Goddard Park in Warwick, RI (600 flies) in 2011. No flies were released in 2012. Approximately 2000 adult Cyzenis albicans were released in Bristol and Jamestown in 2013; South Kingstown and Cumberland in 2014; Lincoln and Little Compton in 2015; and Charlestown in 2017. The 2017 release followed a new protocol of placing a predator-proof cage with Cyzenis albicans puparia that were overwintered in peat moss. Cyzenis albicans adults emerged out of the cage. We also conduct outreach/implemetation activities for mile-a-minute, lily leaf beetle, and knapweed biological control. In 2017 we released 5,500 Rhinoncomimus latipes weevils as biological control agents for mile-a-minute weed, for a total over the last eight years of over 68,000 released in 21 sites in RI. Each year we also visit and monitor both the plants and insects at each release site. We receive lily leaf beetle larvae from homeowners in RI and inform them if they have parasitoids or not, and answer email questions about control of the lily leaf beetle. For our knapweed biocontrol program, in 2017 we released 2,355 Larinus obtusus, biocontrol agents of knapweed. We began releasing these agents in 2015, and each year we visit each release site and monitor both the plants and insects at each release site.

Results

Swallow-wort biocontrol: The approval by USDA for release of Hypena opulenta, in addition to the successful rearing of H. opulenta in the URI biocontrol lab finds us at beginning of a highly anticipated biological control program for swallow-worts. We have been conducting outreach for this program, and writing additional grant proposals to fund research, rearing, releases, and monitoring of this agent. We have a large network of potential cooperators in Rhode Island, and throughout the northeast for biological control of swallow-worts.

Lily leaf beetle biocontrol: Releases of lily leaf beetle parasitoids have resulted in a decrease in the lily leaf beetle populations in many neighborhoods throughout Rhode Island and Massachusetts, as referred to us anecdotally by homeowners. Lily growers who had pulled up their bulbs due to the lily leaf beetle are now growing them again. We are also working with states like CT, NY, and WA, who have the lily leaf beetle as a new pest, and they are initiating biological control in the early stages of the infestation, which should lead to earlier management of the pest. Results from this year's experiments with L. cheni indicate that two of the lily leaf beetle parasitoids, Tetrastichus setifer, and Diaparsis jucunda will not parasitize the weed biocontrol agent, L. cheni. Additional experiments will be conducted in 2018.

Phragmites biocontrol: The host specificity work for two agents for Phragmites australis is complete and the Petition for release request is almost ready to submit. We anticipate further work in 2018 with optimizing our rearing methods and then will wait for a response from our Petition.

Winter moth biocontrol: Heather Faubert works with Joe Elkinton's lab every year to collect winter moth larvae and examine them for parasitic fly pupae. In 2014, 2015, and 2016 flies were recovered from the 2011 release in Warwick. In 2016 flies were recovered from one 2013 release site, and in 2017 they were recovered from the second 2017 release site. We anticipate good results from this project, as this fly is providing very good control of winter moth in southeastern Massachusetts.

Lily leaf beetle outreach: We have regular interaction with stakeholders in our lily leaf beetle

biological control program. Many have indicated a willingness to avoid using pesticides to control the lily leaf beetle, and to allow biological control agents to reproduce and spread and provide management of the beetle.

4. Associated Knowledge Areas

KA Code	Knowledge Area
215	Biological Control of Pests Affecting Plants

Outcome #15

1. Outcome Measures

Improved understanding of how using forage crops improves soil health. 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
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

RI0017-NE1010- Breeding and Genetics of Forage Crops to Improve Productivity, Quality, and Industrial Uses, focuses on the use of forage crops to improve soil health. Organic matter is key to soils' ability to absorb, filter, and retain water. Weather patterns in New England are shifting towards fewer, more intense precipitation events. Healthy soils are able to absorb precipitation, and release the water to vegetation and streams over a long period. Soils with deficient organic matter are unable to absorb precipitation, leading to erosion, flooding, and contamination of surface water during storms, and drought stress between storms. Soil organic matter is constantly being decomposed; the decomposition rate is increased by many agricultural practices. Most annual crops grown in New England produce little residue, so cash crops alone are not sufficient to maintain soil organic matter. High-biomass forage crops can be integrated into vegetable production systems to increase soil organic matter.

What has been done

In 2017 I tested using teff (Eragrostis tef) as a living mulch between rows of pumpkins. Teff is an annual, warm-season grass which forms a dense canopy and can produce up to 3 tons of biomass per acre. Trials in 2016 had shown that teff effectively suppressed weeds between pumpkin rows, but there were concerns that the teff might compete with the pumpkin plants,

decreasing yields. To test the effects of teff on pumpkin yields I established a trial at the Gardner Crops Research facility. The trial used a strip plot design with three replications. The main plot effect was the presence or absence of a teff living mulch. The subplot effect was pumpkin cultivar; four cultivars were tested. Pumpkins were direct-seeded into the field in mid-June with 10 feet between rows, and three feet between plants in the row. The following day teff was seeded at 7 lbs/acre in five foot bands between rows. Cultivation was used to control weeds within the pumpkin rows and between rows in the no-teff treatment. Fertilizer rates and disease and insect control followed standard practices. In late September total and marketable fruit were counted for each plot, and four marketable fruit were randomly selected from each plot and weighed. Marketable fruit were divided into Fancy and wholesale quality based primarily on peduncle condition.

Results
Teff did not significantly affect pumpkin yields or quality. The teff grew well, and did effectively suppress weeds. There were significant differences between pumpkin varieties, as expected.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems

Outcome #16

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
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Our work is performed for the purpose of supporting and advocating for Rhode Island farmers with useful, up-to-date science-based information that will enhance the economic, environmental,

and social sustainability of their businesses. At most scales, agricultural enterprises operate on very thin margins, and yet they are essential to society. At the broadest scale, the maintenance and increase in local food supply is necessary in order to minimize the carbon footprint of human civilization.

Agriculture is resource intensive. Inputs are required to obtain the valuable outputs, which are crops and their byproducts. A central problem is to identify agricultural practices that minimize resource consumption and environmental impact while maximizing productivity and business profits.
A complex underlying issue is a cultural one--practices that have been identified as beneficial may not be readily adopted for a variety of reasons, and furthermore, practices that are popular may not incur any benefit or may actually be detrimental, yet they are deemed essential within the grower community.

The research we perform follows directly from these problems that we witness firsthand in our outreach work. Farmers operate businesses, and we attempt to be conscious of cost constraints, whether they be purchased inputs or labor. While we are not trained business planners, we are familiar with issues faced by these particular small businesses and refer our stakeholders to trusted sources of business information and expertise.

Farms of all types require regulatory compliance. We are familiar with most of these constraints and tailor our consultations to appropriate mandated guidelines, though there are times when we can use our expertise to work with our state regulatory system to make exceptions. We also know who to contact when there are questions of compliance that need precise answers.

What has been done
A significant part of our everyday work is to address farm viability by assisting in identification of production problems and recommending multi-level solution approaches. We have hundreds of interactions every year that concern a broad range of crops, farm operations, and their associated and often unique problems. In fact, Rhode Island may be among the more distinctive cases in terms of its diversity of enterprises. In a single day, we may engage with a grower of 400 acres of vegetables, a mixed 5-acre berry/vegetable operation, a quarter-acre urban garden, and a greenhouse microgreens producer.

We work with the whole of Rhode Island's potato industry, actively monitoring for the seed-piece soft-rot pathogen, Dickeya dianthicola, as well as other disorders. We work with the fruit growers in monitoring and advising on treatment for outbreaks of Lepidopteran pests such as Winter Moth, Gypsy Moth, and Codling Moth, along with the recently arrived Spotted Wing Drosophila, which attacks soft fruits. We spend time cultivating relationships with urban immigrant growers who are unaware that we can assist in identifying and advising on exotic crops grown in urban plots.

Results
There are many issues faced by local growers that we monitor and advise on. There are also great opportunities for producing specialty crops and successfully marketing them, due to Rhode Island's proximity to diverse markets. The following is a list of major projects and ongoing outcomes of several areas of our work.

1. Dickeya dianthicola soft rot pathogen of potatoes: Cooperative Extension's engagement with producers about seed sourcing resulted in a marked decrease of the disease in 2017. This successful engagement has allowed for more productive discussions with producers about unnecessary insecticide spraying and strategies to control Nutsedge, a challenging weed species.
2. Defoliation of apple and highbush blueberry trees by winter moth, Operophtera brumata: We

have monitored early-spring egg hatch to better advise growers on the proper timing of targeted sprays of newly emerged larvae, a successful control strategy. We also collaborated with UMass on release of specialized parasitoid Tachinid flies and have seen reduced infestation with each succeeding spring.
3. Bird damage to ripe sweet corn: We have developed an inexpensive laser scarecrow prototype as an alternative to unpopular propane-fired scare cannons and are conducting on-farm trials for efficacy.
4.Improved soil management: We promote use of winter and summer cover crops as key components of improved soil heath and conduct research to identify appropriate cover crop species for RI, seeding rates, and timing of plantings. Outreach to growers has resulted in increased incorporation of cover cropping into multi-year rotation strategies on their farms.
5.Vegetable and fruit production: We collaborate across New England on the New England Vegetable Management Guide, the New England Small Fruit Management Guide and the New England Tree Fruit Management Guide to help ensure that we are able to provide RI growers with timely information about pests, diseases, and production practices from a wide range of experts within the region.
6. Foliar feeding of specialty crops: We are testing the efficacy of this popular practice to better advise growers about its use. Results from 2017 trials demonstrated no gains in tomato fruit yield or quality.
7. Outreach to immigrant growers: We are conducting trials to determine best practices for growing crops popular among African and South American immigrant groups and are holding workshops with these grower communities to share early results from the trials.
8. Saffron production: We are collaborating with University of Vermont to develop good production techniques of this high-value, low-space demanding crop, which shows promise for RI.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
135	Aquatic and Terrestrial Wildlife
205	Plant Management Systems

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 #6:

- We believe that we achieved our outcomes as planned, but inclement weather did

cause a reduction in participation as compared to prior years. Completed evaluations must be collected on-site to better ensure data collection and affirm this assumption. Also, contingency plans for inclement weather that reduce participation numbers due to program cancellation must be implemented in the future.

