2013 University of Maine Research Annual Report of Accomplishments and Results

Status: Accepted
Date Accepted: 06/02/2014

I. Report Overview

1. Executive Summary

Merit Review Process

The external scientific peer review process fully described in our 2015-2010 Plan of Work continues to be used to evaluate all MAFES projects, regardless of funding source. A total of 23 Hatch, Animal Health, and McIntire-Stennis projects went through the process in FY2013.

Stakeholder Input

MAFES took several actions to seek stakeholder input including formal meetings with advisory groups, attending monthly meetings of the Agricultural Council of Maine, using the Maine Agricultural Center to facilitate communication between MAFES and University of Maine Cooperative Extension, faculty interaction with stakeholder groups and individuals in both formal and informal settings, and field days at our research facilities.

Stakeholder groups were identified through coordinating and advisory committees. Input was collected through formal organization processes, feedback on research programs of faculty via stakeholder grant review programs, and through informal conversations with groups and individuals by MAFES leaders. Input was used internally to evaluate research, outreach, and hiring priorities for MAFES and the Maine Agricultural Center (MAC).

Station administrators have learned that stakeholders would like more research on food safety, climate change, agricultural economics, and agricultural engineering. Stakeholders emphasized that research on climate change, food safety, food agricultural economics, and agricultural engineering was important to Maine. MAFES joined with the experiment stations of New Hampshire and Vermont to develop the Northern New England Collaborative Research Funding Program; the focus of the first round of funding will be on adaptation to or mitigation of climate variability and change by agriculture in northern New England.

Expenditure Summary

In our 2013 Plan of Work, the Maine Agricultural & Forest Experiment Station (MAFES) estimated 35 SYs for 2013; the actual number of SYs was 32.8 for FY2013. For FY2013 MAFES expended $2,180,480(Actual Formula Funds), $3,494,053(Actual Matching Funds), $1,125,644(Actual All Other Funds), for a total of $6,800,177. This year we are continuing to report on McIntire-Stennis and Animal Health projects in the appropriate program area. The All Other Funds column for our program areas includes totals spent on these funds (MS and A) and their associated match. Extramural grants awarded are entered as an output for each program area. MAFES researchers in these program areas received a total of $7,615,152 in grants and contracts in university fiscal year 2013 (July 1, 2012, through June 30, 2013).

Planned Programs

Global Food Security and Hunger

In our 2013 plan of work, we estimated that there would be 12.4 SYs in this program area; the actual amount of SYs allocated for 2013 was 12.3. During FY2013, MAFES expended $980,831 (Hatch), and $1,594,004 (1862 Matching), and $0 (1862 All Other), for a total of $2,574,834 in this program area; there were 34 research projects in this program area.

MAFES research in this program area has resulted in a number of outputs for FY2013, including completed projects, peer-reviewed and other publications, presentations at professional meetings, workshops, and other venues. Faculty working in this area brought in $1,455,069 in extramural funding

There were several outcomes in this program area during FY2013. To highlight a few: MAFES scientists have helped developed local, organic food grain economies in our region; MAFES scientists in partnership with the Maine Potato board released two new potato varieties.

Climate Change

In our 2013 plan of work, we estimated that there would be 3.0 SYs in this program area; because we include McIntire-Stennis-funded projects in this report, the actual amount of SYs allocated for 2013 was 3.2. During FY2013, MAFES expended $171,676 (Hatch), and $249,632 (1862 Matching), $386,373 (1862 All Other, includes M-S funds and their state match) for a total of $807,682in this program area; there were six research projects in this program area.

MAFES research in this program area has resulted in a number of outputs for FY2013, including completed projects, publications, and presentations at professional meetings, workshops, and other venues. Faculty working in this area brought in $1,596,337 in extramural funding during university fiscal year 2013.

There were several outcomes in this program area during FY2013. To highlight a few: MAFES researchers worked with six high school science teachers and 200 K-12 students on climate-related research projects2012-2013 school year.

Sustainable Energy

In our 2013 plan of work, we estimated that there would be 1.0 SYs in this program area; because several faculty working in this program area have left the university, the actual amount of SYs allocated for 2013 was 0.6. During FY2013, MAFES expended $14,971 (Hatch), $63,281 (1862 Matching), $0 (1862 All Other) for a total of $72,252 in this program area; there was one research project in this program area.

Because faculty there is currently only one active project in this program area, we have moved this project to our Supporting Maine's Rural Communitiesprogram area for the 2014 Plan of Work and have discontinued this program area.

Childhood Obesity

In our 2013 plan of work, we estimated that there would be 1.2 SYs in this program area; the actual amount of SYs allocated for 2013 was 0.3 During FY2013, MAFES expended $27,373 (Hatch), $33,294 (1862 Matching), and $0 (1862 All Other) for a total of $60,667 in this program area; there was one research project in this program area.

Research in this program area has resulted in a number of outputs for FY2013, including publications, presentations at professional meetings, workshops, and at other venues.

Starting with the 2014 POW, the one project in this program area has been moved into the Global Food Security and Hunger program area and the program area has been discontinued.

Food Safety

In our 2013 plan of work, we estimated that there would be 2.6 SYs in this program area; the actual amount of SYs expended for 2013 was 4.0. During FY2013, MAFES expended $245,823 (Hatch), and $455,555 (1862 Matching), $0 (1862 All Other) for a total of $701,378in this program area; there were four research projects in this program area.

MAFES research in this program area has resulted in a number of outputs for FY2013, including publications, presentations at professional meetings, workshops, and other venues, and systems for detecting particular food pathogens. Faculty working in this area brought in $226,036 in extramural funding during university fiscal year 2013.

There were several outcomes in this program area during FY2013. To highlight one: MAFES food scientists have found that wild blueberries have prebiotic potentialand encourage thegrowth of good bacteria in the colon.

Sustaining Maine's Natural Resources

In our 2013 plan of work, we estimated that there would be 7.0 SYs in this program area. During FY2013, MAFES expended $412,721 (Hatch), $653,719 (1862 Matching), and $426,087 (1862 All Other, includes M-S funds and their state match) for a total of $1,492,527 in this program area. There were 14 research projects in this program area.

MAFES research in this program area has resulted in a number of outputs for FY2013, including completed projects, peer-reviewed and other publications, and presentations at professional meetings,

workshops, and other venues. Faculty working in this area brought in $2,035,688in extramural funding during university fiscal year 2013.

There were several outcomes in this program area during FY2013. To highlight a couple: MAFES scientistsidentified a new high-priority genetic tool to aid in identifying populations of concern--environmental DNA detection--and have begun to develop this approach as a resource for aquatic resource management in Maine. As part of aprojecton vernal pool conservation, MAFES researchers organized and ran over 40 stakeholder meetings in 2013.

Supporting Maine's Rural Communities

In our 2013 plan of work, we estimated that there would be 6.4 SYs in this program area; the actual amount of SYs expended for 2013 was 6.7. During FY2013, MAFES expended $327,086 (Hatch), $462,568 (1862 Matching) and $313,184 (1862 All Other, includes M-S and AH funds and their state match) for a total of $1,102,838 in this program area. There were 12 research projects in this program area.

MAFES research in this program area has resulted in a number of outputs for FY2013, including completed projects, peer-reviewed and other publications, and presentations at professional meetings, workshops, and other venues. Faculty working in this area brought in $1,508,412 in extramural funding during university fiscal year 2013.

There were several outcomes in this program area during FY2013. To highlight a couple: MAFES researchers conducted Retail Trade Area Analyses for rural Maine communities; and as part of a multistate project, MAFES scientistsfound that it was possible to produce the popular shade perennial, alumroot with as little as 3 to 6 liters of water during a 56-day growing season.

