2011 University of Maine Research Plan of Work

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I. Plan Overview

1. Brief Summary about Plan Of Work

The provisions of the Hatch Act are based on the premise that the experiment stations are in the best position to identify and address the basic and applied research needs of their respective states in the areas of agriculture, forestry, marine and rural economic development. The University of Maine System Board of Trustees concurs with this view and has declared "that the Experiment Station has central responsibilities in the state for research in agriculture, marine, forest resources, and rural economic development."

Based on its stated mission of conducting research for the people of Maine, this plan of work reflects the economic and cultural composition of Maine. Maine's economy is highly dependent on the natural resources that lie within its borders. The agriculture, forestry, and aquaculture and marine industries are all mainstays of the Maine economy. Maine's forestry-related sectors contribute an estimated $6.5 billion to the economy, and agriculture-related industries contribute $1.5 billion. The economic contribution of the aquaculture and marine sector easily exceeds $1.0 billion. Maine's natural resources also attract millions of tourists each year who contribute about $3.0 billion to the state economy.

Maine's economy faces many challenges from the state's location, size, and climate, but in some cases, these challenges are also benefits. More than 90 percent of Maine's land base is forested. Most of the 17.7 million acres of forestland is privately owned, with about half of it owned by small wood lot owners and the other half owned by large industrial forest companies. This forestland presents opportunities for Maine's tourism industry as well as the forest products industry. Maine's farms are small, averaging only 187 acres, but are increasingly diversified. Although the state is predominantly rural (ranking 39th in the nation in terms of persons per square mile), Maine is relatively close to major markets in Boston and New York. Maine's more than 3,500 miles of coastline may create transportation difficulties, but it also provides unique opportunities for aquaculture, fisheries, and tourism industries. Maine's location creates a prime testing ground for research on global climate change, as it falls along the northernmost extent of the range of some species, and the southernmost extent of the range of others.

For this plan of work, we have rearranged our portfolio of projects to include the new program areas identified by NIFA. The research described in this plan of work falls under seven broad program areas: global food security and hunger; climate change; sustainable energy; childhood obesity; food safety; sustaining Maine's natural resources; support for Maine's rural economy; and support for Maine's forest industries. MAFES research in our eighth program area, support for Maine's forest industries, is funded by McIntire-Stennis and is not covered by this plan of work. The outcomes from this research will help Maine's farmers, aquaculture producers, and food producers to increase profits, to develop new markets, and to become more competitive, help Maine to protect its valuable natural resources; help Maine communities to preserve their quality of place; and help to improve the health and wellbeing of Maine citizens and the safety of its food supply.

To achieve these goals, MAFES researchers will join efforts with other scientists and specialists from Cooperative Extension, state or federal agencies, and industry and take part in multistate research projects that are applicable to Maine needs. MAFES administration will meet regularly with stakeholders, legislators, and others to discuss the state's needs for applied research and will direct research resources according to the input we receive.

Estimated Number of Professional FTEs/SYs total in the State.

Year	Extension		Research	
	1862	1890	1862	1890
2011	0.0	0.0	38.6	0.0
2012	0.0	0.0	38.6	0.0
2013	0.0	0.0	38.6	0.0
2014	0.0	0.0	38.6	0.0
2015	0.0	0.0	38.6	0.0

II. Merit Review Process

1. The Merit Review Process that will be Employed during the 5-Year POW Cycle

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

2. Brief Explanation

All research projects funded by the Maine Agricultural and Forest Experiment Station (MAFES) 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 CSREES for final approval.

III. Evaluation of Multis & Joint Activities

1. How will the planned programs address the critical issues of strategic importance, including those identified by the stakeholders?

Many of the multistate projects and integrated research and extension programs of the Maine Agricultural and Forest Experiment Station contribute to the high-priority needs identified by stakeholders, both within Maine and throughout the nation. In fact, some stakeholder groups contribute additional funding to these programs through voluntary assessments that they pay.

NE1031--Collaborative Potato Breeding and Variety Development Activities to Enhance Farm Sustainability in the Eastern US--is a multistate project that develops and evaluates new potato clones for the eastern USA. Potato-breeding programs in Maine, New York, New Jersey, Ohio, North Carolina, Pennsylvania, Virginia, Wisconsin, and the ARS breeding program in Beltsville, MD, develop new potato clones and their performance is evaluated (in terms of the desired characteristics) in each of the regions of the eastern U.S.A. where potatoes are grown. This project addresses many stakeholder needs, including improved disease resistance, reduced used of pesticides, lower production costs, and culinary characteristics and qualities. All these factors ultimately contribute to the profitability of potato growers and the long-term survival of the industry.

