

V(A). Planned Program (Summary)

Program # 3

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	25%		0%	
205	Plant Management Systems	38%		5%	
215	Biological Control of Pests Affecting Plants	6%		0%	
216	Integrated Pest Management Systems	13%		0%	
301	Reproductive Performance of Animals	6%		5%	
302	Nutrient Utilization in Animals	0%		15%	
304	Animal Genome	0%		5%	
305	Animal Physiological Processes	6%		15%	
307	Animal Management Systems	6%		20%	
311	Animal Diseases	0%		15%	
605	Natural Resource and Environmental Economics	0%		5%	
606	International Trade and Development Economics	0%		5%	
609	Economic Theory and Methods	0%		5%	
610	Domestic Policy Analysis	0%		5%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2014	Extension		Research	
	1862	1890	1862	1890
Plan	9.0	0.0	10.0	0.0
Actual Paid	5.5	0.0	3.1	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
356632	0	114599	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
402730	0	147988	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.

Research genetic factors controlling muscle growth in rainbow trout, a model species for aquaculture.

Develop and share strategies to create sustainable fisheries and enhance aquaculture in the state and region.

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

Establish demonstration sites within existing community gardens to showcase best practices for edible production, pollinator habitat and resource conservation;

Utilize urban community garden sites as living laboratories to engage youth and adults in the urban food system;

Develop and disseminate fact sheets, websites and guidance documents for community leaders interested in starting community gardens in RI.

Horticulture

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

Develop and deliver training for green industry professionals and volunteer garden educators to encourage the incorporation of plants that require less water, labor, nutrients, and pesticides into landscapes.

Expand markets for resource-conserving products.

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

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

Economics, Markets and Policy

Develop new risk-aware approaches to on-farm risk management via best practices for oysters and land based agriculture.

Improve the development of seafood markets by focusing on analyses of new marketing themes, market niches, and alternative seafood products.

Enhance fishery and aquaculture production by developing decision support tools to integrate management and marketing.

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, the livestock artificial insemination industry and 4-H youth

Community Gardening

General public; agricultural producers; residential and engineering/regulatory community members; school aged children; urban residents; various NGOs (land trusts, environmental organizations)

Horticulture

Agricultural producers of turf grass and ornamental plants (administered by a joint advisory committee of the Plant Sciences and Entomology department, 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

2014	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	18010	500000	7888	8000

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

Patent Applications Submitted

Year: 2014

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2014	Extension	Research	Total
Actual	0	1	1

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Peer reviewed publications

Year	Actual
2014	1

Output #2

Output Measure

- Books and monographs

Year	Actual
2014	0

Output #3

Output Measure

- Abstracts

Year	Actual
2014	1

Output #4

Output Measure

- Conference proceedings

Year	Actual
2014	2

Output #5

Output Measure

- Technical documents, fact sheets, bulletins and newsletters

Year	Actual
2014	12

Output #6

Output Measure

- Training manuals (includes instructional CD's)

Year	Actual
2014	22

Output #7

Output Measure

- Scientific/professional presentations

Year	Actual
2014	7

Output #8

Output Measure

- Workshops (including short courses)