Total Actual Amount of professional FTEs/SYs for this State

Year: 2013	Extension		Research	
	1862	**1890**	**1862**	**1890**
Plan	0.0	0.0	35.0	0.0
Actual	0.0	0.0	33.7	0.0

II. Merit Review Process

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

- Internal University Panel

- External Non-University Panel

- Expert Peer Review

2. Brief Explanation

The station uses its standard external scientific review process for continuing faculty proposing new projects and a fast-track project approval process for new faculty. The standard external scientific peer review process fully described in our Plan of Work 2015 update is used to evaluate the scientific and societal significance of proposed MAFES projects, regardless of funding source. The fast-track process is intended for new faculty, where an accelerated approval process and a shorter two-year project period better meets the needs of the faculty member and station. Subsequent development of a five-year project begins during the initial two-year project. A total of 23 Hatch, Animal Health, and McIntire-Stennis projects went through the process in FY2013.

For the standard process, MAFES-funded projects go through three reviews. First, all pre-proposals

are reviewed by the MAFES Research Council, which is comprised of senior faculty who have an established record of high productivity and high-quality research. The Research Council reviews the pre-proposals to ensure that the proposed work falls within the purview of MAFES, addresses an important need identified by stakeholders, and that the faculty member submitting the pre-proposal possesses the expertise to conduct the research. Once approved by the Research Council, pre-proposals are distributed to advisory committees to elicit their input on the importance of the issues addressed within the pre-proposals.

Upon receiving the input of the Research Council and the advisory committees, each faculty member develops a full research proposal for the work they wish to perform. Upon receipt of the full proposals by the Director of the Experiment Station, the proposals are sent out for external, expert peer review by scientists who are qualified to review the proposals. All reviewers are external to the University of Maine. Potential reviewers are identified through the CRIS system, faculty, and department chairs who work in related areas, and through other experiment station directors. Each proposal is sent to three to five reviewers. Upon completion of the external expert peer reviews, the proposal is returned to the researcher, who then makes changes based on the comments of the reviewers. Finally, the proposal is reviewed and approved by the Research Council before it is submitted to USDA for final approval.

The fast-track process for MAFES-funded projects is initiated by the station director after consultation with the unit director/chair. The fast-track process can begin prior to a faculty member arriving on campus. The goal is to complete project development and obtain USDA approval in four months, which is substantially shorter than the time line for standard projects. Fast-track projects also are two years in duration compared to standard five-year projects. Subsequent development of a five-year project will occur during the initial two-year project.

The shorter time line for fast-track projects is achieved by using an abbreviated and internal proposal review, reducing proposal requirements, and expediting processing. Proposals are reviewed by a member of the research council and a faculty member designated by the unit director/chair to ensure that the proposed work falls within the purview of MAFES, addresses an important need identified by stakeholders, and that the faculty member submitting the proposal possesses the expertise to conduct the research.

III. Stakeholder Input

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

- 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.

The Maine Agricultural & Forest Experiment Station encouraged stakeholder input by hosting (along with the college leadership) formal meetings with advisory groups including the Board of Agriculture (thrice annually), the Forest Resources Advisory Committee (twice annually), the Potato Licensing Advisory Committee (twice annually), and the Coordinating Committee of the Maine Cooperative Fish and Wildlife Research Unit (annually). This year again, as a way to encourage more participation by state legislators, one Board of Agriculture meeting was held in the state capitol building.

The associate director attended a legislator's tour of Maine's wild blueberry industry, which included participation by local growers and presentations on the station's research programs. Associated discussions help inform the station on current research needs. The director and associate director also take part on on-campus legislative tours.

Other key stakeholders groups also provided input in direct or indirect ways. Three boards or committees (Wild Blueberry Commission of Maine Advisory Committee, Maine Potato Board, Cooperative Forestry Research Unit) held funding competitions where MAFES scientists submitted all or the majority of project proposals. The director and associate director met with the executive committee of the Maine Pomological Society for input on research needs of the apple industry and upgrading our research farm to ensure that we have appropriate orchard resources to meet these needs in the future. A committee of horticultural professionals along with the associate director approves research proposals supported by a horticulture fund. Feedback from these committees provides information on research priorities and needs for these commodity groups. The station also met with several private businesses and foundations to explore potential partnerships for future research in bioenergy, forest ecology, and sustainability.

The director and associate director discussed current research programs with legislators at two college exhibitions at the State House, one in association with the agricultural industry. The associate director of MAFES attended monthly meetings of the Agricultural Council of Maine (AGCOM) as a way to maintain effective communication with the wide array of agricultural organizations in the state. These meetings provide MAFES administration with good information on issues important to Maine's agricultural community.

The Maine Agricultural Center continued to facilitate improved communication between MAFES and University of Maine Cooperative Extension and therefore between researchers and extension faculty. Extension educators are both stakeholders in research and good sources of information about the research needs of the groups they serve.

MAFES faculty, through their interaction with stakeholder groups and individuals in both formal and informal settings, also continued to encourage stakeholder participation. Our research facilities hosted field days for apples, small fruits, and vegetables, potatoes, grains, and wild blueberries and other interests of growers, which allow researchers and administrators to learn more about the needs of the stakeholders in attendance.

Overall, the station makes every effort to allow all groups and individuals to express their suggestions and concerns about station-sponsored research through the mechanisms discussed above.

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

Brief explanation.

In the agricultural and forestry sectors, the major stakeholder groups are identified through coordinating and advisory committees such as the Board of Agriculture, the Forestry Research Advisory Committee, and the Coordinating Committee of the Maine Cooperative Fish and Wildlife Research Unit. MAFES provides input on potential committee members as do the current member stakeholder groups. For agriculture and forestry, MAFES maintains a list of all known stakeholder groups, and these groups are contacted on a regular basis. Individual stakeholders are identified in a variety of ad hoc ways including through faculty and department/school contacts as well as UMaine Extension.

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
- 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

Brief explanation.

Input is collected through formal organization processes (Board of Agriculture, Forest Resources Advisory Committee, and Maine Cooperative Fish and Wildlife Research Unit Coordinating Committee) and feedback on research programs of faculty via stakeholder grant review programs (Wild Blueberry Commission of Maine Advisory Committee, Maine Potato Board, Cooperative Forestry Research Unit). The Board of Agriculture and Forest Resources Advisory Committee reviews all MAFES project pre-proposals. Faculty researchers meet with and collect input from both traditional and nontraditional stakeholders at the group and individual level.

3. A statement of how the input will be considered

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

Brief explanation.

Input was used internally to evaluate research, outreach and hiring priorities for MAFES and the Maine Agricultural Center (MAC). As noted above, some stakeholder groups provide direct input during project approval processes. Based on the input received and the priorities set by the Board of

Agriculture and Forest Research Advisory Committee, critical areas were identified for emphasis and support. Since agriculture is a dynamic industry, MAC/MAFES needs to update long-range plans, and will rely on the recently completed strategic plan of the Agricultural Council of Maine.

Faculty, where appropriate, develop their research proposals to address the stated concerns of stakeholders.

Brief Explanation of what you learned from your Stakeholders

Based on the needs assessment of agricultural research and extension priority areas, station administrators have learned that stakeholders would like more research on food safety, climate change, agricultural economics, and agricultural engineering. As part of the newly created Northern New England Collaborative Research Funding Program, Maine has joined with the New Hampshire and Vermont experiment stations to encourage regional collaborative research projects. To address the need for research on climate change, the focus of the first two rounds of funding will be on adaptation to or mitigation of climate variability and change by agriculture in northern New England.