Apple growers in the northern regions of the United States are in need of new varieties that are desired by consumers and more vigorous rootstocks that improve yield and profitability, and are resistant to freeze damage. NC140--Improving Economic and Environmental Sustainability in Tree-Fruit Production Through Changes in Rootstock Use--addresses part of this critical stakeholder need by evaluating new rootstock at several locations with differing climates.

Weed control is a major problem for producers of almost all crops, whether grown organically or conventionally. Improved methods of weed control are a high-priority need identified by stakeholders across Maine. NE-1026--*Weed Management Strategies for Sustainable Cropping Systems*--determines how weeds can be suppressed with new tillage practices, rotation crops, and seed predators. Better weed control without the used of herbicides can also reduce production costs and potential environmental spillover effects, both of which are also important stakeholder needs.

For integrated extension and research activities, researchers and extension personnel at UMaine are developing an IPM program for the wild blueberry industry of Maine. The goal of this program is to improve yields, reduce weed and insect problems, reduce pesticide use and avoid the cost of inputs that do not contribute to plant health or production. This program is highly valued by wild blueberry growers and is being widely adopted. Some of the applied

research is performed on stakeholders' farms.

Food safety and the development of value-added products are other high-priority needs that are addressed through integrated activities. A new food pilot plant is being used for product development and development of processing methods. Food safety is addressed through the measurement of pesticide residues of fruits and vegetables and the development and distribution of HCCAP procedures.

2. How will the planned programs address the needs of under-served and under-represented populations of the

Both the Maine Agricultural and Forest Experiment Station and the University of Maine Cooperative Extension will continue their efforts to identify both underserved and underrepresented groups in the state and MAFES will develop new integrated programs with UMCE to address those needs.

Both multistate research projects and programs integrated with UMCE represent programs available to MAFES to serve the needs of these populations.

Several of our multistate projects and integrated research and extension programs currently address needs of the under-served and under-represented populations in Maine. Historically, experiment station research has focused on food production issues of importance to growers and has ignored the needs of the consumers of the food products. Two of our multistate projects focus on the nutritional needs and habits of consumers to address high-priority needs such as obesity in the population. NC1028 examines the effectiveness of different intervention materials to encourage an increase in the consumption of fruits and vegetables in the diet of young adults. If successful, the project should reduce diet-related illnesses and obesity as this segment of the population ages. NE1023 is examining improved methods to measure fruit, vegetable and whole grains in the diet of older Americans. It will also develop and test intervention methods to improve the intake of these food products among older adults. If successful, the information should reduce diet-related disabilities, obesity and chronic diet-related disease rates in this segment of the population.

3. How will the planned programs describe the expected outcomes and impacts?

All the research and integrated programs of MAFES are moving toward a format that emphasizes reporting of planned outcomes and impacts. Researchers will be asked to identify the outcomes and impacts that will be achieved over the life of the program and specific progress in the attainment of these outcomes and impacts will be documented and reported annually.

4. How will the planned programs result in improved program effectiveness and/or efficiency?

Multistate research projects allow researchers to accomplish more as a research team than they can accomplish individually. A good example of the improved effectiveness and efficiency is the multistate potato clones project identified above. Through the multistate format, new potato clones can be tested in multiple locations on the east coast simultaneously, and the various breeding programs in the east can specialize in characteristics for which they develop clones as the other breeding programs take the lead for developing clones with other desirable characteristics.

Integrated programs also improve effectiveness by more efficiently distributing the results of the research performed by station scientists. Integrated programs also improve the identification of new research needs by facilitating the flow of information between the stakeholders and the researchers in MAFES.

IV. Stakeholder Input

1. Actions taken to seek stakeholder input that encourages 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.

Stakeholder input related to research needs is conducted on a continual basis. The manner in which the input is sought is variable, including informal discussions between Experiment Station staff/faculty and traditional and non-traditional stakeholder groups/individuals, more formal settings designed to specifically discuss stakeholder research needs, surveys of traditional groups/individuals, and surveys of the general public. The frequency in which the different methods are used is also variable. Informal discussions occur continuously. Formal meetings to elicit

input occur about every two to three years, and surveys of stakeholders are usually conducted every three to five years. The surveys of stakeholders are usually done in conjunction with Cooperative Extension and the University of Maine Board of Agriculture, a legislatively mandated board to advise the university on issues related to agriculture. Surveys of the general public are usually done every five to seven years.