Outcome #13:

- Poor weather delayed some of the experiment and moved the timeline back a few months.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Outcome #3:

Pre- and post-workshop evaluations and follow-up surveys**.**

Results: The majority of online and face-to-face workshop participants planned to adopt or improve at least one parasite control practice. The NSIP workshops reached a large number of producers resulting in five producers enrolling in NSIP and 17 producers planning to enroll in NSIP.

Outcome #4:

We sent a year end survey out to all clients and received a 15% response rate. We collected emails year round from our various clients via public outreach events, requests for Master Gardener services, projects and individual annual reports totaling 2451 individual emails. In addition, we sent out evaluations for each of our large public education events for which we conducted online registration (Core Training, Garden Symposium, Gardening with the Masters Tour). The year-end survey indicated knowledge gain, attitude and behavior change. 88% of clients learned something new after interacting with Extension Master Gardener volunteers. This year, we were most successful in encouraging people to reduce the amount of harmful pesticides applied in residential garden settings by adopting the steps of Integrated Pest Management. The top three behaviors that were newly adopted or increased included: identifying plant problems before taking action (44%), using research-based (university/extension) answers to gardening questions (42%) and finding alternative to pesticides whenever possible (32%).

Outcome #5:

We sent a year end survey out to all clients and received a 15% response rate. We collected emails year round from our various clients via public outreach events, requests for Master Gardener services, projects and individual annual reports totaling 2451 individual emails, more than doubling collection efforts in the past. The survey gathers information about knowledge gain, attitude change and behavior change.

Our year end client survey indicated the URI Master Gardener Program's success in improving the public's comfort level and ability to grow their own food through our various public education services. 18% of clients began or increased their gardening for food crops, with 25% striving to increase the amount of food grown in the garden. 42% of clients were influenced to seek out research-based resources to answer their gardening questions.

The evaluations given after our trainings and events indicated increased knowledge and intended behavior change. After attending the 14-week Master Gardener Program Core Training, attendees indicated increased frequency of all sustainable gardening behaviors. Notably, there was the largest change in pre and post-course survey results for frequency of using research-based resources to answer gardening questions (73% increase), amending soils correctly (71% increase), increased success with growing food plants (49% increase).

Outcome #6:

A field trip evaluation form was provided to teachers and volunteer instructors to complete after the program ended on a daily basis, to be returned to URI via mail. The evaluation included questions about program follow-up in the classroom via the nature journals provided to students and the lesson plans provided to teachers. 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 met its objectives based on survey results. Anecdotal responses also indicated the teachers were pleased with the program content, instruction methods, location and quality.

Outcome #8:

URI CoopExt follows up with the RI Coastal Resources Management Council to determine how many permit applications for coastal invasive management were filed by Certified Invasive Managers trained through this program. 30 permits were obtained by Certified Invasive Managers for projects to restore biodiversity in coastal areas, totaling approximately 50 acres of coastal habitat.

Key Items of Evaluation

URI's Master Gardener Program continues to have a positive impact on knowledge and willingness of Rhode Islanders to adopt environmentally sustainable gardening practices.

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	3%		7%	
112	Watershed Protection and Management	19%		14%	
123	Management and Sustainability of Forest Resources	8%		11%	
131	Alternative Uses of Land	8%		2%	
132	Weather and Climate	2%		8%	
133	Pollution Prevention and Mitigation	20%		3%	
135	Aquatic and Terrestrial Wildlife	9%		13%	
136	Conservation of Biological Diversity	8%		11%	
605	Natural Resource and Environmental Economics	6%		15%	
608	Community Resource Planning and Development	6%		9%	
721	Insects and Other Pests Affecting Humans	3%		2%	
722	Zoonotic Diseases and Parasites Affecting Humans	3%		2%	
803	Sociological and Technological Change Affecting Individuals, Families, and Communities	5%		3%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	4.0	0.0	15.0	0.0
Actual Paid	4.1	0.0	6.3	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**
351592	0	359635	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
283839	0	313362	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.

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 will identify needs and build upon successful local programs to create and disseminate new materials, tools and curricula in RI and New England. Our water quality programs will continue development, delivery, training and application of proven water quality management tools and techniques such as:

- 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

Use geological evidence to evaluate risks from coastal hazards. Primary tools are the records of inundation that are preserved in salt marshes and coastal freshwater marshes that enable us to identify when land-level changed due to earthquakes, when tsunami and storm sediments inundated the coastline, and how sea level has risen in response to past climatic changes.

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.

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 insect pests 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

- Energy audit and GHG inventory in selected municipalities/businesses
- Feasibility and implementation of energy efficiency and renewable energy technologies
- Municipal energy training for municipal officials and employees
- Climate Showcase Community conferences
- Train the future workforce for RI's energy sector organizations
- Evaluate public acceptance of offshore wind energy generation

2. Brief description of the target audience

Vector Borne Diseases
The target audience will be diverse and will represent all Rhode Islanders, especially those at greatest risk of contracting vector borne diseases. This audience will include 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.

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

2017	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	40831	25052332	4790	501390

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

Patent Applications Submitted

Year: 2017

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	2	31	33

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of peer reviewed publications

Year	Actual
2017	33

Output #2

Output Measure

- Number of books and monographs

Not reporting on this Output for this Annual Report

Output #3

Output Measure

- Number of abstracts

Not reporting on this Output for this Annual Report

Output #4

Output Measure

- Number of conference proceedings
  Not reporting on this Output for this Annual Report

Output #5

Output Measure

- Number of fact sheets, bulletins and newsletters

Year	Actual
2017	226

Output #6

Output Measure

- Number of training manuals (includes instructional CDs)
  Not reporting on this Output for this Annual Report

Output #7

Output Measure

- Number of scientific/professional presentations

Year	Actual
2017	144

Output #8

Output Measure

- Number of workshops (including short courses)
  Not reporting on this Output for this Annual Report

Output #9

Output Measure

- Number of conferences hosted
  Not reporting on this Output for this Annual Report

Output #10

Output Measure

- Number of websites developed and/or refined
  Not reporting on this Output for this Annual Report

Output #11

Output Measure

- Number of public presentations
  Not reporting on this Output for this Annual Report

Output #12

Output Measure

- Number of public service announcements
  Not reporting on this Output for this Annual Report

Output #13

Output Measure

- Number of students trained

Year	Actual
2017	188

Output #14

Output Measure

- Number of theses/dissertations completed
  Not reporting on this Output for this Annual Report

Output #15

Output Measure

- Number of postdoctoral scientists trained
  Not reporting on this Output for this Annual Report

Output #16

Output Measure

- How many volunteers did you train?

Year	Actual
2017	877

Output #17

Output Measure

- How many trainings or workshops (including professional, volunteer, industry, school-based, etc.) did you conduct?

Year	Actual
2017	222

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

15	Increased understanding of how plant genome size influences competitive ability and susceptibility to herbivory. Indicators are number of publications and presentations.
16	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.
17	Increased understanding of the economic valuation of air quality and greenhouse gas emissions. Indicator is number of publications and presentations.
18	Enhance capacity of land use managers to identify effective strategies for minimizing watershed nitrogen export. Indicator is number of publications and presentations.
19	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.
20	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.
21	Improve 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.
22	Improved understanding of the factors that influence public acceptance of the Block Island Wind Farm. Indicator is number of publications and presentations.
23	Enhance understanding of the tradeoffs between alternative groundwater management regimes to improve decisions by irrigators and policymakers. Indicator is number of publications and presentations.
24	Improved understanding of the efficacy and accuracy of using small unmanned aerial systems (UAS) to map and monitor gypsy moth defoliation in hardwood forest ecosystem. 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.

   Not Reporting on this Outcome Measure

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
2017	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 managed the TickEncounter website and its Facebook, Twitter and YouTube social media channels. Several features of our outreach program make it unique and one of the most widely used tick and tickborne disease prevention resources in America. Perhaps the most unique aspect of TickEncounter is our focus on seasonal and geographical relevance and how that relates to tick encounter risk. During this reporting period, TickEncounter hosted 1,043,165 sessions (+8.5%) by 962,076 unique users (+6.8%) viewing 2,211,541 pages (+13.9%). We added 41 posts to our Facebook page that reached 335,229 people and were shared by 2,544. Our YouTube channel had 652,240 total views for a total of 541,538 viewing minutes. Our most popular video (Remove a tick safely) was viewed by 565,376 people.

During this reporting period our TickSpotters crowdsourced tick survey and riskiness assessment, promoted as our "free & fast portal to a tick expert," received 12,963 submissions which came from all 50 United States, every Canadian province, several Mexican states, as well as a number of foreign countries. Each submission received an auto-reply message with tick generic TickSmart tips and next best actions. Of these submissions, a total of 8,751 included a picture of the tick, and all of those submissions received at least one additional email providing a customized confirmation of the tick identification, riskiness assessment based on geography, stage of development, and state of engorgement. Additionally, these customized responses provided a more tailored best next action response for preventing disease and future tick encounters. About 1 in 10 of these customized responses resulted in at least one more round of email communications (880) with the client. We have now serviced almost 43,000 TickSpotters submissions in 4 years of operating this popular activity. In moving forward with TickSpotters, we have been designing a schematic plan for building a customized customer relationship management (CRM) software along with a scaleable implementation plan that will allow us to better manage and distribute the workload of responding to such a large and growing volume of submissions.