Year	Actual
2014	36

Output #9

Output Measure

- Conferences hosted

Year	Actual
2014	3

Output #10

Output Measure

- Website development and refinement

Year	Actual
2014	6

Output #11

Output Measure

- Public presentations

Year	Actual
2014	77

Output #12

Output Measure

- Public service announcements

Year	Actual
2014	4

Output #13

Output Measure

- Student training

Year	Actual
2014	40

Output #14

Output Measure

- Thesis/dissertation

Year	Actual
2014	0

Output #15

Output Measure

- Biological control agent released

Year	Actual
2014	0

Output #16

Output Measure

- Germplasm developed

Year	Actual
2014	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Increased aquaculture production in Rhode Island (both of current species and new species. An increase in technology and understanding of basic mechanisms of immunity and muscle growth that will ultimately enhance production.
2	Growth of Rhode Island's shellfish aquaculture industry (includes number of farms, number of farmers employed and farmgate value of the aquaculture crops)
3	Development of fertility assays for use in AI industry
4	Develop research-based strategies to modify animal feeds that which will improve the immune status and disease resistance of domestic livestock
5	The successful Master Gardener Volunteer Program will be maintained and enhanced to expand the impact of URI Extension and free up Extension staff time by recruiting, training, supporting, managing, recognizing and retaining volunteers
6	Master Gardener volunteers work with URI staff and students to establish and maintain demonstration gardens that serve as teaching centers for Rhode Islanders interested in growing their own food. Produce from the demonstration gardens is donated to local food banks.
7	Through participating in the Learning Landscape and other hands on youth environmental education programs, students in grades K-5 will demonstrate increased knowledge and skills about the environment, horticulture and science. Teachers' trainings offer supplemental environmental science tools for formal and informal educators.
8	URI will continue to enhance the Master Composter training program to extend the educational reach of the University by recruiting, training and managing volunteers to education and encourage Rhode Island citizens to compost. In addition to the core training compost workshops will be added throughout the year for the general public.
9	Through ongoing curricula development, workshop offerings to the general public and provision of certification opportunities for green industry professionals, the integration of native plants, landscape restoration principles, invasive plant management and low impact development practices will be promoted to increase business and consumer demand for ecological sustainable landscape services and general practice.
10	Growers in RI propagate and market native plants. Consumers (state agencies, municipalities and residential landscape managers) seek out native plants for use in landscape
11	Increase the understanding of private and public sector and scientists of economic and market factors in fisheries and aquaculture management through publications and presentations.
12	Increase the understanding of scientists and decision makers through publications and presentations of the outcomes of game theoretical models to identify fisheries where political intervention is likely based on the degree of heterogeneity among harvesters.
13	Increased use of native trees, shrubs, and grasses by homeowners.

Outcome #1

1. Outcome Measures

Increased aquaculture production in Rhode Island (both of current species and new species. An increase in technology and understanding of basic mechanisms of immunity and muscle growth that will ultimately enhance production.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Shellfish aquaculture in general, and oyster aquaculture in particular, is one of the fastest growing segments of United States agriculture. In 2012, the US imported oysters in the value of more than \$27 million, showing that the more than \$100 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 and climate change. 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.

What has been done

Many of the challenges and opportunities facing the bivalve shellfish industry can be achieved through selective breeding and improved understanding of traits of commercial and ecological interest. Many researchers working on these issues have established the East Coast Shellfish Breeding Consortium, and joined efforts of this group with the shellfish industry has resulted in increased collaborative funding for the development of tool and resources for breeding in bivalve shellfish, including sequencing the genome of the Eastern oyster.

Results

Collaborative research efforts focused on the development and testing of fast-growing disease-resistant strains of Eastern oysters have demonstrated that the environment influences the performance of existing strains, suggesting a need for the development of a family-based breeding strategy that involves testing the performance of these families in sites through the Atlantic and Gulf coasts of the US representative of the highly varying environmental conditions in which oysters are cultured. Differences in disease resistance between oyster families and targeted challenge experiments have been exploited to investigate mechanisms of disease resistance in oysters and the development of markers potentially associated with disease resistance. These results have been shared with stakeholders through different venues.

4. Associated Knowledge Areas

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

Outcome #2

1. Outcome Measures

Growth of Rhode Island's shellfish aquaculture industry (includes number of farms, number of farmers employed and farmgate value of the aquaculture crops)

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Shellfish aquaculture in general, and oyster aquaculture in particular, is one of the fastest growing segments of United States agriculture. In 2012, the US imported oysters in the value of more than \$27 million, showing that the more than \$100 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 and climate change. 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.