All identified groups/individuals are asked and encouraged to provide the input being sought.Once new groups/individuals are identified, they are placed on a listing of the groups/individuals from whom information is sought on a continual basis.

2(A). A brief statement of the process that will be 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.

Existing advisory committees are good sources of information for identifying new stakeholder groups and individuals. Members of advisory groups are aware of the formation on new groups that have been formed and individuals who have assumed positions of leadership, either as individuals or leaders of the new stakeholder groups.

However, there is a need to go beyond advisory groups to insure that new groups/individuals are identified that may not be networked with existing groups for a variety of reasons. Internal focus groups, comprised of faculty, extension and other people within the University that work with external constituents, will be used to identify new groups and individuals. External focus groups, comprised of federal and state officials as well as traditional and non-traditional will also be conducted to identify new groups and individuals.

Finally, listening sessions would be held periodically around the state to elicit input and provide an opportunity for new groups and individuals to come forward and be identified as stakeholder groups and individuals to work with in the future.

2(B). A brief statement of the process that will be 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.

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.

Stakeholder input is a central part of the planning process in the Maine Agricultural and Forest Experiment Station. For example, stakeholder input is used to identify emerging issues and to redirect on-going research programs to address those issues. Adjustments in short-term objectives are made regularly in these on-going research programs to address the emerging issues.

Stakeholder input is also used to make changes in the long-term direction of the research programs of MAFES, including the setting of priorities, the budget process and the hiring of new faculty. While these types of changes occur more slowly and are dependent on the availability of open positions through retirement or resignations, they represent the best option for moving into new research areas and serving the needs of new stakeholder groups.

V. Planned Program Table of Content

V(A). Planned Program (Summary)

Program # 1

1. Name of the Planned Program

Global Food Security and Hunger

2. Brief summary about Planned Program

Global food security requires the availability of sufficient, nutritionally adequate food to allow all people to maintain and active and healthy lives. It's an enormous issue, however, which can be broken into many smaller parts. In addition to the issue of ensuring access to sufficient food for a growing population, global food security requires that food producers have access to arable land with healthy soils and adequate water for crop and livestock production. Producers need ways to protect their plants and animal from diseases and pests and ways or crops varieties that improve productivity. Furthermore, food production needs to be profitable to encourage current producers to remain involved and new producers to start up.

The Maine Agriculture and Forest Experiment Station conducts research to boost Maine's agricultural productivity, focusing on the fruits, vegetables, and animals important to Maine's food producers: potatoes, blueberries, apples, small fruits and vegetables, dairy, and marine aquaculture. Within the Global Food Security and Hunger program area, researchers conduct basic and applied research that aims to increase the sustainability, productivity, and profitability of production, processing, marketing, and international export of Maine food products.

In the Global Food Security and Hunger program area, MAFES scientists are researching new ways to control plant diseases, weeds, and insect pests to ensure sufficient food resources. They are looking to increase the productivity of Maine crops, by developing and testing new vegetable and fruit varieties and investigating ways to increase yields and improve soil quality through new soil management techniques. To ensure the productivity of Maine's animal food sources, they are working to increase the reproductive success of dairy cows; to develop new stocks of oysters; to develop and test new fish diets for marine aquaculture species; and to improve overall animal health. Researchers are also working to help Maine farms and food producers become more profitable through development of new, value-added products, reducing use of purchased inputs, increasing quality of Maine food products, and improving marketing efforts.