IV. Expenditure Summary

1. Total Actual Formula dollars Allocated (prepopulated from C-REEMS)			
Extension		**Research**	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
0	0	2149300	0

2. Totaled Actual dollars from Planned Programs Inputs				
	Extension		**Research**	
	Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
Actual Formula	0	0	2180480	0
Actual Matching	0	0	3494053	0
Actual All Other	0	0	1125644	0
Total Actual Expended	0	0	6800177	0

3. Amount of Above Actual Formula Dollars Expended which comes from Carryover funds from previous				
Carryover	0	0	474685	0

V. Planned Program Table of Content

S. No.	PROGRAM NAME
1	Global Food Security and Hunger
2	Climate Change
3	Sustainable Energy
4	Childhood Obesity
5	Food Safety
6	Sustaining Natural Resources
7	Supporting Rural Economies

V(A). Planned Program (Summary)

Program # 1
1. Name of the Planned Program

Global Food Security and Hunger

☑   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
102	Soil, Plant, Water, Nutrient Relationships			10%	
201	Plant Genome, Genetics, and Genetic Mechanisms			1%	
202	Plant Genetic Resources			7%	
204	Plant Product Quality and Utility (Preharvest)			3%	
205	Plant Management Systems			13%	
211	Insects, Mites, and Other Arthropods Affecting Plants			6%	
212	Pathogens and Nematodes Affecting Plants			6%	
213	Weeds Affecting Plants			8%	
216	Integrated Pest Management Systems			3%	
301	Reproductive Performance of Animals			4%	
302	Nutrient Utilization in Animals			3%	
303	Genetic Improvement of Animals			2%	
305	Animal Physiological Processes			3%	
311	Animal Diseases			11%	
403	Waste Disposal, Recycling, and Reuse			3%	
501	New and Improved Food Processing Technologies			2%	
502	New and Improved Food Products			3%	
601	Economics of Agricultural Production and Farm Management			3%	
605	Natural Resource and Environmental Economics			6%	
702	Requirements and Function of Nutrients and Other Food Components			3%	
	Total			100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	**1890**	**1862**	**1890**
Plan	0.0	0.0	12.4	0.0
Actual Paid Professional	0.0	0.0	12.3	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**
0	0	980831	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	1594004	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

Conduct scientific research. Publish peer-reviewed journal articles and other publications. Present findings at professional meetings, at field days for growers, and at other venues. Educate undergraduate and graduate students.

2. Brief description of the target audience

Maine crop and livestock farmers, aquaculture industry, food processors and marketers, Cooperative Extension staff, other scientists, state policymakers, regulators, and legislators, classroom teachers

3. How was eXtension used?

{No Data Entered}

V(E). Planned Program (Outputs)

1. Standard output measures

2013	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: 2013
   Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

   Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	0	30	30

V(F). State Defined Outputs

Output Target

Output #1

   Output Measure

   ● Number of completed research projects
     Not reporting on this Output for this Annual Report

Output #2

   Output Measure

   ● Number of other publications:

Year	Actual
2013	43

Output #3

   Output Measure

   ● Total amount of extramural funding ($):

Year	Actual
2013	1455069

Output #4

   Output Measure

   ● New web site: umaine.edu/localwheat

Year	Actual
2013	1

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content	
O. No.	**OUTCOME NAME**
1	Enhanced capacity of a sustainable global food system including new/improved plants, animals, technologies, and management systems
2	More sustainable, diverse, and resilient food systems in Maine
3	Improved animal genetics
4	Number of plant releases:
5	Number of new or improved innovations developed for food enterprises

Outcome #1

1. Outcome Measures

Enhanced capacity of a sustainable global food system including new/improved plants, animals, technologies, and management systems

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Demand for local organic food has inspired new interest in growing bread-quality wheat in New England. Our region's farmers have long produced small grains for animal feed on dairy and crop farms, but lack local knowledge and research information regarding production for the organic bread market. MAFES researchers are working with peers in New Hampshire and Vermont to build farmers' capacity to produce high-quality organic bread wheat.

What has been done
Experiment Station scientists have conducted extensive screening of spring and winter wheat cultivars and component studies of fertility and weed management practices for organic production in northern New England. In addition, they have initiated more intensive characterization of regionally adapted genotypes, with an expanded range of grain quality and hedonic tests.

Results
This project is helping to create local, organic food grain economies in our region. The field research projects have provided new information that was implemented directly by farmers in our region. Twenty-five of the 30 (83%) northern New England commercial grain farmers who completed a recent survey reported they had adopted at least one and on average three new management practices based on the project?s research results. These included selecting adapted varieties based on the project?s variety trial reports (72%); increasing seeding rates (43%) and spatial density (33%) to better suppress weeds; topdressing nitrogen on winter grains (29%) to improve grain quality; and changed a marketing practice (13%).

4. Associated Knowledge Areas

KA Code   Knowledge Area

| 205 | Plant Management Systems |
| 601 | Economics of Agricultural Production and Farm Management |

Outcome #2

1. Outcome Measures

More sustainable, diverse, and resilient food systems in Maine

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Demand for local organic food has inspired new interest in growing bread-quality wheat in New England. Our region's farmers have long produced small grains for animal feed on dairy and crop farms, but lack local knowledge and research information regarding production for the organic bread market. MAFES researchers are working with peers in New Hampshire and Vermont to build farmers' capacity to produce high-quality organic bread wheat.

What has been done
Experiment Station scientists have conducted extensive screening of spring and winter wheat cultivars and component studies of fertility and weed management practices for organic production in northern New England. In addition, they have initiated more intensive characterization of regionally adapted genotypes, with an expanded range of grain quality and hedonic tests

Results
Farmers and millers reported increased yields (47%); improved grain quality and crop value (75%); new buyer contacts (40%); increased or maintained employment (33%), and increased wheat acreage (80%). The economic value farmer respondents placed on the benefits they gained from the project was on average $7,000 each. For farmer/millers and millers, this value was over $35,000 each. Grain buyers also have benefitted. Of the 14 bakers and distributors who responded to a survey, 71% increased their use of locally grown grains, 36% developed new products, and 86% contacted someone new. Eight estimated an economic value of the project for their business, which ranged from $500 to $20,000, and averaged over $5,000 each. Additionally, organic wheat acreage has increased from 300 acres in 2008 to just under 1,700 acres in 2013 (MOFGA Certification Services, LLC and Vermont Organic Farmers, L.L.C.) and they are well-

positioned to meet further increases in demand.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
601	Economics of Agricultural Production and Farm Management

Outcome #3

1. Outcome Measures

Improved animal genetics

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Oyster culture comprises a growing portion of the aquaculture production in Maine waters. In 2006, the harvest of eastern oysters, C. virginica, was worth in excess of $1.4 million with >3 million oysters harvested, representing a 67% increase over the 2005 harvest. However, outbreaks of disease still cause considerable damage to the industry and limit its expansion. The impact of disease has been partially alleviated through improved husbandry and genetic improvement programs.

What has been done
MAFES researchers are using genetic selection to develop and provide to commercial and public hatcheries high-performance, disease-resistant broodstock so that growers have access to oyster seed with enhanced survival and growth which, in turn, leads to increased oyster production.

Results
The University of Maine Shellfish Hatchery produced oyster seed for the two selectively bred lines and three hybrid lines. Seed for a third selectively bred line was provided by a commercial hatchery. These six lines were deployed in triplicate bags at industry partner sites in Maine, and at sites in Massachusetts, Rhode Island, and Connecticut. Overall, oysters reached market size at all sites during our 2-year field trial at all but one site. Although we observed substantial variation

in oyster growth among sites, there was little evidence of line-specific effects or line-by-site interactions for growth. In contrast, there were large differences in yield among both lines and sites; the differences in yield were driven by variation in survival. These patterns lead to significant site by line interactions for survival and yield. There was clear evidence of disease pressure at several sites in our field trial.

4. Associated Knowledge Areas

KA Code	Knowledge Area
303	Genetic Improvement of Animals
311	Animal Diseases

Outcome #4

1. Outcome Measures

Number of plant releases:

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	3

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done
The Maine Potato Board (MPB) in partnership with the University of Maine has released two new potato varieties, Easton and Sebec. Easton, a new french fry processing potato variety, resulted from a cross between Silverton Russet and AF1668-60. Sebec is expected to primarily be useful for out-of-field potato chip production in growing areas that currently rely on the standard chipping variety Atlantic.

Results
Field evaluations conducted since 2004 indicate that Easton is typically higher yielding than the standard french fry processing variety Russet Burbank and that it produces lighter-colored French fries. It also typically had less hollow heart and fewer tuber defect problems than Russet Burbank. While french fry processing is expected to be the primary market for Easton, it also has excellent flavor and is very good boiled, mashed, or baked. It has outstanding late-season vigor and good resistance to Verticillium wilt. Research indicates that Easton can be grown with approximately

25% less nitrogen and potassium fertilizer than Russet Burbank. Field evaluations conducted since 2003 indicate that Sebec is high yielding and widely adapted. Sebec typically produces yields equal to or greater than Atlantic, with a much lower incidence of internal tuber defects than Atlantic. Sebec produces good-quality potato chips directly from the field, but with its good flavor, it can also be used for fresh market consumption. Sebec also has good resistance to Verticillium wilt.