What has been done

Many of the challenges and opportunities facing the bivalve shellfish industry can be achieved through selective breeding and improved understanding of traits of commercial and ecological interest. Many researchers working on these issues have established the East Coast Shellfish Breeding Consortium, and joined efforts of this group with the shellfish industry has resulted in increased collaborative funding for the development of tool and resources for breeding in bivalve shellfish, including sequencing the genome of the Eastern oyster. In collaboration with the industry, disease resistant families and strains derived from this research have been tested in selected commercial farm locations in Rhode Island, and information on performance, as well as samples from these oysters, have been used to inform further research.

Results

Collaborative research efforts focused on the development and testing of fast-growing disease-resistant strains of Eastern oysters have demonstrated that the environment influences the performance of existing strains, suggesting a need for the development of a family-based breeding strategy that involves testing the performance of these families in sites through the Atlantic and Gulf coasts of the US representative of the highly varying environmental conditions in which oysters are cultured. Differences in disease resistance between oyster families and targeted challenge experiments have been exploited to investigate mechanisms of disease resistance in oysters and the development of markers potentially associated with disease resistance. These results have been shared with stakeholders through different venues.

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 #3

1. Outcome Measures

Development of fertility assays for use in AI industry

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

Develop research-based strategies to modify animal feeds that which will improve the immune status and disease resistance of domestic livestock

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Gastrointestinal parasites, particularly the barber pole worm, limit the ability of producers to raise grass-fed sheep and goats. Emergence of anthelmintic (dewormer) resistance in all species of gastrointestinal nematodes, particularly the barber pole worm, and growing concern over chemical residues in animal products and in the environment has made the development of alternative methods of parasite control for small ruminants vital. In recent years, plants containing compounds called condensed tannins have been shown to reduce parasite loads in sheep and goats. The potential of cranberry leaf and birdsfoot trefoil to suppress GIN infection in small ruminants is under investigation.

What has been done

During the project period, adult *Haemonchus contortus* worms were incubated with cranberry leaf extract, cranberry leaf powder or control and the effects of these treatments on structural changes to the adult worm are being assessed using scanning electron microscopy. Tissue samples from 48 birdsfoot trefoil accessions and 6 commercial cultivars were collected, and were freeze-dried in preparation for use in anthelmintic assays in either leaf form or as a condensed tannin extract. Additional land was planted with the 6 commercial varieties of birdsfoot trefoil for the production of hay that will be fed during the in vivo testing phase of these studies in sheep fitted with rumen fistulas.

Results

Results from the scanning electron microscopy studies and the testing of birdsfoot trefoil accessions and cultivars for anthelmintic efficacy are pending.

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 #5

1. Outcome Measures

The successful Master Gardener Volunteer Program will be maintained and enhanced to expand the impact of URI Extension and free up Extension staff time by recruiting, training, supporting, managing, recognizing and retaining volunteers

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The URI Master Gardener Program serves to amplify the ability of Cooperative Extension to address community, environmental, and social challenges related to home gardening for the general public. The ability of URI Extension staff to directly work with the public is limited by staff size, funding and time constraints due to other projects and programs. This volunteer program trains qualified individuals to educate the public in science-based horticultural practices and connect them to the resources of Cooperative Extension.

What has been done

From January to April 2014, 120 members of the general public participated in the 14-week Master Gardener Program Core Training. This train-the-trainer program served to train the students as volunteer Extension educators and change their behavior to include environmentally-sound horticultural practices. In addition, approximately 600 veteran Master Gardener volunteers educated 9,700 people statewide by staffing the Master Gardener hotline, kiosk booths and free soil testing service, and by delivering educational workshops. They also educated home gardeners and their families through educational events held at Master Gardener demonstration gardens. Additional volunteer service activities improved the gardening skills of special

populations, including the school garden mentor and community garden consultant programs. New in 2014, the Master Gardeners now have a bi-monthly educational radio show.