3. Program existence : Mature (More then five years)

4. Program duration : Long-Term (More than five years)

5. Expending formula funds or state-matching funds : Yes

6. Expending other than formula funds or state-matching funds : Yes

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
101	Appraisal of Soil Resources			2%	
102	Soil, Plant, Water, Nutrient Relationships			12%	
204	Plant Product Quality and Utility (Preharvest)			1%	
205	Plant Management Systems			11%	
211	Insects, Mites, and Other Arthropods Affecting Plants			5%	
212	Pathogens and Nematodes Affecting Plants			6%	
213	Weeds Affecting Plants			7%	
215	Biological Control of Pests Affecting Plants			2%	
216	Integrated Pest Management Systems			8%	
301	Reproductive Performance of Animals			4%	
302	Nutrient Utilization in Animals			4%	
303	Genetic Improvement of Animals			3%	
307	Animal Management Systems			4%	
311	Animal Diseases			11%	
312	External Parasites and Pests of Animals			4%	
501	New and Improved Food Processing Technologies			4%	
601	Economics of Agricultural Production and Farm Management			3%	
603	Market Economics			4%	
702	Requirements and Function of Nutrients and Other Food Components			3%	
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources			2%	
	Total			100%	

V(C). Planned Program (Situation and Scope)

1. Situation and priorities

Maine's potato industry encompasses more than 500 businesses generating nearly $280 million in annual sales, employing more than 2,600 people, and providing more than $100 million in income to Maine residents. Maine potatoes are exported both nationally and internationally. Potato production in Maine is concentrated in Aroostook County and central Penobscot County. Potato production in the Northeast is highly dependent on expensive chemical fertilizers and pesticides, yet productivity has not increased dramatically over the past 50 years. Maine potato growers need new strategies for controlling insect pests, such as the Colorado potato beetle, plant diseases caused by *Rhizoctonia solani, Phytophthora infestans, P. erythroseptica,* and *Spongospora subterranea,* and weeds. Potato growers in Maine and the eastern U.S. also need new potato varieties with better disease/pest resistance and better quality for fresh and processing markets.

Furthermore, they need new management systems that produce the yields and quality needed for profitability.

Wild blueberries are a unique agricultural crop in that they occur naturally in Maine and are cultivated in Maine and Maritimes Canada, with limited production in other states. Wild blueberries are grown on more than 500 farms on 64,000 acres in Maine. Maine produces the most blueberries of any state or province in North America, with an average production of more than 75 million pounds a year. Maine blueberries are exported around the world and make up about 50% of the world's wild blueberry crop. Developing new nutrient recommendations for wild blueberry will improve productivity on low-yielding fields and increase the profitability of the wild blueberry industry. Additionally, Maine's wild blueberry growers need improved tools for managing weed and insect pests and plant diseases.

Maine dairy farmers produce about $100 million worth of milk each year, and dairy farms employ more than 1,200 people full time and many seasonal laborers. Over the past 25 years, however, there has been a steady decline in the number of dairy farms. Maine's dairy farmers face increased production costs and depressed pricing. MAFES research is trying to increase the profitability of Maine's dairy farms by increasing the productivity of dairy cows through improved nutrition and reproduction success rates.

Maine's fisheries and aquaculture industries are comprised of marine fish and shellfish species, including Atlantic salmon, groundfish stocks, lobster, crab, clam, mussel, and oyster. Many Maine seafood products, most notably lobster, are exported around the world as well as across the country. The fish aquaculture industry in Maine is currently dominated by Atlantic salmon, but to ensure its sustainability, Maine's aquaculture industry needs other potential marine aquaculture species, new, less-expensive fish diets, and new methods for treating diseases. Maine's shellfisheries also face challenges, and need new methods of disease control, ways to repel invasive predatory species, and stock that performs well in Maine's cold water.

Much of the experiment station's research looks to develop new methods and treatments that reduce the amount of herbicide, insecticide, or fungicide applied to Maine crops. Reducing use of these chemicals will result in both direct economic savings for growers (obtaining effective control, but applying less pesticide) and indirect economic savings for growers (minimizing detrimental effects of insecticides on pollinators and pest natural enemies). In addition, Maine's communities also benefit from this tactic because a significant reduction in the use of chemical inputs should translate into reduced risk for ground and surface water contamination, and human and wildlife exposure to pesticides.

2. Scope of the Program

- In-State Research
- Multistate Research
- Integrated Research and Extension
- Multistate Integrated Research and Extension

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

Funding will stay the same; staffing levels will stay the same; participation from both oyster and mussel growers in the state; requires highly qualified hatchery personnel; requires use of the University of Maine Zebrafish Facility and trained personnel to monitor the fish stocks; continued integration with UM Cooperative Extension; potato industry will remain important for Maine economy; apple production will remain stable but replanting will increase; cooperation with scientists from state and federal research programs involved in genetic improvement of potato and other solanaceous species; weed insect and disease pressure will continue; growers will continue to adopt new practices, cooperate with researchers on projects, and learn to use new pest control materials to be able to control these pests; the slow rate at which new pesticides are developed, and increasing public pressure for environmental stewardship, will require the farming sector to increasingly rely on knowledge of the ecology of agroecosystems to produce equal or greater crop yields, of improved quality, with less reliance on pesticides for crop protection

2. Ultimate goal(s) of this Program

To increase global food security by enhancing the sustainability, productivity, and profitability of production, processing, marketing, and exporting for Maine food producers.