4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms
202	Plant Genetic Resources
204	Plant Product Quality and Utility (Preharvest)
212	Pathogens and Nematodes Affecting Plants

Outcome #5

1. Outcome Measures

Number of new or improved innovations developed for food enterprises

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
While the lobster fishery in Maine has experienced record high catches in the past two years, the value of the catch has declined while the cost of doing business has increased. In addition, more of the catch has gone to processing as opposed to live shipping. The trend in the industry is to look more to value-added product development as a way to maintain and ultimately increase the worth of the catch and the economic viability of the industry.

What has been done
MAFES scientists are working to enhance the viability of the lobster industry through development of value-added products, particularly those made with materials typically underutilized or part of the waste stream of lobster processing (i.e. residual meat from bodies and walking legs, shell, hemolymph and other liquids).

Results

The scientists have developed a new, non-invasive technique for determining lobster viability for shipping using a load cell to measure the closing strength of the claw. This closing strength is related to muscle mass, which correlates with vigor for shipping. We can obtain the most value for our lobster by selecting those that should be sold locally (weak closing strength) versus those that are able to be shipped to Asia (strong closing strength). The researchers are also working on an all Maine lobster and cheese ravioli and a ?jerky? made from lobster byproducts.

4. Associated Knowledge Areas

KA Code	Knowledge Area
502	New and Improved Food Products

V(H). Planned Program (External Factors)

External factors which affected outcomes
- Economy
- Appropriations changes
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Evaluations are currently conducted at the project and program levels. At the project level, all projects are reviewed by an internal research council and external peer reviewers when initiated and again at completion by the research council. During the research council final evaluation, the focus is on determining if terminating projects met their stated objectives, secured extramural funding, and produced peer-reviewed publications. For FY13, 13 projects went through the review process in this program area. As for other measures of successful research programs, faculty in this program area published 30 peer-reviewed articles and secured more than $1,400,000 in extramural funding.

Researchers use a variety of methods to evaluate their own research projects including evaluations retrospectively, before-after, and during the life of the project; case studies; and comparisons between treatment/intervention and nontreatment/nonintervention.

At the program level, external NIFA review teams are asked to review the research programs of schools/departments. These teams provide input on the impact and productivity of research programs supported through the station. The station is working to develop a standard program-level evaluation process, which will be used to evaluate each station program area. Our current plans include an approach based on use of expert panels as recommended by the federal Government Accounting Office with individual program

evaluations occurring every four to five years on a staggered time table.

Key Items of Evaluation

Faculty in this program area published 30 peer-reviewed articles and secured more than $1,400,000 in extramural funding.

V(A). Planned Program (Summary)

Program # 2

1. Name of the Planned Program

Climate Change

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
101	Appraisal of Soil Resources			4%	
102	Soil, Plant, Water, Nutrient Relationships			11%	
112	Watershed Protection and Management			13%	
123	Management and Sustainability of Forest Resources			21%	
133	Pollution Prevention and Mitigation			5%	
135	Aquatic and Terrestrial Wildlife			9%	
136	Conservation of Biological Diversity			8%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants			17%	
204	Plant Product Quality and Utility (Preharvest)			3%	
211	Insects, Mites, and Other Arthropods Affecting Plants			3%	
212	Pathogens and Nematodes Affecting Plants			3%	
213	Weeds Affecting Plants			3%	
	Total			100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	**1890**	**1862**	**1890**
Plan	0.0	0.0	3.0	0.0
Actual Paid Professional	0.0	0.0	3.2	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**
0	0	171676	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	249632	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	386373	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Conduct scientific research. Publish peer-reviewed journal articles and other publications. Present findings at professional and public meetings and at other venues. Educate undergraduate and graduate students.

2. Brief description of the target audience

Maine natural-resource-based industries, Cooperative Extension staff, other scientists, state and federal policymakers, regulators, and legislators, classroom teachers

3. How was eXtension used?

{No Data Entered}

V(E). Planned Program (Outputs)

1. Standard output measures

2013	**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: 2013

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	0	14	14

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

● Number of other publications

Year	Actual
2013	16

Output #2

Output Measure

● Number of research projects completed
Not reporting on this Output for this Annual Report

Output #3

Output Measure

● Total $ amount received in extramural funding

Year	Actual
2013	1596337

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content	
O. No.	**OUTCOME NAME**
1	Development of new knowledge and technologies and the transfer of these to clientele to address the effects of climate variability and change
2	Enhance adaptive capacity of production and natural systems to reduce exposure and vulnerability to climate change
3	Improve mitigation strategies for the reduction of greenhouse gas emissions and increase carbon sequestration in production and natural systems and communities

Outcome #1

1. Outcome Measures

Development of new knowledge and technologies and the transfer of these to clientele to address the effects of climate variability and change

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Studying the way nutrients, carbon, water, and energy flow through forested ecosystems will provide a better understanding of the underlying mechanisms that control the form and function of these ecosystems. This understanding is essential to determine the effects of environmental perturbations at the global (e.g., climate change), continental (e.g., acid deposition), regional (e.g., biomass harvesting), and local (e.g., biosolids land spreading) scales. The ecosystem process research helps us to design better environmental-monitoring systems, as well as better predictive models to all us to determine the future effects of the present and emerging environmental stressors of today.

What has been done
This research has conducted intensive studies of biogeochemical processes at the plot- and small-watershed-level in forested watersheds of Maine and elsewhere. The project has directly involved 12 undergraduate student researchers, five graduate students, one postdoctoral fellow, four technicians and at least six senior scientists including the project PI. In addition, six high school science teachers and 200 K-12 students were involved in the 2012-2013 school year, and a similar number are involved in a new project on snowmelt and watersheds in 2013-2014.

Results
Over the past year the science of watershed biogeochemistry has progressed with the involvement of a wide group of participants. The science has been distributed to local, national and international community through presentations at meetings and through scientific publications. The development of curricula materials resulted in teachers and K-12 science students in three states becoming aware of the influence of management, air pollutants, and climate change on the health of our forested landscape. Some of the science in this project supports outreach efforts by the lead PI that includes the development of climate adaptation initiatives in Maine, testimony to the Maine Legislature in the spring of 2013, and involvement in

regional science synthesis efforts.

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources
102	Soil, Plant, Water, Nutrient Relationships
112	Watershed Protection and Management
123	Management and Sustainability of Forest Resources

Outcome #2

1. Outcome Measures

Enhance adaptive capacity of production and natural systems to reduce exposure and vulnerability to climate change

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

Improve mitigation strategies for the reduction of greenhouse gas emissions and increase carbon sequestration in production and natural systems and communities

Not Reporting on this Outcome Measure

V(H). Planned Program (External Factors)

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

Brief Explanation

{No Data Entered}

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Evaluations are currently conducted at the project and program levels. At the project

level, all projects are reviewed by an internal research council and external peer reviewers when initiated and again at completion by the research council. During the research council final evaluation, the focus is on determining if terminating projects met their stated objectives, secured extramural funding, and produced peer-reviewed publications. For FY13, no projects went through the review process in this program area. As for other measures of successful research programs, faculty in this program area published 14 peer-reviewed articles and secured more than $1,596,337 in extramural funding.

Researchers use a variety of methods to evaluate their own research projects including evaluations retrospectively, before-after, and during the life of the project; case studies; and comparisons between treatment/intervention and nontreatment/nonintervention.

At the program level, external NIFA review teams are asked to review the research programs of schools/departments. These teams provide input on the impact and productivity of research programs supported through the station. The station is working to develop a standard program-level evaluation process, which will be used to evaluate each station program area. Our current plans include an approach based on use of expert panels as recommended by the federal Government Accounting Office with individual program evaluations occurring every four to five years on a staggered time table.

Key Items of Evaluation

Faculty in this program area published 14 peer-reviewed articles and secured more than $1,596,337 in extramural funding.