Results

The Master Gardener Core Training participants showed demonstrable changes in behavior as related to reducing pesticide use, adopting integrated pest management strategies, storm water-sensitive cultural practices, gardening for biodiversity, more efficient edible gardening techniques and environmentally-sound lawn care practices. 9,700 people were exposed to science-based horticultural information through the Master Gardener hotline, kiosk, soil testing and public workshop service activities. 7,000 people were encouraged to grow their own food, utilize science-based horticultural practices and spend more time outdoors through educational events held at Master Gardener demonstration gardens. About 50,000 listeners learn through the Master Gardener radio show which airs bi-monthly.

4. Associated Knowledge Areas

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

Outcome #6

1. Outcome Measures

Master Gardener volunteers work with URI staff and students to establish and maintain demonstration gardens that serve as teaching centers for Rhode Islanders interested in growing their own food. Produce from the demonstration gardens is donated to local food banks.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Food security remains a problem in Rhode Island and nationally, with many residents lacking access to fresh, affordable food. This food insecurity is often concentrated in urban areas where growing food poses a unique set of challenges.

What has been done

URI Master Gardener volunteers grew fresh produce for donation at local food pantries in six educational gardens located in Providence, Coventry, Kingston and Wrentham, Massachusetts. In addition, targeted public educational workshops were held for food insecure populations to teach residents to grow their own healthy food. URI Master Gardener volunteers worked directly with community gardeners and school gardens as mentors and consultants, bringing the resources and knowledge base of extension to those who require it.

Results

6,800 pounds of food was donated to local food pantries within the reporting period. URI Master Gardener volunteers also worked one-on-one with fifteen school and community gardens statewide, serving as horticultural mentors, educators and consultants.

4. Associated Knowledge Areas

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

Outcome #7

1. Outcome Measures

Through participating in the Learning Landscape and other hands on youth environmental education programs, students in grades K-5 will demonstrate increased knowledge and skills about the environment, horticulture and science. Teachers' trainings offer supplemental environmental science tools for formal and informal educators.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Rhode Island youth, particularly low income, urban youth, have limited access and understanding of the natural environment resulting in a 'nature deficit disorder.' The manifestation is seen in low science achievement at school resulting in few entering science, technology, engineering and

mathematics (STEM) fields. Children ages 5 to 12 benefit from URI Outreach Center youth education programs through hands-on learning about the environment. Eco-exploration Camp engages children in environmental education day camp experiences at the URI Botanic Gardens in Kingston and the Botanical Center at Roger Williams Park in Providence. This provides families with a fun and educational opportunity for their children while school is not in session and promotes children's interest and engagement in environmental topics. This opportunity provides a foundation for further academic achievement.

What has been done

The URI Outreach Center implemented Learning Landscape Field Trips, Eco-Exploration Camp and other family and outreach events to engage youth ages 5 to 12 in hands-on environmental education activities. Learning Landscape was held at the Botanical Center at Roger Williams Park in Providence during the winter months and URI Botanic Gardens in Kingston during the spring. Topics addressed included seed starting, composting, native mammals and birds, and insects and pollination and ecology. Title 1 Providence schools received bus transportation scholarships and reduced admission for Learning Landscape to ensure that low-income urban youth were not excluded from the program due to financial restrictions. Also, the curriculum was reviewed to assure that it aligned with RI Grade Span Expectations for life science and earth science. The URI Eco-Exploration Camp connected children from Providence and environs to the natural environment through a day-long camp at the Botanical Center at Roger Williams Park for three weeks and URI Botanic Gardens for one week, led by Extension staff and URI Science and Engineering Fellows. In Providence, children engaged with URI Master Gardeners to harvest produce from the on-site community gardens, learned the ecology and natural history of the area and visited other facilities at the Park, including the Museum of Natural History. At URI, the children benefited from university facilities including outdoor investigations and recreational swimming in the URI pool. Camp programs in both locations fostered an increased environmental awareness and sensitivity.

Results

Through Eco-Exploration Camp, 52 children between the ages of 5 and 12 experienced nature investigation and learned ecological concepts through hands-on learning activities. Through Learning Landscape, URI engaged 2,336 elementary school children, nearly 50% of whom are students at Title 1 schools.