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2011	0.0	0.0	19.7	0.0
2012	0.0	0.0	19.7	0.0
2013	0.0	0.0	19.7	0.0
2014	0.0	0.0	19.7	0.0
2015	0.0	0.0	19.7	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

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. Type(s) of methods to be used to reach direct and indirect contacts

Extension

Direct Methods	Indirect Methods
	● Newsletters ● Web sites

3. Description of targeted audience

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

V(G). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons(contacts) to be reached through direct and indirect contact methods

	Direct Contact Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2011	0	0	0	0
2012	0	0	0	0
2013	0	0	0	0
2014	0	0	0	0
2015	0	0	0	0

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

2011:0 **2012:**0 **2013:**0 **2014:**0 **2015:**0

3. Expected Peer Review Publications

Year	Research Target	Extension Target	Total
2011	10	0	0
2012	10	0	0
2013	10	0	0
2014	10	0	0
2015	10	0	0

V(H). State Defined Outputs

1. Output Target

- Mathematical model on sea lice settlement risks for fish-farmed embayments in Maine

2011:0 **2012:**0 **2013:**0 **2014:**0 **2015:**0

- Number of crustacean mince-based products commercialized

2011:0 **2012:**1 **2013:**1 **2014:**0 **2015:**0

V(I). State Defined Outcome

O. No.	Outcome Name
1	Decrease in percentage of lowbush blueberry leaf tissue samples with nitrogen and phosphorus deficiences
2	Percentage of Maine lowbush blueberry growers surveyed who are changing their fertilization practices due to information provided by the fertility research program
3	Number of Maine vegetable and/or grain producers increasing their knowledge of biologically based nutrient sources and how to manage them
4	Number of Maine vegetable and/or grain producers adopting soil testing or other practices to improve the efficiency of their soil fertility programs as indicated by reduced nutrient inputs, improved yields, or both
5	Development of a basic vaccine against the emerging fish pathogen Francisella philomiragia subsp. Noatunensis
6	Development of best husbandry practices for polyculture fish farms
7	Maine aquaculturists use "new" feeds with lower fishmeal content to grow juvenile cod and halibut
8	Use of formulated feeds to grow juvenile sea urchins
9	Number of dairy producers modifying their forage management procedures by including the use of a silage additive
10	Increase in number of organic potato growers using biocontrol and mutualistic microorganisms to improve disease management, enhance crop yields, and increase soil fertility
11	Number of wild blueberry acres in Maine being treated with control measures for leaf drop diseases
12	More potato breeders will start using transgenic lines carrying novel R-genes from S. bulbocastanum as donors in their variety development programs
13	Release of at least one new eastern oyster broodstock to the oyster culture industry
14	Increase production efficiency and market share for Maine's oyster growers
15	Increase in number of crustacean processors in Maine producing/selling mince
16	Savings for aquaculture industry from development of effective vaccine regimens for Infectious Pancreatic Necrosis Virus and other infectious diseases of marine aquaculture species
17	Increased production of wild blueberries through proper management of weeds, diseases, and insect pests
18	Number of organic and sustainable Maine growers adopting the use of the most ecologically and economically efficient nutrient amendments to supplement or improve their current nutrient management systems
19	Percentage decline in use of nutrient amendments that pose a net-negative impact on soil or water systems in Maine
20	Number of Maine vegetable growers practicing crop rotation in hoop houses by growing alternative crops
21	Percentage of Maine potato producers adding organic amendments to improve soil quality
22	# of commercial-scale tests of new high-yielding, high-quality, and/or pest-resistant potato clones tested in Maine
23	# of new high-yielding, high-quality, and/or pest-resistant potato clones named and released by the Maine Potato Breeding Program

O. No.	Outcome Name
24	Reduced pesticide use and/or improved marketable yields on acres planted to new pest-resistant potato cultivars in Maine