V(A). Planned Program (Summary)

Program # 3

1. Name of the Planned Program

Sustainable Energy

☑ 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
123	Management and Sustainability of Forest Resources			20%	
605	Natural Resource and Environmental Economics			40%	
607	Consumer Economics			40%	
	Total			100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	**1890**	**1862**	**1890**
Plan	0.0	0.0	1.0	0.0
Actual Paid Professional	0.0	0.0	0.6	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**
0	0	14971	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	63281	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

Conduct scientific research projects. Publish peer-reviewed journal articles and other publications. Present findings at professional and public meetings and at other venues. Educate undergraduate and graduate students.

2. Brief description of the target audience

Maine forest resources industry, other scientists, Cooperative Extension staff, state and federal policymakers, regulators, and legislators, classroom teachers

3. How was eXtension used?

{No Data Entered}

V(E). Planned Program (Outputs)

1. Standard output measures

2013	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: 2013

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

● Number of other publications

Year	Actual
2013	0

Output #2

Output Measure

● Number of research projects completed
  Not reporting on this Output for this Annual Report

Output #3

Output Measure

● Total $ amount received in extramural funding

Year	Actual
2013	296587

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content	
O. No.	**OUTCOME NAME**
1	Increased knowledge and understanding of the biofuels supply chain
2	Integration and evaluation of sustainable biofuels and bioproducts systems

Outcome #1

1. Outcome Measures

Increased knowledge and understanding of the biofuels supply chain

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
average. The International Energy Agency and World Health Organization have linked energy and poverty, claiming that equitable access to affordable energy is a crucial step toward economic development in rural areas. Maine spends approximately $4 billion per year on imported energy, and approximately 55% of Maine?s energy demands are met with imported fossil fuels, which make the state particularly susceptible to price fluctuations. Rural workers and residents in poverty-stricken counties are typically affected most by these price fluctuations.

What has been done
As part of a research to identify opportunities and barriers to widespread adoption of renewable energy in Maine, MAFES economists gathered data on the state of renewable energy in Maine and the issues that the industry is facing. In particular, the scientists focused on residential and commercial solar energy options for electricity and heating, biofuels development for transportation, and offshore wind energy development for electricity.

Results
Although only in its first year, the project is already laying the groundwork for important assessments of technical, social, economic and environmental implications of developing more renewable energy in Maine. For the solar focus, the researchers surveyed 22 solar installers throughout the state and created a model of Maine-based solar water heating performance, cost and environmental effects. The data were used to help build models and will be presented in the Maine Consumer Guide to Solar Energy, which is an ongoing project that will inform Maine citizens and business owners of solar options and pricing.

4. Associated Knowledge Areas

KA Code   Knowledge Area

123	Management and Sustainability of Forest Resources
605	Natural Resource and Environmental Economics
607	Consumer Economics

Outcome #2

1. Outcome Measures

Integration and evaluation of sustainable biofuels and bioproducts systems

Not Reporting on this Outcome Measure

V(H). Planned Program (External Factors)

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

Brief Explanation

Several faculty working within this program area have left the university. Program area has been discontinued and any remaining research has been incorporated into another program area.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Nothing to report -- program area no longer exists.

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 4

1. Name of the Planned Program

Childhood Obesity

☑   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			100%	
	Total			100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	**1890**	**1862**	**1890**
Plan	0.0	0.0	1.2	0.0
Actual Paid Professional	0.0	0.0	0.3	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**
0	0	27373	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	33294	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

Conduct scientific research projects. Publish peer-reviewed journal articles and other publications. Present findings at professional and public meetings and at other venues. Educate undergraduate and

graduate students.

2. Brief description of the target audience

Other scientists, nutritionists, Cooperative Extension staff, state and federal policymakers, regulators, and legislators, classroom teachers, young adults

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2013	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: 2013
Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

   Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	0	1	1

V(F). State Defined Outputs

Output Target

Output #1

   Output Measure

   ● Number of other publications

	Year	Actual

2013	13

Output #2

Output Measure

● Number of completed research projects
  Not reporting on this Output for this Annual Report

Output #3

Output Measure

● Total $ amount of extramural funding received

Year	Actual
2013	497023

Output #4

Output Measure

● Six 2-hour lesson curriculum was developed as the central component of the iCook intervention.

Year	Actual
2013	0

Output #5

Output Measure

● The website for the iCook 4-H project was developed to meet the priority areas of the lessons. Sections were created for goal setting and recipe, video, and photo sharing. During the pilot, the website was used by all participants. Researchers gathered feedback from participants, and through analysis of Google Analytics. Changes are being made to include features that are similar to large social media sites (Facebook, Twitter, YouTube). These changes are being made from the feedback gathered.

Year	Actual
2013	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content	
O. No.	**OUTCOME NAME**
1	Better understanding of the usefulness of community based participatory research (CBPR) with a vulnerable population group--young adult college students,
2	Determine the usefulness of a new approach to preventing weight gain--the non-calorically restrictive, weight gain prevention intervention--with young adult college students
3	Improved weight-gain-prevention programs

Outcome #1

1. Outcome Measures

Better understanding of the usefulness of community based participatory research (CBPR) with a vulnerable population group--young adult college students,

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

Determine the usefulness of a new approach to preventing weight gain--the non-calorically restrictive, weight gain prevention intervention--with young adult college students

2. Associated Institution Types

● 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	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. Young adults are at a uniquely increased risk for weight gain because of rapidly changing social situations that influence eating and exercise behaviors. 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.

What has been done
Maine led a multistate team in refining and testing the Campus Dining Environmental Audit Tool which will be part of the Healthy Campus Index tool, the focus of the five-year project NC1193. In Maine the Green Eating Survey was implemented with 206 college students and the Food Environment Tool was used to audit all campus dining facilities.

Results
Based on the GE Survey, 75% of respondents self-identified in the pre-action (precontemplation, contemplation, preparation) stages of change for GE behavior, while the remaining 25% self-

identified in either action or maintenance (post action). Participants in post-action stages of change were significantly more likely to participate in GE behavior and to consider environmental issues important. Participants who were in the post-action group also associated with higher dietary quality, namely lower intakes of fast food among both genders (p=0.003), fewer servings of red meat per week among females, and more servings of fruits and vegetables per day among females. Based on the audit, dining halls and the student union had more variety of healthful and Green foods. The high-scoring facilities had more main dishes that qualified as ?healthful,? and provided more facilitators to Green Eating through signage and promotions. Students who regularly practiced GE behavior were more likely to have higher dietary quality and to place importance on environmentally responsible behavior. Dining facilities generally provided many facilitators for students to eat Green, healthful diets.

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior

Outcome #3

1. Outcome Measures

Improved weight-gain-prevention programs

Not Reporting on this Outcome Measure

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

This program area has been eliminated because of its small size. Research has been incorporated into another program area.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Nothing to report because program area has been eliminated.

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 5
1. Name of the Planned Program

Food Safety

☑   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
311	Animal Diseases			17%	
501	New and Improved Food Processing Technologies			7%	
502	New and Improved Food Products			17%	
603	Market Economics			3%	
607	Consumer Economics			3%	
703	Nutrition Education and Behavior			3%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins			50%	
	Total			100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	**1890**	**1862**	**1890**
Plan	0.0	0.0	2.6	0.0
Actual Paid Professional	0.0	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**
0	0	245823	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	455555	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

Conduct scientific research. Publish peer-reviewed journal articles and other publications. Present findings at professional and public meetings and at other venues, and provide training sessions for food producers and processors. Educate undergraduate and graduate students.

2. Brief description of the target audience

Maine food producers and processors, Cooperative Extension staff, other scientists, state policymakers, regulators, and legislators, classroom teachers

3. How was eXtension used?

{No Data Entered}

V(E). Planned Program (Outputs)

1. Standard output measures

2013	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: 2013

Actual: 0

Patents listed

?Disclosure of Invention?Lowbush blueberries as food ingredients to promote gut health. Wu, V.C.H. A. Lacombe, R.W. Li, D. Klims-Zacas, A.S. Kristo, S. Tadepalli s, E. Krauss, and R. Young. 2012. Inventions-Patent Disclosure.