We continued to recruit TickEncounter Prevention Partners (TEPPs) from a wide variety of stakeholder groups. During the current period we added 56 Basic TEPPs (free), 5 Basic Plus TEPPs ($25), 19 Business Plus TEPPs ($100) and 4 Enhanced TEPPs ($1,000). We also added a bi-monthly newsletter that is sent to a growing mailing list of over 3,700 individuals and entities.

We initiated a Continuing Education (CE) program with certification (TickSmart certified) and CE credits, currently targeting only veterinary clinics but we are making plans to expand this program to other stakeholder groups. During this reporting period, we developed and conducted five 3-hour in person training workshops, and have certified a total of 45 veterinarians/veterinary technicians representing 19 clinics in Rhode Island, Massachusetts, and New Hampshire.

We also conducted a high volume of more traditional outreach, including 23 TickSmart lectures and workshops to a wide variety of stakeholder groups, with an estimated direct reach of 1,807 individuals. During the reporting period, we also had at least 56 media contacts, including regional (Providence, Boston, Baltimore, Washington, Dallas, Charlotte, Burlington, etc) and national television appearances (GoodMorning America) and radio (CBS radio, Sirius Doctor radio, etc), local to national newsprint (NY Times, Wall St. Journal, Washington Post, etc) and magazines (Womens Health, Mens Health, Consumer Reports, Time, etc). We participated in 3 elementary school health fairs with our "Do A Daily TickCheck program (estimated direct contacts 750 youths).

Results

Our outreach work has 2 principal goals: to increase our reach and influence, and to change people's tick prevention behaviors leading to a healthier lifestyle. We are in the process of developing survey tools for assessing changes in behavior based on specific components of our outreach programming.

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
2017	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. 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
We conducted research of the performance of advanced nitrogen removal technologies to assess their treatment efficiency and to optimize their performance. We assessed the influence of sea level rise on groundwater tables adjacent to existing OWTS along the Southern RI Coast to assess influence of sea level rise, and evaluated plant species that can be used with plant-based OWTS designs to help mitigate the impacts of climate change. In addition, we evaluated DNA sequencing methods to compare the microbial community composition in commonly-used nitrogen removal onsite wastewater treatment systems to better understand and optimize treatment, and evaluate greenhouse gas emissions in these systems. During the reporting period, our project team published three peer-reviewed papers, one MS thesis, and delivered 14 talks (two of which were invited) and seven posters to academic and professional audiences in RI, CT, MA, CA, AZ, and FL; reaching scientists, wastewater practitioners, board of health officials, regulatory decision makers and coastal resource managers. The team delivered a total of 31 workshops/ classes in three states in the region, reaching 750 practitioners, decision makers and students. These classes provided continuing education credits needed by over 540 licensed professionals to renew their professional licenses.

Results
Our results indicate that nitrogen removal technologies used in RI are in compliance with treatment standards approximately 60-65% of the time, and that recursive sampling and system monitoring would likely result in system compliance rates of about 80%. We have developed low cost field sampling measures that would make this improvement in compliance possible and are working with regulatory decision makers to make these required practices.

URI project staff educated wastewater practitioners about performance of 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 submitted to the RI Department of Environmental Management were 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 usage 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
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Seasonal droughts, periodic deluges, rising nutrient levels, nuisance and 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 NE) 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 has 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 and 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 (30 years!) 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 targeted 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. Eleven classroom and field trainings were provided across the state. The monitoring itself was done on sites of particular concern to the sponsoring organizations, exemplifying the responsiveness of the programs. Sites were 1/3 lakes or ponds, 1/3 rivers and streams, 1/3 estuaries, bays, and salt ponds. We hosted the annual NE Lakes conference at URI to educate NE lake and watershed organizations about lake and watershed ecology. In FY 2017 we made 26 public presentations and held or participated in 14 workshops or short courses. We are using 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 use it internally, and have provided data free of charge and upon request to thirteen organizations. 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 third 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

NE boasts a number of very long-term volunteer monitoring or citizen science programs, with ones in NH, VT and ME more than 35 years in existence. URI WW has reached 30 years. With each passing year the value of the long-term data and results of water clarity, temperature, oxygen content, nutrients and bacterial levels increases. In this 2017 FY over 25,000 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 DEM & US EPA. We downloaded and sent large data sets in response to 13 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 of impaired waters. 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 a 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
2017	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 15% 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 (approximately 150,000) who rely on private wells, this Extension program has used a variety of methods to educate and provide technical assistance to the state's private well owners.

What has been done
The University of Rhode Island Cooperative Extension Home*A*Syst Program provides education

and technical assistance to Rhode Island private well owners to help them make informed decisions to protect drinking water and human health. We partner with the Rhode Island Department of Health, the Rhode Island Department of Environmental Management, Rhode Island Association of Conservation Districts, local communities, libraries, Farm Fresh RI, and other groups to provide these services. Below is a summary of our efforts for this reporting period. Education and Technical Assistance to RI Private Well Owners:There were eight community workshops across the state attended by 350 private well owners. In January 2014, we began facilitated well water testing in conjunction with our workshops. Workshop participants can sign out well water test kits for the RI State Health Laboratories. Two days after the workshop, we return to the community to pick up test kits and take them to the State Health Lab. We have continued to provide this facilitated testing as part of our educational programming. Our 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 our workshops. We continued and expanded upon the 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. We provided technical assistance to 1,167 people at 38 events throughout this reporting period.

Two URI Coastal and Environmental Fellows attend the vast majority of these community events; these students are trained and supervised by the program director and program graduate student. During this reporting period, we piloted the facilitated testing process instituted at private well workshops in 2014 and described above. We were interested to learn if people would take a kit and return it to us at a designated community pick up location. Students signed out annual water test kits at events and scheduled four pick up events at four different locations across the state. During this pilot effort, 58 people had their water tested.

We continued to update the program website at web.uri.edu/safewater. Our community event calendar is posted on the website and people can sign up for workshops via our website. The Program's quarterly email newsletter was sent to 1200 private well owners quarterly during this reporting period. We maintained an active and robust social media outreach on Facebook to build and sustain interest in program events. We mentored Students, including two graduate assistants and four undergraduate Coastal and Environmental Fellows.

We provided education and technical assistance to professional audiences. We began working with the RI Realtor's Association to develop and offer training to their professional membership. We developed and submitted training materials in August 2017. Training is scheduled for March, 2018. We began work with the RI Association of Building Officials to develop and offer training to their professional membership.

Results

Each year, we mail surveys to private well water workshop attendees to determine actions they took as a result of attending the program. This is an IRB approved approach. Post workshop evaluations conducted annually show that workshop participants are taking action to protect their private well. Most notably, 78% 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 State Health Lab. In addition, 77% of workshop attendees inspected their wellhead area for possible pollution problems and 68% shared workshop information with others. Results of these annual evaluations can be found at http://web.uri.edu/safewater/files/ImpactSummary_ForWeb.pdf

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
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Stormwater pollution is a major cause of water pollution in RI, leading to swimming beach closures, shellfishing bans, loss of recreational value, and degraded habitat. Almost all of RI's 38 municipalities are at least partly urbanized and own storm sewer systems that contribute to the problem. Under EPA and DEM Rules, these municipalities are required to implement storm water management programs to reduce stormwater pollution. To comply, they must address several minimum standards including educating the public about the stormwater pollution and actions they can take, and promoting citizen involvement in local stormwater management programs. These requirements, while necessary, represent a significant burden for most municipalities already struggling with few staff, shrinking budgets, and limited expertise in education and outreach. Our project is designed to assist these communities at a statewide level while also ensuring consistent educational messages, effective outreach methods, and economy of scale.

What has been done
We provided education and outreach to municipal officials, agency staff, watershed groups, and the public on managing stormwater runoff statewide. We delivered presentations on stormwater management topics for local officials and environmental professionals. We developed training in use of the updated RI Soil Erosion and Sediment Control Handbook in conjunction with StormwaterOne LLC. We assisted RIDEM with updates to the RI Stormwater Standards Manual. We partnered with the RI Green Infrastructure Coalition to promote maintenance of vegetated stormwater treatment systems by providing training and educational materials for municipal staff.

We responded to requests for information on water quality issues, primarily from local officials and have continued to update and maintain the RINEMO and RIStormwaterSolutions.org websites.

Results
At least 95% 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 a high level of EPA compliance with public education and involvement requirements based on URI outreach. RIDEM and RIDOT are proceeding with online training in Soil Erosion Training for their staff, ranging from introductory training for all staff involved in land development activities or permitting, to training for field staff, inspectors and plan developers. The Town of Charlestown continues to support the "Charlestown Recommended Landscaper Process" which sets guidelines for lawn care to protect water quality based on regional recommendations; other municipalities have expressed interest.

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
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Migrating song birds require suitable food sources to complete their migration. 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, 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.

What has been done
We conducted studies on the habitat and dietary requirements of migratory birds in Rhode Island. We developed a new model of habitat suitability for American woodcock that utilizes new GIS layers in conjunction with additional telemetry data, and allows us to identify properties in Rhode Island with strong potential for creation of habitat for this species. We continued our outreach program to engage land trusts and private landowners in the conservation of migratory birds and other wildlife species. Our outreach program included workshops, management of the Rhode Island Woods website, and field visits to private landowners to advise them on how to best manage their properties.