Outcome # 1

1. Outcome Target

Decrease in percentage of lowbush blueberry leaf tissue samples with nitrogen and phosphorus deficiences

2. Outcome Type : Change in Knowledge Outcome Measure

2011:70	**2012:**80	**2013:**80	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 102 - Soil, Plant, Water, Nutrient Relationships

4. Associated Institute Type(s)

- 1862 Research

Outcome # 2

1. Outcome Target

Percentage of Maine lowbush blueberry growers surveyed who are changing their fertilization practices due to information provided by the fertility research program

2. Outcome Type : Change in Action Outcome Measure

2011:40	**2012:**60	**2013:**80	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 102 - Soil, Plant, Water, Nutrient Relationships

4. Associated Institute Type(s)

- 1862 Research

Outcome # 3

1. Outcome Target

Number of Maine vegetable and/or grain producers increasing their knowledge of biologically based nutrient sources and how to manage them

2. Outcome Type : Change in Knowledge Outcome Measure

2011:30	**2012:**30	**2013:**40	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 102 - Soil, Plant, Water, Nutrient Relationships
- 205 - Plant Management Systems

4. Associated Institute Type(s)

- 1862 Research

Outcome # 4

1. Outcome Target

Number of Maine vegetable and/or grain producers adopting soil testing or other practices to improve the efficiency of their soil fertility programs as indicated by reduced nutrient inputs, improved yields, or both

2. Outcome Type : Change in Action Outcome Measure

2011:0	**2012:**10	**2013:**20	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 102 - Soil, Plant, Water, Nutrient Relationships
- 205 - Plant Management Systems

4. Associated Institute Type(s)

- 1862 Research

Outcome # 5

1. Outcome Target

Development of a basic vaccine against the emerging fish pathogen Francisella philomiragia subsp. Noatunensis

2. Outcome Type : Change in Knowledge Outcome Measure

2011:0	**2012:**0	**2013:**0	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 307 - Animal Management Systems
- 311 - Animal Diseases
- 312 - External Parasites and Pests of Animals

4. Associated Institute Type(s)

- 1862 Research

Outcome # 6

1. Outcome Target

Development of best husbandry practices for polyculture fish farms

2. Outcome Type : Change in Knowledge Outcome Measure

2011:0	**2012:**0	**2013:**0	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 307 - Animal Management Systems
- 311 - Animal Diseases
- 312 - External Parasites and Pests of Animals

4. Associated Institute Type(s)

- 1862 Research

Outcome # 7

1. Outcome Target

Maine aquaculturists use "new" feeds with lower fishmeal content to grow juvenile cod and halibut

2. Outcome Type : Change in Action Outcome Measure

2011:0	**2012:**0	**2013:**0	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 501 - New and Improved Food Processing Technologies

4. Associated Institute Type(s)

- 1862 Research

Outcome # 8

1. Outcome Target

Use of formulated feeds to grow juvenile sea urchins

2. Outcome Type : Change in Action Outcome Measure

2011:0	**2012:**0	**2013:**0	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 302 - Nutrient Utilization in Animals
- 501 - New and Improved Food Processing Technologies

4. Associated Institute Type(s)

- 1862 Research

Outcome # 9

1. Outcome Target

Number of dairy producers modifying their forage management procedures by including the use of a silage additive

2. Outcome Type : Change in Action Outcome Measure

2011:0	**2012:**1	**2013:**3	**2014:**5	**2015:**5

3. Associated Knowledge Area(s)

- 302 - Nutrient Utilization in Animals

4. Associated Institute Type(s)

- 1862 Research

Outcome # 10

1. Outcome Target

Increase in number of organic potato growers using biocontrol and mutualistic microorganisms to improve disease management, enhance crop yields, and increase soil fertility

2. Outcome Type : Change in Action Outcome Measure

2011:0	**2012:**0	**2013:**0	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 205 - Plant Management Systems

4. Associated Institute Type(s)

- 1862 Research

Outcome # 11

1. Outcome Target

Number of wild blueberry acres in Maine being treated with control measures for leaf drop diseases

2. Outcome Type : Change in Action Outcome Measure

2011:20	**2012:**50	**2013:**0	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 212 - Pathogens and Nematodes Affecting Plants
- 216 - Integrated Pest Management Systems

4. Associated Institute Type(s)

- 1862 Research

Outcome # 12

1. Outcome Target

More potato breeders will start using transgenic lines carrying novel R-genes from S. bulbocastanum as donors in their variety development programs