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	0	6	6

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of other publications

Year	Actual
2013	4

Output #2

Output Measure

- Completed research projects
  Not reporting on this Output for this Annual Report

Output #3

Output Measure

- Extramural funding

Year	Actual
2013	226036

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content	
O. No.	**OUTCOME NAME**
1	Increase number of viable technologies to improve food safety
2	Reduce incidence of foodborne illness
3	Increase adoption of recommended safe food-handling practices at the individual, family, community, production and supply system levels.

Outcome #1

1. Outcome Measures

Increase number of viable technologies to improve food safety

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Controlling foodborne pathogens and reducing potential health risks to consumers from pathogens is one of the most urgent problems confronting the food industry. With the goal of reducing foodborne illnesses, MAFES food scientists are developing more effective, rapid methods to detect and control bacterial pathogens in or on foods before these foods are released for sale.

What has been done
Experiment station researchers have developed a nano-biosensor capable of detecting Listeria monocytogenes in food.

Results
The assay detected L. monocytogenes artificially inoculated on wild blueberries with specificity over other pathogens. The technology is based on screen-printed carbon electrode (SPCE) strips similar to those used by diabetic patients for blood glucose monitoring. The strips, modified by the addition of gold nanoparticles, are capable of detecting L. monocytogenes at 2 log CFU/g in wild blueberry samples. They can detect a single bacterial cell in as little as one hour. This portable, inexpensive biosensor would be useful for on-site screening tests conducted by the food industry and regulatory agencies. The researchers think that, one day, it could be used by consumers at home once is it further optimized and commercialized, just like the glucose monitoring strips used by diabetic patients daily.

4. Associated Knowledge Areas

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

Outcome #2

1. Outcome Measures

Reduce incidence of foodborne illness

2. Associated Institution Types

● 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Controlling foodborne pathogens and reducing potential health risks to consumers from pathogens is one of the most urgent problems confronting the food industry. Chemical agents with antimicrobial activity have been used as one of the most traditional techniques. However, consumers today are increasingly concerned about the safety of these chemical additives in foods and prefer natural, healthy, and unadulterated foods. Consequently, many researchers are searching for naturally occurring antimicrobial compounds from sources such as fruit, plants and herbs.

What has been done
MAFES food scientists have studied the impacts of wild blueberry consumption on gut microbial population dynamics and gastrointestinal health in Sprague Dawley rats.

Results
The researchers found that wild blueberries have prebiotic potential. A prebiotic is a plant fiber that promotes growth of good bacteria in the colon, thereby promoting digestive and health benefits. In addition, the team found lower levels of Enterococcus (bacteria sometimes responsible for infections) in rats that ate a blueberry-enriched diet. This suggests that the protective anti-inflammatory effect of blueberries can be accredited to microbial metabolism, which is dependent on the composition of the microbiota (gut flora). These findings are more good news for medical officials and people who have resolved issues such as obesity, inflammation, allergies and headaches by regulating their digestive tracts.

4. Associated Knowledge Areas

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

Naturally Occurring Toxins

Outcome #3

1. Outcome Measures

Increase adoption of recommended safe food-handling practices at the individual, family, community, production and supply system levels.

Not Reporting on this Outcome Measure

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

Brief Explanation

Starting in 2015, research projects in this program area will be moved to the new Maine Food Systems program area.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Evaluations are currently conducted at the project and program levels. At the project level, all projects are reviewed by an internal research council and external peer reviewers when initiated and again at completion by the research council. During the research council final evaluation, the focus is on determining if terminating projects met their stated objectives, secured extramural funding, and produced peer-reviewed publications. For FY13, one project went through the review process in this program area. As for other measures of successful research programs, faculty in this program area published six peer-reviewed articles, and received $226,036 in extramural funding.

Researchers use a variety of methods to evaluate their own research projects including evaluations retrospectively, before-after, and during the life of the project; case studies; and comparisons between treatment/intervention and nontreatment/nonintervention.

At the program level, external NIFA review teams are asked to review the research programs of schools/departments. These teams provide input on the impact and productivity of research programs supported through the station. The station is working to develop a standard program-level evaluation process, which will be used to evaluate each station program area. Our current plans include an approach based on use of expert panels as recommended by the federal Government Accounting Office with individual program evaluations occurring every four to five years on a staggered time table.

Key Items of Evaluation

Faculty in this program area published six peer-reviewed articles, and received $226,036 in extramural funding

V(A). Planned Program (Summary)

Program # 6
1. Name of the Planned Program

Sustaining Natural Resources

☑   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
111	Conservation and Efficient Use of Water			7%	
123	Management and Sustainability of Forest Resources			11%	
131	Alternative Uses of Land			2%	
132	Weather and Climate			2%	
134	Outdoor Recreation			8%	
135	Aquatic and Terrestrial Wildlife			21%	
136	Conservation of Biological Diversity			22%	
206	Basic Plant Biology			8%	
215	Biological Control of Pests Affecting Plants			8%	
301	Reproductive Performance of Animals			2%	
306	Environmental Stress in Animals			6%	
605	Natural Resource and Environmental Economics			1%	
723	Hazards to Human Health and Safety			2%	
	Total			100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	**1890**	**1862**	**1890**
Plan	0.0	0.0	7.0	0.0
Actual Paid Professional	0.0	0.0	5.8	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
0	0	412721	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	635719	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	426087	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Conduct scientific research. Publish peer-reviewed journal articles and other publications. Present findings at professional and public meetings and at other venues. Educate undergraduate and graduate students.

2. Brief description of the target audience

Other scientists; teachers at all levels; directors of aquariums and museums, exhibit halls, etc.; endangered species biologists/managers; policy makers; state regulatory agencies; environmental consultants

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2013	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: 2013

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	0	17	17

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

● # of other types of publications

Year	Actual
2013	16

Output #2

Output Measure

● # of research projects completed
Not reporting on this Output for this Annual Report

Output #3

Output Measure

● web site: www.tidalmarshbirds.org

Year	Actual
2013	1

Output #4

Output Measure

● Total $ amount of extramural funding received

Year	Actual
2013	2035688

V(G). State Defined Outcomes

	V. State Defined Outcomes Table of Content
O. No.	**OUTCOME NAME**
1	Improve knowledge of, or strategies and tools for, protecting fish and wildlife habitat
2	Adoption of strategies for protecting fish and wildlife habitat
3	New strategies for improving and/or preserving surface and ground water quality
4	Adoption of strategies for improving/preserving surface and ground water quality
5	Enhance sustainability, diversity, and resiliency of Maine's natural resource-based industries
6	Improve health, distribution, and/or abundance of crucial plant and animal species

Outcome #1

1. **Outcome Measures**

   Improve knowledge of, or strategies and tools for, protecting fish and wildlife habitat

2. **Associated Institution Types**

   - 1862 Research

3a. **Outcome Type:**

   Change in Knowledge Outcome Measure

3b. **Quantitative Outcome**

Year	Actual
2013	0

3c. **Qualitative Outcome or Impact Statement**

   Issue (Who cares and Why)
   Humans are currently the world's most potent evolutionary agent, drastically reshaping the face of biodiversity in the wake of various forms of disturbance. Indeed, many of our current approaches to the management and conservation of natural resources can alter such genetic diversity for the better or worse. Although the preservation of locally adapted diversity is commonly cited as a central tenet of conservation biology and natural resource management, several factors still limit our ability to implement evolutionarily informed monitoring and management practices: (1) population resources (genetic and phenotypic) are often poorly characterized, (2) a lack of quantitative insights into the role of evolutionary diversity in the fate of populations and function of ecosystems, and (3) a lack of guidance to managers and the public with respect to why or how genetic diversity and ongoing evolution should be incorporated in resource management.

   What has been done
   MAFES scientists have continued to address these limitations and foster eco-evolutionarily informed management for several aquatic species in Maine. Notably, they also identified a new high-priority genetic tool to aid in identifying populations of concern, environmental DNA detection, and have begun to develop this approach as a resource for aquatic resource management in Maine.