4. Associated Knowledge Areas

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

Outcome #8

1. Outcome Measures

URI will continue to enhance the Master Composter training program to extend the educational reach of the University by recruiting, training and managing volunteers to education and encourage Rhode Island citizens to compost. In addition to the core training compost workshops will be added throughout the year for the general public.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Rhode Island's only landfill has a life expectancy of less than 25 years. Since RI is the smallest state, selecting a community as a host site for establishing a new landfill will be a challenging task. RI Resource Recovery Corporation, the quasi-state agency who manages the Central Landfill in Johnston, reports that at least 40 percent of what goes into the landfill is food scraps. These food scraps are taking valuable space in the landfill that could be used as a depository site for non-degradable and non-recyclable materials.

What has been done

In response to this space issue and in order to educate RI residents on compost and healthy soil practices, we offered two Master Composter Core Trainings, whereby participants received 16 hours of educational training on composting, large-scale compost operations, vermicomposting, urban composting and compost regulations. In order to educate a more advanced audience, we also hosted two Advanced Composting trainings where attendees enhanced their compost knowledge to include hot composting, hands-on compost operations and compost tea applications. To bring information and resources about compost to larger audiences, Master Composter volunteers at public and community events gave presentations, demonstrations and exhibitions related to waste reduction throughout the state.

Results

A total of 36 attendees received the Master Composter Core Training; Advanced Compost Training was attended by 29 attendees. These training afforded our stakeholders with the most up-to-date information on compost, and made resources available for them to learn hands-on skills related to composting. This knowledge and information was then extended to more RI residents by participating in 20 community events throughout the state. By educating a group of advocates to educate the public on this issue, we are able to extend the life of the landfill and at the same time promote land conservation and healthy soil practices.

4. Associated Knowledge Areas

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

Outcome #9

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Rhode Island is the second most densely populated state in the US, with 40% of land under development (the other 60% is privately owned and forested). The negative impacts of land development and poor landscape management practices in RI on water quality, habitat and resource conservation are profound.

What has been done

In partnership with state and local regulatory agencies and nonprofit organizations, Extension staff deliver training programs targeting green industry, and environmental and regulatory professionals engaged in landscape design and management in sensitive areas. Practical tips regarding landscape design and management that protect habitat and surface and groundwater quality are shared. This allows professionals to expand their portfolio of services to include storm water management and invasive plant management.

Results

25 professionals were trained in invasive plant management, with 5 submitting coastal buffer zone management applications to the state coastal regulatory agency, thereby increasing their portfolio of services to include coastal invasive plant management. Also, 75 Certified Invasive Managers were recertified through the program for an additional two year period. As a result, state regulations governing land management in sensitive coastal areas saw increased

compliance through the program.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
216	Integrated Pest Management Systems

Outcome #10

1. Outcome Measures

Growers in RI propagate and market native plants. Consumers (state agencies, municipalities and residential landscape managers) seek out native plants for use in landscape

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Biodiversity loss is increasingly apparent as productive ecosystems are converted to developed land. As the second most densely populated state, the way in which we manage our private land (backyards and garden spaces) affects the amount of species that are supported in urban and suburban areas. A classic chicken versus egg style conundrum exists in that native plants are desired by certain consumers, while garden centers are not aware of which plants are considered indigenous or what the demand for them may be. Consumers are often unsure of which garden centers supply native species.

What has been done

After three years of development, the Rhode Island Native Plant Guide was launched in September 2014. This online, interactive tool allows gardeners and green industry professionals to find the right plant for the right place and function, and also displays the plant photo. The most innovative feature of the guide is the dynamic availability listing, which can be updated by local nurseries and garden centers who are assigned log-in credentials for the purposes of updating plant availability, creating a direct link between producers and consumers.