Results
The overall outcome was 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. 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 new model to predict habitat suitability for American woodcock in any location of the state has been produced. We will use this model to (a) prioritize landowners for future URI outreach efforts; and (b) advise state and private conservation agencies on site selection for habitat creation.

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
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Our studies will improve the understanding of the climatic drivers of vernal pool hydrology, thus creating a management tool that conservationists can use to restore, maintain, and preserve vernal pools and their related values and ecosystem functions.

What has been done
Four vernal pools were instrumented to monitor hydrology, redox chemistry, and carbon accounting along transects at three hydrologic zones: basin, wetland boundary, and upland. Hydrology, hydroperiods, and soil temperature have been measured since July of 2015 and are currently being monitored. Samples were collected along transects to calculate soil organic carbon pools and identify morphologies relative to hydric soil indicators. Simulated roots and deadfall were deployed to quantify decomposition rates. IRIS and IRMS tubes were deployed to relate reducing conditions with respect to Fe and Mn with hydrology and temperature.

Results
Vernal pool soils classified as Spodosols, Inceptisols, and Histosols. Hydroperiods in the basins extended from winter to early June before going dry. Although all of the basin and transitional zones met the saturation requirements for hydric soils, and IRIS tubes in the basin and transition zones showed 44 to 49% loss of Fe in the upper part of the soil meeting criteria for reducing conditions required for hydric soils, 25% of the soils did not meet a hydric soil indicator. Both of these soils were Spodosols, suggesting the need for continued evaluation of hydric soils with spodic morphologies.
On average, basin and transitional zone soils possessed the largest SOC pools (11 kg m-2), while SOC pools in upland zones were substantially less (8 kg m-2). Simulated deadfall decomposition was similar along the hydrosequence with average losses ranging from 23% (basin), 26% (transition), and 31% (upland). Similar trends were observed for root decomposition except there were significant differences across the hydrosequence transect with 6% loss in the basin, 13% loss in the transition, and 27% loss in the upland. The decomposition rates suggest that the upland SOC pools are because decomposition is significantly higher at the surface and in the soil than in the wetland.

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
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The University of Rhode Island (URI) Renewable Resources Extension Act (RREA) Program facilitates the use of geospatial data and technology for more informed decision making by natural resource managers. The primary objectives of the URI RREA Program are: 1) increasing the amount and reliability of geospatial data and technology resources that are available to Rhode Island's conservation community; 2) increasing the awareness of natural resource managers of the availability of these geospatial resources; 3) increasing the number of natural resource managers skilled in the effective application of these geospatial resources; 4) providing training and guidance in forest management to private and NGO landowners.

What has been done
The University of Rhode Island Renewable Resources Extension Act Program (URI RREA) promotes and supports the use of geospatial technologies to support natural resource management in our State. We meet our goals through traditional instructor-led training, online data and map distribution services, and mentoring and advising conservation organizations.

Objective 1: Increasing the amount and reliability of geospatial data and technology resources that are available to Rhode Island's conservation community: The University of Rhode Island (URI) Renewable Resources Extension Act (RREA) Program supported the development of a new data distribution website for the Rhode Island Geographic Information System (RIGIS) consortium. Based on the Esri ArcGIS Open Data Platform, this new website makes it far easier for Rhode Island's conservation community to access geospatial data about natural resources.

Objective 2: Increasing the awareness of natural resource managers of the availability of these geospatial resources: In addition to URI RREA's traditional instructor-led classroom training opportunities, program staff incorporated technology transfer and learning opportunities for its

audiences at professional meetings and over the internet. Approximately 500 people attended seventeen additional public presentations given by URI RREA staff during this reporting period.

Objective 3: Increasing the number of natural resource managers skilled in the effective application of these geospatial resources: URI RREA continued to update and offer URI's Geospatial Training Program's core course offerings during this reporting period. During this reporting period, the Introduction to GIS class was offered three times and attended by a total of 44 people. Working with ArcGIS Online was offered twice and was attended by 21 people.

Objective 4: Providing training and guidance in forest management to private and NGO landowners: URI RREA provided technical assistance to private forest owners in Rhode Island about how to increase the productivity of their forest products while improving forest health and wildlife habitat. During the reporting period, 36 landowners were directly assisted, which included visiting their properties and providing information about sources of technical and financial support.

Results

The amount of geospatial data available to Rhode Island's conservation community has increased. Natural resource managers are more aware of these geospatial resources, and are more skilled in the effective application of them. Private and NGO forest landowners are more aware of effective forest management practices.

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 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual

2017 0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Eastern hemlock, a majestic native conifer, is famous for its "cathedral-like" groves that remain cool and shady on even the hottest summer day - an attraction to humans and wildlife alike. Unlike other native conifers, this hemlock maintains needles on even its lowest branches, creating protected habitats that several species of warblers and the Solitary Vireo rely on for nesting. Eastern hemlocks in Mid-Atlantic states are also of considerable recreational importance for anglers: their deep shade cools headwater streams enough for trout and other cold-water fish species to survive summer heat waves. The ecological and societal roles of eastern hemlock are currently threatened by an invasive Asian insect, the hemlock woolly adelgid. It was first detected in the 1950s and, despite decades of work aimed at controlling this pest, it has since spread throughout eastern U.S. forests. Mature hemlocks die within 4-10 years of first infestation, and stand-level mortality rates in the northeastern U.S. often exceed 95%. Because the adelgid also attacks and kills hemlock seedlings, there will soon be no way for hemlock groves to recover - and profound environmental changes will be inevitable.

The devastation caused by the adelgid has, paradoxically, provided information vital to restoring hemlocks to our landscapes. The most pest-affected forests often contain several mature trees that may appear sick, but have not died. A few individual trees do much better than that, growing vigorously and without apparent insect damage in stands filled with dead hemlocks. Pest outbreaks have been characterized as 'smokeless forest fires' that remove a single tree species with almost surgical precision - and the worse the fire, the lower the odds that survivors persisted by chance alone. From a statistical perspective, the tens of millions of eastern hemlocks growing prior to the adelgid's arrival almost certainly included a few individuals whose genetic makeup fortuitously allowed them to survive attack. The fact that 11 of the 13 other species of hemlock worldwide ARE resistant to this pest further suggests that rare eastern hemlocks might do the same.

My work takes advantage of the adelgid's devastating impact to find, propagate, and test the pest resistance of rare surviving mature hemlock trees in southwestern PA; the most successful lines will be further propagated for use in PA-based reforestation efforts. Finding such rare individuals can be seen as searching for a needle in a haystack, but since the adelgid has burned down the haystack, we need only sift the ashes. I have been pursuing this line of research and locating eastern hemlock 'survivors' for over a decade, and have published experimental work showing (A) that rooted cuttings from these survivors retain their adelgid resistance; and (B) how the survivors and their rooted cuttings resist adelgid attack. Most recently, I have worked with colleagues and cooperators in several Northeastern states to establish eight trial reforestation sites where URI-produced hemlocks have been planted alongside similarly-sized susceptible hemlocks.

What has been done

In 2011, we planted 200 hemlock saplings into a temperate forest understory and experimentally manipulated the presence/absence of two herbivore species, hemlock scale and hemlock wooly adelgid. In 2015, we harvested the 88 remaining saplings and assessed plant physiology, growth, and resource allocation.

Results

Adelgid strongly affected hemlock growth. Infested saplings had lower above/belowground biomass ratios, more needle loss, and produced fewer new needles than control saplings.

Hemlock scale did not alter plant biomass allocation or growth, and its co-occurrence did not alter the impact of adelgid. While both adelgid and scale impacted the concentrations of primary metabolites, adelgid effects were more pronounced. Adelgid feeding simultaneously increased free amino acids local to feeding sites and a -30% reduction in starch. The cumulative impact of adelgid-induced needle loss, manipulation of nitrogen pools, and the loss of stored resources likely accelerates host decline through disruption of homeostatic source-sink dynamics occurring at the whole-plant level. Our research stresses the importance of considering long-term impacts to predict how plants will cope with contemporary pressures experienced in disturbed forests.

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
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Energy use and energy production are major sources of emissions that need to be reduced. In accordance with the Resilient Rhode Island Act of 2014, URI helps Rhode Island meet statutory goals for reduction of greenhouse gas emissions through stakeholder engagement. Increasing Rhode Islanders' awareness of contemporary energy challenges and bringing about behavior change by promoting best practices that increase sustainable energy consumption and production have a positive impact on this effort.

What has been done
1) Participated in public outreach events in Providence and Washington counties in the spring, manning outreach displays and leading hands-on educational activities for adults and youth;

2) Engaged in social media throughout the year through educational and informational energy-related posts;
3) Designed and delivered youth education programming on campus through school field trips in the spring and family camps in the summer; and
4) Designed and delivered an educational workshop on campus during the fall.

Results
The outcome of the activities described above was a change in behavior among participants in all four activities regarding best practices that encourage sustainable energy consumption, including, but not limited to:
1) completion of a home energy audit and implementation of energy saving measures suggested as a result of the audit;
2) conservation of home energy through in-home consumption behaviors, purchases, and landscape management decisions; and
3) current and future state and local level policy initiatives relevant to energy consumers, and the implications of these policies on energy prices, environmental quality and economic development.

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
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Many students enrolled at URI have indicated interest in sustainability and more specifically, opportunities to engage with renewable energy production and distribution, energy efficiency and energy conservation practices outside the classroom.

Rhode Island has a growing need for a well-trained energy workforce, and energy companies and organizations seek talent with experience and training in the energy field.

What has been done
The Energy Fellows Program staff curated five fellowship positions with industry and policymaker mentors for the 2017 program year. We solicited applications from high performing, motivated students interested in supplementing their classroom studies with an experiential learning opportunity, professional development training and immersion in a summer learning institute.