   Results
   MAFES fisheries biologists interact extensively with resource managers and the public in the region and nationally. This year they were invited to provide a presentation on genetic/evolutionary tools for trout management to the state?s Brook Trout Public Working Group. That presentation helped lead to new funding to expand the scientists? work on assessing genetic diversity within and among Maine?s brook trout populations and demonstrates progress towards a change in action by Maine?s fisheries managers to increasingly use genetic/evolutionary data in management. The researchers strongly value both dissemination of

their knowledge and also stakeholder input. By working with state, federal, NGO and public groups, they identified environmental DNA detection (eDNA) as an emerging tool for detecting new populations of aquatic invaders or rare/threated species from mere water samples. The station scientists have now obtained priority funding to develop eDNA tools for Maine that could revolutionize approaches to aquatic resource assessment, providing greater management responsiveness at a fraction of the costs of traditional survey approaches (e.g., netting and boat surveys).

4. Associated Knowledge Areas

KA Code	Knowledge Area
135	Aquatic and Terrestrial Wildlife
136	Conservation of Biological Diversity

Outcome #2

1. Outcome Measures

Adoption of strategies for protecting fish and wildlife habitat

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Maine?s wildlife diversity is as great as the habitats that support it but the links between resources offered by these habitats and how animals use them are little understood. A better understanding of how resource availability, including naturally occurring and that affected by anthropogenic activities, influences songbird survival and breeding success is needed to develop strategies to protect wildlife habitat.

What has been done
MAFES biologists have taken feather, claw, and blood samples at key breeding and fall stopover sites during spring and fall migration to link energetic condition with distance from either the wintering or breeding area. They have documented species occurrence and sex, age, mass, fat, morphometrics, at key banding stations established in the Gulf of Maine and measured plasma indicators of energy regulation, breeding status, and immune function during the early pre-hatch and late post-hatch periods in Atlantic puffins and Razorbills at Machias Seal Island.

Results

The results from these studies have increased our understanding of the need for 'full life cycle' conservation. The results have been used by multiple state and federal agencies, including the Smithsonian Migratory Bird Center and the American Bird Conservancy, as they develop policy for conserving migratory bird habitat and work with resources managers in other regions in North America and beyond. In addition, at the 2013 Northeast Regional Migration Monitoring Network (NRMMN) meeting, biologists from several Canadian academic institutions (and resources agencies developed collaborations with University of Maine, University of Massachusetts (Amherst), several regional offices of the US Fish & Wildlife Service and Maine DIF&W to support a digital tracking network for tracking bird movements spanning from Hudson Bay and the Canadian Maritimes to Cape Cod and beyond.

4. Associated Knowledge Areas

KA Code	Knowledge Area
111	Conservation and Efficient Use of Water
135	Aquatic and Terrestrial Wildlife
301	Reproductive Performance of Animals
306	Environmental Stress in Animals

Outcome #3

1. Outcome Measures

New strategies for improving and/or preserving surface and ground water quality

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

Adoption of strategies for improving/preserving surface and ground water quality

Not Reporting on this Outcome Measure

Outcome #5

1. Outcome Measures

Enhance sustainability, diversity, and resiliency of Maine's natural resource-based industries

Not Reporting on this Outcome Measure

Outcome #6

1. Outcome Measures

Improve health, distribution, and/or abundance of crucial plant and animal species

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Maine?s vernal pool laws regulate the most ecologically important vernal pools based on the presence of key amphibian egg mass abundance. However, the protection of vernal pools suffers from a lack of statewide inventory and from an inefficient means of assessing specific pool characteristics. Development may cause direct loss or degradation of vernal pools, reduce adjacent wetland and terrestrial habitats, result in increased road mortality of amphibians, and create barriers to movement of amphibians. While Maine is in the forefront of vernal pool conservation, several uncertainties exist, and with no consideration of the terrestrial habitat necessary for juvenile dispersal and adult habitat, policies may be less than effective at protecting amphibian populations.

What has been done
MAFES ecologists are working to effect conservation of vernal pools other wetlands through stakeholder-driven science that incorporates the human dimension into natural resources policy and conservation strategies. As part of the project, researchers organized and ran over 40 stakeholder meetings in 2013.

Results
The scientists are successfully developing innovative vernal pool conservation strategies at the federal, state, and local levels to be implemented in two model towns. They are in the process of writing a Special Area Management Plan for vernal pools to be adopted by the US Army Corps of Engineers for Maine and the New England Region.

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
605	Natural Resource and Environmental Economics

V(H). Planned Program (External Factors)

External factors which affected outcomes
- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)
- Other (new invasive species)

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Evaluations are currently conducted at the project and program levels. At the project level, all projects are reviewed by an internal research council and external peer reviewers when initiated and again at completion by the research council. During the research council final evaluation, the focus is on determining if terminating projects met their stated objectives, secured extramural funding, and produced peer-reviewed publications. For FY13, two projects went through the review process in this program area. As for other measures of successful research programs, faculty in this program area published 17 peer-reviewed articles and secured more than $2,000,000 in extramural funding.

Researchers use a variety of methods to evaluate their own research projects including evaluations retrospectively, before-after, and during the life of the project; case studies; and comparisons between treatment/intervention and nontreatment/nonintervention.

At the program level, external NIFA review teams are asked to review the research programs of schools/departments. These teams provide input on the impact and productivity of research programs supported through the station. The station is working to develop a standard program-level evaluation process, which will be used to evaluate each station program area. Our current plans include an approach based on use of expert panels as recommended by the federal Government Accounting Office with individual program evaluations occurring every four to five years on a staggered time table.

Key Items of Evaluation

Faculty in this program area published 17 peer-reviewed articles and secured more than $2,000,000 in extramural funding.

V(A). Planned Program (Summary)

Program # 7
1. Name of the Planned Program

Supporting Rural Economies

☑ 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
102	Soil, Plant, Water, Nutrient Relationships			4%	
111	Conservation and Efficient Use of Water			4%	
112	Watershed Protection and Management			4%	
131	Alternative Uses of Land			3%	
134	Outdoor Recreation			15%	
311	Animal Diseases			8%	
315	Animal Welfare/Well-Being and Protection			8%	
605	Natural Resource and Environmental Economics			17%	
608	Community Resource Planning and Development			21%	
609	Economic Theory and Methods			4%	
610	Domestic Policy Analysis			4%	
723	Hazards to Human Health and Safety			8%	
	Total			**100%**	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	**1890**	**1862**	**1890**
Plan	0.0	0.0	6.4	0.0
Actual Paid Professional	0.0	0.0	6.7	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**
0	0	327085	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	462568	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	313184	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Conduct scientific research. Publish peer-reviewed journal articles and other publications. Present findings at professional and public meetings and at other venues. Educate undergraduate and graduate students.

2. Brief description of the target audience

Scientists, economists, state and local policymakers, extension specialists, green/horticulture industry, tourism planners, land use commissions, and commercial fishermen

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2013	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: 2013
Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	0	32	32

V(F). State Defined Outputs

Output Target

<u>Output #1</u>

Output Measure

● Number of research projects completed
  Not reporting on this Output for this Annual Report

<u>Output #2</u>

Output Measure

● Number of other publications

Year	Actual
2013	25

<u>Output #3</u>

Output Measure

● Total $ amount of extramural funding received

Year	Actual
2013	1508412

<u>Output #4</u>

Output Measure

● Maine Futures Community Mapper: websites.greeninfo.org/ccgis/mainefuture

Year	Actual
2013	1

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content	
O. No.	**OUTCOME NAME**
1	Improve knowledge of, or strategies and tools for, sustaining Maine's rural economies and comunities
2	Adoption of strategies/tools for sustaining Maine's rural economies and communities
3	Enhance sustainability, diversity, and resilency of Maine's rural economies and communities
4	Improve tools for sustaining Maine's rural economies and communities

Outcome #1

1. **Outcome Measures**

   Improve knowledge of, or strategies and tools for, sustaining Maine's rural economies and comunities

2. **Associated Institution Types**

   - 1862 Research

3a. Outcome Type:

   Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The quality of rural life both affects and is affected by the movement of people into and out of rural communities, the evolution of agriculture and industry, local social organization, and public policy. An understanding of attributes and forces that enhance or detract from community quality of life is important for guiding decision-making on policy.