Results

Over 20 local businesses have registered with the guide and provided their plant availability information. About 5000 residents, school gardeners, community gardeners and green industry professionals have accessed the guide since its launch.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
215	Biological Control of Pests Affecting Plants
216	Integrated Pest Management Systems

Outcome #11

1. Outcome Measures

Increase the understanding of private and public sector and scientists of economic and market factors in fisheries and aquaculture management through publications and presentations.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Wild shellfish management in Rhode Island, as undertaken by the RI Department of Environmental Management (DEM), is focused on conserving naturally occurring shellfish populations in RI waters and managing public health outcomes due to water quality issues. Management is further complicated and made more challenging by economic factors. To a large extent, RI's shellfish management programs are driven by the economic interests of commercial harvesters. As such, an economic analysis of the Rhode Island shellfish market, and a better understanding of how the management interacts with the market, is essential to guide and support shellfish management policies in Rhode Island.

What has been done

This project set out to understand the market demand for wild-harvested clam species in Rhode Island to enhance the integration of its fishery management and marketing by estimating AIDS

model to obtain own-price and cross-price elasticities among different shellfish species and/or market categories.

Results

We found several insights about the clam (quahog) market in Rhode Island. The elasticity value suggests that demand for cooked quahog is less vulnerable to price change than the raw quahog products. Scallops and clams were not found as a substitute product for cooked quahog, whereas the raw quahog was found to be a substitute. Our results suggest that cooked quahogs (market categories "cherrystone" and "chowder" in particular) are more in demand than the raw quahog (ditto "little neck" and "top neck"). Moreover, the model also revealed that the cooked quahogs are preferred throughout the year with a higher demand during summer months whereas the demand for raw quahogs is confined to winter months especially February. Some of the key results were incorporated in the final draft of the Rhode Island Shellfish Management Plan, which was released in November 2014. Also, this study has become one of the dissertation chapters for a PhD student.

4. Associated Knowledge Areas

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

Outcome #12

1. Outcome Measures

Increase the understanding of scientists and decision makers through publications and presentations of the outcomes of game theoretical models to identify fisheries where political intervention is likely based on the degree of heterogeneity among harvesters.

Not Reporting on this Outcome Measure

Outcome #13

1. Outcome Measures

Increased use of native trees, shrubs, and grasses by homeowners.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Trees, shrubs and turf grasses are not only a major economic driver in Rhode Island but constitute the primary agricultural land use. In addition, these commodities are used by all homeowners attempting to improve the aesthetic appeal and intrinsic monetary value of their property. As such, the establishment of inappropriate, environmentally damaging or potentially invasive species can quickly become a significant problem throughout the state. It is therefore extremely important to minimize the use of non-native and invasive materials and to identify more effective ways to manage and maintain native adapted plant species for use in the homeowner landscape.

What has been done

Work has been undertaken to identify low maintenance grass species that can be used in highway medians and in other locations where soil stabilization is necessary but maintenance costs must remain low. Additional work has been undertaken to select and breed Eastern Hemlocks that are resistant to the hemlock wooly adelgid and to identify and establish biological control agents capable of managing purple loosestrife, mile-a-minute vine, swallow-worts and Phragmites australis. Finally, work has been undertaken to identify alternative management strategies for root-feeding nematodes on amenity turf grasses.

Results

A number of potentially useful native grass species have been identified and successfully tested in marginal growing environments. These species could be used throughout the state to reduce labor and improve the quality of areas currently exhibiting very little herbaceous cover. Currently, no alternative pesticide to organophosphates has been identified which is effective at controlling turf grass nematodes. Purple loosestrife has come under successful biological control throughout much of the state and agents for mile-a-minute vine are also well established. We have released our swallow-wort agents in Canada where results look promising and we anticipate USFWS and USDA approval to release in the USA in 2015.

4. Associated Knowledge Areas

KA Code	Knowledge Area
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

V(I). Planned Program (Evaluation Studies)

Evaluation Results

None

Key Items of Evaluation

None