We worked to refine our professional development trainings based on feedback from our 2016 student cohort and their mentors. We began developing a summer learning institute to incorporate industry-led training sessions with field trips to energy projects and offices around southern New England. We also changed the culminating presentation format from scientific poster to qualitative oral presentation.

Results
Five students engaged in experiential learning through project-based work, and subsequently graduated from the Energy Fellows Program in 2017. Two fellows worked alongside energy professionals at the Rhode Island Commerce Corporation and Wind Energy Development, LLC., one fellow worked to develop energy literacy workshops alongside Cooperative Extension faculty and staff, and two fellows worked on an efficient buildings project with policymakers at the RI Office of Energy Resources.

These students, from a variety of majors, were afforded the experience of working on real-world, current energy projects in interdisciplinary teams with their mentors. Fellows received training in general energy topics through presentations from energy professionals, field trips, and conference attendance as well as specialized training in leadership and communications. Fellows actively participated in outreach events and presented their work to the university community and general public at an academic oral presentation session at the end of the year.

Four of the five students, or 80% of program participants, landed energy jobs immediately after they graduated.

4. Associated Knowledge Areas

KA Code	Knowledge Area
133	Pollution Prevention and Mitigation

Outcome #13

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 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Coastal marshes are valuable ecosystems and this research tests how human inputs of nitrogen (from sewage and/or fertilizer) are affecting the sustainability of those ecosystems. Further, our research is unique in testing potential opportunities to receive carbon market credits for tidal wetland restoration in response to degradation. If feasible, this would be a cost-effective means of restoring wetlands while also increasing biological carbon storage in coastal ecosystems.

What has been done
We completed a multiple year study of plant productivity (biomass) and greenhouse gas emissions (carbon dioxide, methane, nitrous oxide) from coastal marshes in three stages of degradation (with little, medium, and high historical inputs of human-derived nitrogen). We presented these findings at a regional meeting for natural resource managers in Connecticut.

Results
We found that both plant productivity and greenhouse gas emissions were surprisingly similar across our three sites, and thus degradation of the marshes in RI did not seem to impact their potential for storing carbon over the short-term study period. This means that despite high nitrogen inputs, marshes maintain robust ecosystem functions and may therefore qualify for "Blue Carbon" projects (which aim to increase biological carbon sequestration via coastal ecosystem restoration). Our outreach presentations have been part of a multi-year series by the collaborative team of scientists, engineers, and policy developers that are increasing the knowledge of Blue Carbon fundamentals throughout the New England Region. The work is attracting new invitations every year for further discussions on climate policy and marsh restoration.

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 #14

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 #15

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 #16

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
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

In the Northeastern U.S., a major trend in land use/land cover change over the past 50 years is the decline in both forest and agricultural lands and associated ecosystem services, primarily due to residential development. This study aims to quantify the changes in key ecosystem services, and understand what incentives and policies can change human behavior to reduce the impact on the ecosystem services.

What has been done
1) We designed and implemented 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. We are currently working towards a publication.
2) We identified and quantified the economic impacts of the Narragansett Bay Watershed and its importance to sustained economic development. We synthesized secondary data sources to understand the values and magnitude of consumptive and non-consumptive uses. In this FY, we completed the full draft of the report.

Results
1) We found that information that makes salient the relationship between lawn care decisions and water quality increases potential demand for green-certified lawn care services. Financial incentives were found to be substitutes rather than complementary. These findings suggest that lawn care industries and the RI Department of Environmental Management may benefit by a campaign that explains these linkages, but may not be cost effective to offer subsidies.
2) The Narragansett Bay watershed supports a number of sectors that generate employment and income.

4. Associated Knowledge Areas

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

Outcome #17

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
2017	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 well-being. Insights into the valuation of energy extraction and production byproducts will generate new understanding of how our economy should evolve and will evolve if left unchecked.

What has been done
Hydraulic fracturing ("fracking") is a relatively new drilling technique that has greatly expanded the oil and gas production in the United States, and as a result reduced prices for consumers. However, there are serious concerns about local impacts of drilling. In FY2017, I analyzed how housing prices responded proximate hydraulically fractured drilling in Colorado.

Results
Results indicate that housing prices decline sharply when there is proximate fracking, suggesting that local residents are harmed by the increase in drilling activity. While previous work conducted for this grant found evidence of large financial positive impacts from drilling royalties, this new work is able to separately identify the negative aspects by focusing on a sample of houses that do not have mineral rights and thus cannot financially benefit. Together, these results are important for understanding both the positives and negatives that can result from nearby fracking.

4. Associated Knowledge Areas

KA Code	Knowledge Area
605	Natural Resource and Environmental Economics

Outcome #18

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 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The export of nitrogen (N), phosphorus (P) and organic matter (OM) from watersheds can exert profound negative effects on the function and value of coastal estuaries and drinking water reservoirs. Elevated nitrate-N concentrations in drinking water can also be a human health concern. Phosphorus inputs to freshwater is linked to harmful algal blooms and increases organic matter compounding problems for water treatment plants associated with disinfectant byproducts from organic matter. Watershed management and climate also influence stream temperature, which governs a host of processes, including the health and fecundity of aquatic organisms. The goal of our research is to characterize the extent of N, P and OM transport within watersheds and identify climatic, land use and aquatic attributes that relate to export and removal rates. We are able to contribute to the scientific and management dialog that will target site-specific control strategies to locales with high potential for export of N, P and OM.

What has been done

We use data from high-frequency water quality sensors, samples from the field, and watershed, hydrologic and water quality models to assess temperature and the extent of N, P and OM export. Our work seeks to increase insights and management applications that can sustain and restore coastal waters and freshwaters.

We completed three years of high frequency water quality sensor deployment (including nitrate sensor) in three streams of watersheds of different dominant land use (in spring 2017, we deployed in two of these locations). The first three years of data have been subject to rigorous QA/QC. The nitrate sensor has undergone the first round of calibration to grab and storm event samples. Hydrologic and water quality models are in development on several watersheds. We are also developing statistical models and water quality models to assess the performance of riparian zones in removing nitrate from groundwater.

Several manuscripts have been published or are in review or in development with RI data and regional data. After several meetings with our team and RI DEM, RI DEM is using some of our data in their TMDL's to protect the drinking water resources of Aquidneck Island. In addition, NRCS is also interested in the results to help focus their best management practices. We conducted training sessions with ten journalists at the Metcalf Institute's 19th Annual Science Immersion Workshop for Journalists. We presented this work at a Providence Water Authority's Public Field Tour and to four 6th grade classes. A webinar (now on YouTube) was presented to students at The Energy Research Institute in India. A watershed process river table was demonstrated to students at URI.

We also completed work on a synthesis of the USDA NIFA water portfolio of funding from 2000-2013. We sorted the entire formula and non-formula portfolio into water quality categories to assess the breadth and extent of the portfolio. We serve on a panel and participate in in-person and virtual meetings to make suggestions for the investigator surveys, investigator interviews and final result dissemination.

We are also in a project studying dam removals in New England. We developed the New England Dam Database and are involved in adding additional attributes to it. Nitrogen, P and OM retention by dammed reservoirs can be considered a watershed scale practice that can minimize the effects of various land-based sources on downstream waters and can suggest an approach to ranking dams in order of importance to N, P and OM retention. This approach gives decision makers one more tool in the consideration of dam removals. We presented at an invited talk at the University of New Hampshire and continue to explore avenues to distribute this information.

Results
We are still in the process of assessing all of our data from sensors and models. Initial results indicate that watersheds with different land use/land cover respond differently during storm events versus baseflow conditions, and different water quality parameters also respond differently. Some of our work indicates potential thermal and oxygen stress with climate change and disturbance scenarios. RI DEM trusted our data to use in their reports that will lead to land use management strategies being put in place on Aquidneck Island, RI. Our outreach presentations garnered interest from multiple stakeholders.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
132	Weather and Climate

Outcome #19

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
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
As human populations grow, forested land continues to be cleared for construction of new roads, residences, businesses, and other infrastructure, and with that land development typically comes increases in pollution. As forested habitat dwindles, humans may increasingly come into contact with wildlife, including snakes, that perhaps are not desirable near our homes. For many species of reptiles and amphibians that are forest-dependent, we have a limited understanding of the amount of forested land required to maintain their populations and of their tolerance to contaminants associated with development.

Specifically, this research addressed the problems concerning how much forest is needed around

wetlands to protect amphibian populations, how snake populations are affected when individuals are moved from developed areas to nature reserves, and how turtle and amphibian populations are affected by road deicing salts.

The American public largely appreciates national and state parks, national forests, and other large protected areas. In addition, they value smaller parks and natural areas in their communities. Development and protection of biodiversity need not be incompatible. However, in order to develop responsibly, we must understand the thresholds of forest cover below which animal populations are no longer viable and below which forests cease to provide the key ecological service of taking up and sequestering contaminants.

Americans value nature, including wildlife, clean air, and clean water, and maintaining adequate amounts of healthy forest is essential to protecting those values.

What has been done
In this reporting period, we completed analyses of all data sets, submitted a number of manuscripts for publication in peer-reviewed scientific journals, and presented the results of this work at scientific meetings and in public forums.

Results
We determined that stream-breeding salamanders spend the majority of their time in adjacent forested landscapes within about 100 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 exhibited high levels of mortality compared with those in undeveloped areas, because of human-wildlife conflict and road mortality.

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 found that forest salamanders were more strongly influenced by the volume of cover objects (woody debris) near roads than by road salt levels in the soil. We expect that the results of these studies 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 #20

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.