What has been done
MAFES economists, as part of multistate project NE1049, are attempting to increase knowledge about the forces affecting rural communities in terms of labor markets, industry, governance, and quality of life. Their research focuses on long-run socio-economic sustainability and the ability of communities to respond to changes and to grow. The challenges that communities have faced, and will continue to face, have come from natural disasters such as floods, hurricanes, and tornados. Communities also face what might be called human-made disasters. While the term disaster may overstate some instances, all have some component of human caused transformation. Although this covers the well known topics of the changing public revenue streams, industrial restructuring, major recessions, and environmental challenges, it may can also include the more exotic such as terrorism.

Results
Over the course of the year, the researchers conducted Retail Trade Area Analyses for rural Maine communities. These studies educate economic development professionals and other stakeholders about the health of the local retail sector. Researchers also analyzed the economic impacts of big-box stores on Maine?s retail sector. During the past year, researchers examined the economics of Maine?s forest products industry, film production and photography, and popular music concerts held in the Bangor region. They have also examined issues related to productivity, human capital and workforce skills?with an analysis of the differences in skills across the U.S. rural-urban hierarchy.

4. Associated Knowledge Areas

KA Code	Knowledge Area
608	Community Resource Planning and Development
609	Economic Theory and Methods

Outcome #2

1. Outcome Measures

Adoption of strategies/tools for sustaining Maine's rural economies and communities

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Limited fresh water supplies and severe drought experienced in some areas of the United States have made it increasingly important for farmers and growers to use water efficiently. Recent advances in water sensor technology have made it possible for greenhouse growers to use sensor-automated irrigation systems to efficiently water plants. In these systems, plants are irrigated only as they use water. However, there are still many basic questions about plant water use that must be answered for growers to irrigate efficiently. We understand very little about how plant water use of greenhouse crops is impacted by changing light levels, relative humidity, and temperature.

What has been done
MAFES scientists have helped develop protocols for irrigation that maximize water-use efficiency while maintaining crop growth and quality. The researchers collaborated with researchers from Georgia and the USDA to develop models that predict how plant water use is affected by the greenhouse environment. This information will be integrated into the USDA's 'Virtual Grower' model by Jonathan Frantz. Growers may use the information in this model regardless of the irrigation system they are using to determine how irrigation practices should be adjusted for changes in the weather.

Results
Based on their findings, the scientists provided irrigation guidelines for greenhouse growers for

economically important herbaceous perennials. The amount of water needed to grow these crops was previously unknown. With this information, greenhouse growers may grow higher quality crops using very little water. For example, the researchers found that it was possible to produce the popular shade perennial, alumroot with as little as 3 to 6 liters of water during a 56-day growing season. Throughout the project, the researchers determined that other perennials grown in a sensor-automated irrigation system consistently used very little water. The adoption of sensor-automated irrigation systems by commercial horticulture industry has the potential to conserve a great deal of water. This irrigation system is also a closed irrigation system, which means that so little water is applied at one time that none is lost from containers as leachate. Using sensors in container irrigation would greatly reduce or eliminate leaching of nitrates and phosphates.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water

Outcome #3

1. Outcome Measures

Enhance sustainability, diversity, and resiliency of Maine's rural economies and communities

2. Associated Institution Types

● 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Maine has one of the highest rates of asthma incidence in the U.S. Asthma can be induced or exacerbated by certain environmental agents. MAFES scientists are assessing whether various environmental or occupational chemicals found in Maine's rural communities, including some associated with agriculture, may contribute to asthma incidence in Maine.

What has been done
The researchers are attempting to determine whether previously untested environmental chemicals found in Maine's rural communities (particularly, endocrine disruptors) can affect mast cells. Mast cells are a type of immune cell found in most bodily tissues. In response to the

presence of allergens, mast cells release histamines and other substances into body tissues. The process is known as degranulation and it is responsible for inflammation, swelling, redness and pain. But degranulation also triggers the healthy deployment of white blood cells and supports the innate immune response that helps prevent infection and tumor growth. The scientists have been working with a mammalian mast cell model to test the effects of several chemicals on the final outcome of allergic signaling, degranulation, using a fluorescence microplate experiment.

Results

Triclosan, a common antibacterial agent found in many hand soaps and other products, is known to have the added benefit of alleviating allergic skin conditions such as eczema. The MAFES scientists have found that this anti-inflammatory effect may be caused by triclosan?s inhibitory effect on mast cells, which are implicated in allergies and asthma but which also are key components of a healthy immune system. Testing rat mast cells with triclosan at much lower concentrations than those found in household products, the researchers found that triclosan strongly inhibits degranulation and other mast cell functions, possibly accounting for its therapeutic effect in treating eczema and other allergic skin disorders. These findings support clinical evidence that triclosan could be an effective targeted treatment for such conditions. But the researchers call for further investigation into the unintended effects of triclosan?s widespread availability in consumer products, including recent separate reports that triclosan may function as an endocrine disrupter. Additionally, other immune cell types that are biochemically similar to mast cells could potentially be adversely affected by triclosan.

4. Associated Knowledge Areas

KA Code	Knowledge Area
723	Hazards to Human Health and Safety

Outcome #4

1. Outcome Measures

Improve tools for sustaining Maine's rural economies and communities

2. Associated Institution Types

● 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Alternative futures modeling (AFM) has proven to be an effective way to improve understanding of existing land use, and the intricate and dynamic connections between human and natural systems. In Maine, AFM is particularly relevant given the close economic and social ties between the state's forests and its people?both culturally and economically. Ensuring the health of these systems is not only important to quality-of-life, but also the sustained viability of the tourism and forest products sectors.

What has been done
In the past year, MAFES researchers have made significant progress on land suitability modeling efforts in the 2.5-milion-acre Lower Penobscot River Watershed (LPRW), and the 1.9-million-acre Casco Bay Region (CBR). They have engaged over 70 stakeholders via focus groups to create Bayesian network-based land suitablity models. Stakeholder land use categories include foresters, developers, agriculturalists, and conservationists.

Results
The researchers have leveraged the impact of this ?futures? research through: (1) the Maine Futures Community Mapper (MFCM) grant funded by the Elmira Sewall Foundation; (2) Northern States Research Cooperative funding that examines the effects of changing land use scenarios on future timber supplies; (3) a 30-minute public television special on their research; and (4) the Acadian Internship in Regional Conservation, where in the summer of 2013 the scientists gathered 12 students from five countries to study and apply landscape conservation tools through a series of case studies. The new mapping tool, MFCM, will be released in early 2014. As the scientists engaged select stakeholders during the initial website testing, the early results were promising, with users expressing interest in the models and applications.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
131	Alternative Uses of Land
608	Community Resource Planning and Development

V(H). Planned Program (External Factors)

External factors which affected outcomes
- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

{No Data Entered}

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Evaluations are currently conducted at the project and program levels. At the project level, all projects are reviewed by an internal research council and external peer reviewers when initiated and again at completion by the research council. During the research council final evaluation, the focus is on determining if terminating projects met their stated objectives, secured extramural funding, and produced peer-reviewed publications. For FY13, three projects went through the review process in this program area. As for other measures of successful research programs, faculty in this program area published 32 peer-reviewed articles and secured more than $1,500,000 in extramural funding.

Researchers use a variety of methods to evaluate their own research projects including evaluations retrospectively, before-after, and during the life of the project; case studies; and comparisons between treatment/intervention and nontreatment/nonintervention.

At the program level, external NIFA review teams are asked to review the research programs of schools/departments. These teams provide input on the impact and productivity of research programs supported through the station. The station is working to develop a standard program-level evaluation process, which will be used to evaluate each station program area. Our current plans include an approach based on use of expert panels as recommended by the federal Government Accounting Office with individual program evaluations occurring every four to five years on a staggered time table.

Key Items of Evaluation

Faculty in this program area published 32 peer-reviewed articles and secured more than $1,500,000 in extramural funding.