Not Reporting on this Outcome Measure

Outcome #21

1. Outcome Measures

Improve 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 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	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 including trans-Pacific tsunami generated from Alaska that can impact the west coast and Hawaii. 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 continued to analyze samples from prior seasons from southern Washington, Oregon, northern California, as well as Kodiak Island and Unga Island, Alaska. The research at URI has involved 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. Fieldwork will resume for both the west coast and Alaska in the 2018 field season. As part of this project, we continued our collaboration with the Earthwatch Institute and the Durfee Foundation that resulted in eight high school students spending two weeks on a residential field trip learning the techniques we use in our research. The work was based in Rhode Island as similar salt marsh environments are found that can be used to demonstrate our approach while minimizing logistical difficulties.

Results
Our analysis of data collected from Unga Island during the FY16 field season has demonstrated an absence of evidence for large rupture of the Shumagin seismic gap that is consistent with our prior published results. Our results from here are also inconsistent with historical reports of a very large earthquake in the area in 1788, calling into question those reports. This data suggests that the Shumagin segment may rupture as a series of smaller M7 and low M8 earthquakes, rather than in large high M8 to M9 ruptures.

4. Associated Knowledge Areas

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

Outcome #22

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
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
A recent report by the U.S. Department of Energy and Department of Interior reinforced an earlier DOE goal of establishing 86 gigawatts of offshore wind energy capacity by 2050. The U.S. has only recently entered the offshore wind market with the 30-megawatt Block Island Wind Farm. Reaching the federal goal will require an aggressive and extensive development program. There is widespread acknowledgement that the implementation of renewable energy technologies, including offshore wind energy, requires public acceptance as much as technological know-how. Therefore, we are at a critical time for better understanding not just what the U.S. public thinks about offshore wind energy, but also what factors influence those perceptions.

What has been done
The first commercial offshore wind farm in the United States, the Block Island Wind Farm, began operations in Rhode Island state waters in December 2016. Throughout construction and the first year of operation, I conducted a research project to understand factors leading to support or opposition of the project among visitors, seasonal residents, and full-time residents. Teams of students visited the island throughout the summers of 2015, 2016, and 2017 to implement an intercept survey, systematically sampling members of the public and asking them to complete an 8-page paper survey.

Results
Although analysis is ongoing, the surveys revealed a moderate level of project support among respondents. Anticipated positive and negative impacts of the project are the greatest predictors of support; however, assessments of anticipated impacts and support are both influenced by underlying values (such as altruism and traditionalism) and beliefs about the ocean. This demonstrates that support for offshore wind energy projects and beliefs about that project are influenced by higher-order beliefs and ideologies. These insights are important for project advocates who hope to influence public acceptance, but also for policy makers who must understand the best practices for planning and engagement of the public. Additional analyses will seek to understand how public attitudes and acceptance changed throughout the construction process.

4. Associated Knowledge Areas

KA Code	Knowledge Area
605	Natural Resource and Environmental Economics
803	Sociological and Technological Change Affecting Individuals, Families, and Communities

Outcome #23

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
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
This work addresses water use regulations, over extraction of shared resources, and water quality initiatives from an economic and environmental perspective. This research is important because it can potentially lead to savings for the public from damages associated with over extraction of groundwater and other shared resources, improve the sustainability of irrigation in the U.S., and improve the efficiency of water quality policies.

What has been done
I worked with a number of other economists and graduate assistants at the university to further model groundwater commons and understand how policy can be conducted to improve the sustainable use of groundwater overtime.

Results
One project that is in its later stages led to a publication that demonstrated that uncertainty of rainfall processes leads to very little in welfare gains to farmers, relative to other concerns; mainly the risk of running out of groundwater for irrigation. Another project has shown that cognitive factors lead to over use of the commons, which means that when cognitive resources are stressed a heuristic that people often use is to deplete the commons, leading to a greater tragedy of the commons.

4. Associated Knowledge Areas

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

Outcome #24

1. Outcome Measures

Improved understanding of the efficacy and accuracy of using small unmanned aerial systems (UAS) to map and monitor gypsy moth defoliation in hardwood forest ecosystem. 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
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Gypsy moth defoliation is diminishing the health of forest ecosystems in RI. We are conducting this research to determine the efficacy and accuracy of using small Unmanned Aerial Systems (UAS) carrying true-color and multispectral sensor packages to map and monitor gypsy moth defoliation in hardwood forest ecosystems. The results of our research will be of significant importance to forest managers who must monitor the extent and magnitude of defoliation.

What has been done
In late August 2017 we deployed a small UAS to collect 3-inch pixel resolution true-color aerial imagery over the Cork Brook watershed within the larger Scituate Reservoir watershed. We engaged Providence Water Supply Board Natural Resource Management personnel.

Results
The results of our early stage research demonstrated the effectiveness of UAS-collected, true-color imagery for identifying late growing season evidence of defoliation. We anticipate more feedback on changes in learning due to outreach during the upcoming 2018 field season.

4. Associated Knowledge Areas

KA Code	Knowledge Area
123	Management and Sustainability of Forest Resources

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Competing Programmatic Challenges

Brief Explanation

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:

- 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.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Outcome #3:

We conduct proficiency exams in some classes, and entrance and exit questionnaires in others to assess a gain in knowledge. Seventeen OWTS professionals took the URI wastewater inspector training classes, passed their proficiency exams, and can now conduct inspections in RI communities. Forty-three professionals took URI classes required by RI or MA regulatory agencies in order to design and install bottomless sand filters. Twenty-four onsite wastewater professionals took the URI installer prep course to prepare them for the RIDEM installers licensing exam - 22 passed the exam and received an installer's license, required to install OWTS in RI. Nine onsite wastewater professionals took the URI course to prepare them for the RIDEM designer licensing exam, of which seven passed the exam and received a designer's license, required to design OWTS in RI.

Outcome #4:

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 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

Outcome #5:

We evaluate the program and program development in several ways. Workshop participants complete a program evaluation at the end of each community workshop. Also, an annual mail survey is sent to workshop participants in January or February of each year to determine what actions they took to protect their drinking water quality as a result of coming to a community

Evaluation results from the mail survey indicate that workshop participants are taking action to protect their private well. Most notably, results for 2016 indicate that 78% 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

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 two 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 86 workshop participants had their well water tested via our facilitated testing

process. In addition, we modified this approach during this reporting period and applied it to our Community Intercept Campaign. During this pilot effort, 58 people had their water tested. We intend to build upon this effort in the current fiscal year.

Outcome #6:

Evaluations are conducted for all workshops. In addition, we evaluate effectiveness of E-news communication using open rate and click throughs. 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 stormwater topics, but is much higher for RI-specific information such as local workshop notices at 44- 50%

Outcome #7:

We conducted formal evaluations of major outreach events such as the annual RI Coverts Workshop. We also monitored the number of landowners to whom we provided one-on-one technical assistance (outside of workshops), and recorded whether or not they followed up with management activities on their land. Finally, we monitored the use of the Rhode Island Woods website using Google Analytics, which records metrics such as the total number of users, the number of unique and repeat users, the number of page views, etc.

The participant evaluations of our workshops were very positive - landowners appreciated the mix of classroom and field sessions that we offer, and especially appreciate the field visits to private landowners who have already implemented related activities. The results of our one-on-one technical assistance was also positive - 28 of the 36 landowner who received this support from URI have already followed up by applying for NRCS support for forestry activities on their properties. Many of them mentioned how much they appreciated being visited by a URI outreach staff member.

Outcome #9:

URI RREA utilizes website statistics and participant evaluations to gauge the effectiveness of its primary outreach initiatives. During this reporting period, the RIGIS online data clearinghouse distributed more than 4.6 TB of data, and the 150 map services affiliated with the Rhode Island Digital Atlas responded to over 5.4 million requests. 17 GB of correction files were also downloaded from the GPS Base Station. These results generally grow each year as the audience for geospatial technology in Rhode Island and the region alike continues to expand.

Outcome #11:

We did not evaluate the effectiveness of our activities, but were aware of the completion of at least 30 home energy audits and/or efficiency projects implemented resulting from interactions with stakeholders through the activities described above.

Outcome #12:

During the program year, we sent a survey to all student fellows and their mentors. We asked questions specific to the professional development of skill development and energy training we currently provide to our Fellows and held several meetings with the URI Center for Career and Experiential Education to plan ahead for necessary program improvements. As a result of program evaluation through students and mentors, we amended the professional development course syllabus to include more training on interpersonal skill development, incorporating training by social scientists and Extension staff on campus.

Key Items of Evaluation

The research and extension activities within this planned program have been in place for many years. Strong evaluation scores provided by program participants show high satisfaction with the quality and content of these activities.

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
608	Community Resource Planning and Development	20%		35%	
801	Individual and Family Resource Management	20%		35%	
806	Youth Development	60%		0%	
903	Communication, Education, and Information Delivery	0%		30%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	3.0	0.0	0.0	0.0
Actual Paid	2.5	0.0	1.9	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
163336	0	102621	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
95804	0	84871	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

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

Teach and promote sustainable development techniques and management to communities.

Work with families to improve financial decision-making skills.

Investigate factors that affect how students engage in academic learning.

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
Students, families, RI Department of Environmental Management (RI DEM), 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

2017	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	1908	504126	3195	4659

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

Patent Applications Submitted

Year: 2017

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	0	2	2

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of workshops (including short courses)
  Not reporting on this Output for this Annual Report

Output #2

Output Measure

- Number of volunteers trained

Year	Actual
2017	117

Output #3

Output Measure

- Number of 4-H record books
  Not reporting on this Output for this Annual Report

Output #4

Output Measure

- Number of youth reached through programs

Year	Actual
2017	5586

Output #5

Output Measure

- Number of community/family serving groups reached
  Not reporting on this Output for this Annual Report

Output #6

Output Measure

- Number of community service projects
  Not reporting on this Output for this Annual Report

Output #7

Output Measure

- Number of activities and programs
  Not reporting on this Output for this Annual Report

Output #8

Output Measure

- Number of students trained

Year	Actual
2017	32

Output #9

Output Measure

- Number of websites developed and/or refined
  Not reporting on this Output for this Annual Report

Output #10

Output Measure

- Number of curricula developed and delivered
  Not reporting on this Output for this Annual Report

Output #11

Output Measure

- Number of professional training sessions completed
  Not reporting on this Output for this Annual Report

Output #12

Output Measure

- Number of public presentations

Year	Actual
2017	5

Output #13

Output Measure

- How many trainings or workshops (including professional, volunteer, industry, school-based, etc.) did you conduct?

Year	Actual
2017	122

Output #14

Output Measure

- How many outreach resources (e.g. fact sheets, bulletins, newsletters, videos, public service announcements, etc.) did you write or produce?

Year	Actual
2017	768

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. Indicator is number of publications and presentations.
6	Improved understanding of best practices for university engagement in local decision making. Indicator is number of publications and presentations.
7	Improved understanding of how social relationships, identity and perceptions affect success of at-risk students. Indicator is number of publications and presentations.

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
2017	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 FY17, we continued to increase the use of 4-H Kits (developed 12 new kits) and expanded our outreach to underrepresented areas of the state not being reached by the traditional 4-H club model through our 4-H SPIN (special interest) programs and clubs. Kits are very popular with libraries, youth-serving agencies, 4-H clubs, teachers and after-school providers.

Results
49% of the 706 4-H Club members participated in science and health projects/programs, competitions, education series and workshops and demonstrated an increase in knowledge. Spin Clubs continued to expand in FY17. 1,951 youth (Kindergarten-Grade 12) were reached through non-traditional club programming. This was accomplished through staff training volunteers, teachers and agency personnel to use the Science and Healthy Lifestyles Kits in under served

communities. 4-H Club Leaders from 18 of 37 4-H clubs responded to a FY17 end-of-year club leader survey. Over half of the clubs responding reported that "Due to 4-H activities", 60% to 100% of their members showed an increase in 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
2017	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 productive, contributing young adults. Today's youth are tomorrow's decision makers and will determine our future.

What has been done
Members of RI 4-H Clubs, 4-H SPIN (Special Interest) 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 (18/37) of registered, active 4-H clubs (average 18 members per club) reported their clubs completed between 1-12 community service projects in FY17 with an average of 4.1 projects resulting in 324 documented 4-H youth participating in approximately four or more community service projects or 46% of the FY17 4-H club enrollment. This 46% only includes clubs who reported their end of year results. 114 4-Hers who submitted record books (16% of 4-H club enrollments) in FY17 reported 2,878 community service hours or an average of 25 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
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Many youth are lacking in school and family-center 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. In FY17 4-H also held a 4-H Teen Leadership Conference at the Northwoods Challenge Course and a Military Teen Leadership Conference on Resiliency.

Results
255 4-H youth or 36% of active 4-H club members participated in district and state public presentation programs (38% demonstrated excellence with a score of 90 or above and moved on to the state contest), 4-H Farm School, Eastern States Exposition and other state level public events promoting 4-H (numbers are not available for local level). 150 4-H teens (may include duplicates) demonstrated their leadership ability by assuming major roles at 4-H Fairs, State 4-H events 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 FY17 more than 50% of their youth exhibited increased leadership skills as a result of their 4-H club experience and 90.3% of the clubs reporting having active Club youth officers. 114 4-H members who submitted record books reported a total of 2,704 4-H leadership hours or an average of 24 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.

Not Reporting on this Outcome Measure

Outcome #5

1. Outcome Measures

Improved understanding of how American households make financial decisions. Indicator is number of publications and presentations.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
American families are faced with a number of complex financial decisions on issues ranging from housing and retirement to attending and paying for college. The goal of this work has been to better understand how American households make financial decisions, and to improve the financial decision-making skills of the American family.

What has been done
After finalizing the student loan experimental design last year, the team has now moved to collect data on retirement and housing decision making using online surveys with experimental components. The team also developed ten fact sheets on personal finance topics to be used in extension and outreach efforts.

Results
From the student loan work, we found that young adults rely on advice from parents, guidance counselors, and friends on their college decision and that attending college was not possible without student loans. Moreover, students appear to have very little knowledge about the student loan repayment process. The group also developed best practices to help future researchers utilizing experimental designs in online surveys review benefits and shortcomings of using virtual focus groups for extension research.

4. Associated Knowledge Areas

KA Code	Knowledge Area
801	Individual and Family Resource Management

Outcome #6

1. Outcome Measures

Improved understanding of best practices for university engagement in local decision making. Indicator is number of publications and presentations.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Coastal communities are facing increasing but uncertain risks from storms and sea level rise. In the context of Rhode Island, this includes significant port infrastructure, the disruption of which would have profound impacts on the regional economy, including disruption of important resources like home heating oil. Understanding and communicating these risks to the broadest base of stakeholders is an essential step to starting broader conversations regarding adaptation to uncertain future conditions.

What has been done
Work undertaken to date has focused on developing strategic partnerships and infrastructure to create, disseminate and test visualizations. These partnerships include the following:
University of Rhode Island, Information Technology Services (ITS): A team of undergraduate students from the departments of computer science and ocean engineering is being trained in relevant visualization methods. This team will assist in creating 3d representations of communities engaged as part of the project and will form an ongoing resource for future work.
The Beach Special Area Management Plan (Beach SAMP): the Beach SAMP is providing ongoing ocean modeling that underpins the visualizations, and is providing the primary means of engagement and outreach through community meetings conducted around the visualizations.
The University of Rhode Island Graduate School of Oceanography (GSO): developing ocean modeling and visualizations for vulnerable port facilities and other infrastructure.
Rhode Island Emergency Management Agency (RIEMA): RIEMA has used visualizations provided by the project in Statewide exercises and trainings, and provides important input data regarding critical facilities.

Results
To date, visualizations have been created for half a dozen Rhode Island communities, this is being expanded by three more communities this spring. These visualizations have been employed in publications, outreach meetings conducted by the Beach SAMP, and in trainings conducted by the RIEMA. These visualizations have played an important role in uncovering and communicating specific vulnerabilities. These visualizations have served as important touchstones to facilitate stakeholder discussions regarding adaptation.

In addition to direct impacts of using these materials, a large scale survey (n=735) has been conducted, including both experts (e.g., coastal managers) and the lay public. The results of the survey are being used, among other things, to develop improved guidance for communication.

4. Associated Knowledge Areas

KA Code	Knowledge Area
608	Community Resource Planning and Development

Outcome #7

1. Outcome Measures

Improved understanding of how social relationships, identity and perceptions affect success of at-risk students. 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
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
This work addresses the various factors that affect the ways in which students engage (or don't engage) in the process of learning. There are many economic, social, and political reasons to promote an educated populace. Chief among these are the need to develop the next generation of leaders who are able to anticipate the future complicated problems that society will grapple with.

What has been done
I investigated the degree to which students feel a sense of belonging by asking them to produce written reflection assignments on sense of purpose, career choice, and advising a hypothetical future freshman at the end of their first semester. Written reflections were qualitatively and quantitatively analyzed to identify common themes indicating students' perception of their motivation for academics. These themes were used to work with faculty on inclusively-minded design of STEM curricula.

Results
The results of this work are currently being prepared for publication in peer-reviewed journals. These results will also inform the design of introductory STEM courses in future semesters.

4. Associated Knowledge Areas

KA Code	Knowledge Area
903	Communication, Education, and Information Delivery

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Competing Public priorities
- Competing Programmatic Challenges

Brief Explanation

Outcome #6:
Bridging boundaries, as this project does, requires development of skills in multiple disciplines. This has meant that the research team has been spending extra time understanding the unique disciplinary approaches and constraints of physical, natural and social sciences to augment their established design skills. While many managerial and organizational skills are portable, learning the unique epistemological approaches of other disciplines has required additional time and dedication. These obstacles have largely been overcome, however, this kind of bridging will require constant learning and adaptation.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Outcome #1:
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 % knowledge gained but are reported under evaluation results. Youth survey results at the 4-H Gross Science Night: This event sparked my interest in science - Not at all = 2%, Somewhat = 29% A lot-26 = 69%; This event helped to improve my knowledge of science - Somewhat = 32% A lot = 68%; Rate your Knowledge of Science Before this event A little =23% Some-= 60% A lot = 15%; Rate your Knowledge of Science AFTER this event A little = 2% Some = 29% A lot = 68%. Overall through evaluations and adult observation the 4-H program can clearly document that there is an increase in science knowledge and skills through their 4-H participation.

Outcome #6:
A large scale public survey (n=735) was conducted to evaluate the visualizations, and the effect they had on perceptions. These included specific outreach to experts (ex. Coastal managers, scientists, persons in the maritime industry, planners, and the lay public. This survey didn't directly measure the effectiveness of outreach activities, but it does measure effectiveness of these visualizations more generally.
The preliminary survey results suggest that 3d visualizations developed as part of this project have strong influence on perception based on place attachment. Although there is some evidence of biased assimilation in the preliminary results, evidence suggests that well-designed visualizations can enhance communication. Other results suggest that enhanced background information, and some specific visual cues may further enhance the perceived credibility and utility of the visualizations.

Key Items of Evaluation

4-H events designed to make learning about science fun are an effective means to enhance science skills and knowledge in young people.

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%		62%	
611	Foreign Policy and Programs	50%		38%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	0.5	0.0	0.5	0.0
Actual Paid	0.5	0.0	1.1	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**
47461	0	56432	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
113882	0	82136	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.

Develop and promulgate sustainable fisheries programs in Ghana and Malawi.

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.

Investigate past and present factors affecting sustainable development of domestic and international communities.

2. Brief description of the target audience

Foreign universities; governments; government officials; policy makers; international business collaborators and producers; international students; AES scientists; 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

2017	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	268	25	150	20

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

Patent Applications Submitted

Year:	2017
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	0	2	2

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

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

Year	Actual
2017	10

Output #2

Output Measure

- Number of training manuals (includes instructional CDs)
  Not reporting on this Output for this Annual Report

Output #3

Output Measure

- Number of scientific/professional presentations

Year	Actual
2017	8

Output #4

Output Measure

- Number of workshops (including short courses)

Year	Actual
2017	9

Output #5

Output Measure

- Number of conferences hosted
  Not reporting on this Output for this Annual Report

Output #6

Output Measure

- Number of websites developed and/or refined
  Not reporting on this Output for this Annual Report

Output #7

Output Measure

- Number of public presentations
  Not reporting on this Output for this Annual Report

Output #8

Output Measure

- Number of students trained

Year	Actual
2017	16

Output #9

Output Measure

- Number of theses/dissertations completed
  Not reporting on this Output for this Annual Report

Output #10

Output Measure

- Number of postdoctoral scientists trained
  Not reporting on this Output for this Annual Report

Output #11

Output Measure

- Number of volunteers trained

Year	Actual
2017	9

Output #12

Output Measure

- Number of intervention studies
  Not reporting on this Output for this Annual Report

Output #13

Output Measure

- Number of social marketing actions/activities
  Not reporting on this Output for this Annual Report

Output #14

Output Measure

- Number of video productions
  Not reporting on this Output for this Annual Report

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	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	Improved understanding of best practices and challenges for small island sustainable development. Indicator is number of publications and presentations.
4	Improved understanding of how gender inequality and unsustainable development affect local, national and international communities. Indicator is number of publications and presentations.
5	Artisanal fisheries ecosystems in Africa 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
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Global hunger is linked to land availability and condition. The changing environment and economy has exacerbated agricultural production. The work conducted in China has focused on achieving higher vegetative cover to protect soil resources from erosion and provide some potential sources of agricultural product need. In northern areas (Harbin) low temperature tolerance is the primary factor driving plant selection. Anti-desertification and salinity tolerance are secondary criteria but no less critical to human accommodation and need. The industrializing areas along the eastern seacoast (Bohai Bay to Quintao) evidence subsistence agriculture being displaced by transplant of business and associated worker accommodations. The regional challenge is high salinity and increasing saline conditions where water is diverted to new flow paths and uses. "New" land is being created by large reclamation projects where on-shore deposition is offered to displaced farmers as recompense for traditional lands. High salinity, decreased water flow and land (soil) without microbial or physical structure suitable to plant growth remains a challenge. Plants that might be food and fodder candidates are essential to human success in new communities.

What has been done
Test trials (survival and growth) have been planted at multiple locations. Cooperators have been identified and information on potential plants shared. Site visits to locations and to nursery in Tianjin have occurred. Meetings and lectures have taken place at several Universities and regional associations in effort to raise necessary local support. The necessary support includes both the funds to continue plant evaluation and training for farmers and other staff.

Results
Alternative plant communities have been established. Approximately 50% survival has been noted in high salinity tolerance plantings and slightly less in the low temperature overlay areas. The USDA model for research/outreach and education is not directly applicable in these regions.

The differences in academic cultures have delivered some unanticipated challenges. The desire to develop or obtain some income beyond salary or derive value from perceived value of new crops/varieties was underestimated in my new colleagues. Social improvements (additional food, products for sale, animal health) are possible but information and crop distribution has been limited by seeming efforts to exploit the situation. Additional applied research could be of value but without greater understanding of social and political construct they might not have the outcomes expected.

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

Improved understanding of best practices and challenges for small island sustainable development. 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
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
This research addresses the issue of sustainable development for small islands and small island states, an outstanding issue in many regions of the world. I specifically work in the Caribbean, Southeast Asia, and coastal New England. Comparing sustainable practices and plans across

regions can lead to cross fertilization of ideas and innovation as well as identification of problems with the basic assumptions of any given sustainability strategy.

What has been done
I have visited and conducted ethnographic research in The Bahamas, Indonesia, and Block Island (RI). This research is in the process of data collection, data analysis, or in the writing up phase, depending on the project.

Results
Most of this research is still in the early stages, and initial results show that islands are complex socio-ecological environments tied to shifting global assemblages of policy and practice. In this context, sustainability is a moving target and there is no silver bullet for island states or island systems to propel them towards sustainable development solutions. Local level sovereignty and autonomy is given lip service but rarely enabled when it comes to development planning, and thus a cultural shift is required among decision makers who manage island planning. Additionally, islands are manifestations of their particular histories and biographies, and these complex histories must be taken into account on an island by island basis in the planning process.

4. Associated Knowledge Areas

KA Code	Knowledge Area
606	International Trade and Development

Outcome #4

1. Outcome Measures

Improved understanding of how gender inequality and unsustainable development affect local, national and international communities. 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
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
My research reveals the expansion of women's issues to include international development, environmental degradation, human rights infractions, and violence. Such a reframing of these issues leads to new conclusions on how to address these global issues.

What has been done
This reframing has taken place over the last half century, and I have collected and analyzed information from archives, organizations, and other sources. This work is ongoing.

Results
This research is part of a book project, which is ongoing. So far, it is clear that in the 1980s and 1990s there was a push to include women's voices in conversations on environmental and other global issues by women's international organizations and that women succeed in rewriting some of the action items at the UN and other world conferences.

4. Associated Knowledge Areas

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

Outcome #5

1. Outcome Measures

Artisanal fisheries ecosystems in Africa are managed more sustainably. Indicator is number of new sustainable fishery management plans.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The need for food has become the primary driver for these activities. Fisheries need to be managed with balanced objectives: food, work, environmental concerns, legal and otherwise. Unless we learn how to manage fisheries in a collaborative manner, fisheries and many of these food limited countries will suffer. The USA imports most of its seafood (2nd only to oil). What happens around the world will affect the US consumer and taxpayer. If we can empower these countries to manage their fisheries, the whole world will benefit.

What has been done
Ghana: THREE YEAR STRATEGY
The strategy is to support fishery leaders across the system at local levels to create quick wins

that can lend legitimacy and hope for national advances.

Malawi: Two leadership trainings of Usipa (Engraulicypris sardella) stakeholders

Results

Ghana: The leadership program has been able to directly impact 60 people, though the true impact of the initiative will be felt as actions are taken and the philosophy of leadership spreads. One of these actions was to create new trainers that could develop and deliver courses in the local language at local levels. In February 2017, alumni gathered to fine tune their skills and adapt the course for a local Ghanaian audience. They have developed plans for building the capacity of co-management committees in three local inshore fisheries. These local pilots will test how co-management can proceed in Ghana and serve as learning sites for the national fishery. The leadership program will be integrated into the fishery co-management planning process to ensure there is a swift transition from planning to implementation by planting the seeds of trust, legitimacy and joint action from the start.

Malawi: To address the need for effective management of the Usipa (Engraulicypris sardella) fishery in Lake Malawi, 19 individuals working throughout the Usipa fishery system attended a five-day leadership orientation event, 22-26 May 2017, to develop their leadership competencies and establish a team to lead a multi-stakeholder planning process. The program was facilitated by URI as part of the USAID funded Fisheries Integration for Society and Habitats (FISH) project. The leaders left with refined leadership skills and action plans for engaging stakeholders as part of a participatory planning process for the Usipa Fishery Management Policy.

The "Leadership for Fisheries Management" is an intensive program focused on the application of an ecosystem approach and a whole systems view to fisheries management as the overarching themes of this leadership development experience. The participants explored new and innovative concepts in fisheries management with examples from international fishery cases. The fishery leaders practiced several leadership skills and discussed potential management objectives and measures. This enabled them to understand the interests of stakeholders and be able to facilitate similar exercises at local meetings to gather input. A key skill was practicing how to solve conflicts in a constructive manner to draw in all stakeholders to the planning process and inspire others to shift their attitudes.

At the conclusion of this event, the participants (1) drafted a vision for the Usipa fishery, and improved their understanding of interests and priorities of various stakeholders engaged in the fishery; (2) outlined the major sections of the Usipa management policy; (3) developed action plans for educating and gathering input from stakeholders for management objectives and measures; (4) committed to working as a team informally to build off of their unique positions throughout the fishery system; and (5) agreed to reconvene in late July to draft the management objectives and measures based on strong representation of the larger fishing community.

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

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

None

Key Items of Evaluation

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: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	3.0	0.0	8.0	0.0
Actual Paid	4.5	0.0	4.0	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**
437995	0	505449	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
424999	0	709619	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

Infrastructure needs are addressed by this program including administrative support personnel, facilities, and farms.

2. Brief description of the target audience

Academic faculty, university staff, graduate students, undergraduate students, university administrators, AES scientists, Extension faculty and staff.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2017	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: 2017

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of proposals submitted

Year	Actual
2017	144

Output #2

Output Measure

- Number of proposals funded

Year	Actual
2017	110

Output #3

Output Measure

- Total funding awarded (in millions of dollars)

Year	Actual
2017	12

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 grant support.

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 grant support.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	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

- Appropriations changes
- Public Policy changes
- Competing Public priorities

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

VI. National Outcomes and Indicators

1. NIFA Selected Outcomes and Indicators

Childhood Obesity (Outcome 1, Indicator 1.c)	
473	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.