2. Outcome Type : Change in Action Outcome Measure

2011:0	**2012:**0	**2013:**0	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 211 - Insects, Mites, and Other Arthropods Affecting Plants

4. Associated Institute Type(s)

- 1862 Research

Outcome # 13

1. Outcome Target

Release of at least one new eastern oyster broodstock to the oyster culture industry

2. Outcome Type : Change in Action Outcome Measure

2011:0	**2012:**0	**2013:**1	**2014:**2	**2015:**0

3. Associated Knowledge Area(s)

- 303 - Genetic Improvement of Animals
- 311 - Animal Diseases

4. Associated Institute Type(s)

- 1862 Research

Outcome # 14

1. Outcome Target

Increase production efficiency and market share for Maine's oyster growers

2. Outcome Type : Change in Condition Outcome Measure

2011:0	**2012:**0	**2013:**0	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 303 - Genetic Improvement of Animals
- 311 - Animal Diseases

4. Associated Institute Type(s)

- 1862 Research

Outcome # 15

1. Outcome Target

Increase in number of crustacean processors in Maine producing/selling mince

2. Outcome Type : Change in Action Outcome Measure

2011:0	**2012:**0	**2013:**1	**2014:**1	**2015:**0

3. Associated Knowledge Area(s)

- 501 - New and Improved Food Processing Technologies

4. Associated Institute Type(s)

- 1862 Research

Outcome # 16

1. Outcome Target

Savings for aquaculture industry from development of effective vaccine regimens for Infectious Pancreatic Necrosis Virus and other infectious diseases of marine aquaculture species

2. Outcome Type : Change in Condition Outcome Measure

2011:0	**2012:**0	**2013:**0	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 311 - Animal Diseases

4. Associated Institute Type(s)

- 1862 Research

Outcome # 17

1. Outcome Target

Increased production of wild blueberries through proper management of weeds, diseases, and insect pests

2. Outcome Type : Change in Condition Outcome Measure

2011:0	**2012:**0	**2013:**0	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 212 - Pathogens and Nematodes Affecting Plants
- 213 - Weeds Affecting Plants
- 215 - Biological Control of Pests Affecting Plants

4. Associated Institute Type(s)

- 1862 Research

Outcome # 18

1. Outcome Target

Number of organic and sustainable Maine growers adopting the use of the most ecologically and economically efficient nutrient amendments to supplement or improve their current nutrient management systems

2. Outcome Type : Change in Knowledge Outcome Measure

2011:0	**2012:**5	**2013:**10	**2014:**60	**2015:**0

3. Associated Knowledge Area(s)

- 102 - Soil, Plant, Water, Nutrient Relationships

4. Associated Institute Type(s)

- 1862 Research

Outcome # 19

1. Outcome Target

Percentage decline in use of nutrient amendments that pose a net-negative impact on soil or water systems in Maine

2. Outcome Type : Change in Knowledge Outcome Measure

2011:0	**2012:**0	**2013:**0	**2014:**10	**2015:**0

3. Associated Knowledge Area(s)

- 102 - Soil, Plant, Water, Nutrient Relationships

4. Associated Institute Type(s)

- 1862 Research

Outcome # 20

1. Outcome Target

Number of Maine vegetable growers practicing crop rotation in hoop houses by growing alternative crops

2. Outcome Type : Change in Knowledge Outcome Measure

2011:25	**2012:**30	**2013:**40	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 205 - Plant Management Systems

4. Associated Institute Type(s)

- 1862 Research

Outcome # 21

1. Outcome Target

Percentage of Maine potato producers adding organic amendments to improve soil quality

2. Outcome Type : Change in Action Outcome Measure

2011:2	**2012:**5	**2013:**7	**2014:**10	**2015:**0

3. Associated Knowledge Area(s)

- 102 - Soil, Plant, Water, Nutrient Relationships
- 204 - Plant Product Quality and Utility (Preharvest)
- 211 - Insects, Mites, and Other Arthropods Affecting Plants
- 212 - Pathogens and Nematodes Affecting Plants
- 213 - Weeds Affecting Plants

4. Associated Institute Type(s)

- 1862 Research

Outcome # 22

1. Outcome Target

# of commercial-scale tests of new high-yielding, high-quality, and/or pest-resistant potato clones tested in Maine

2. Outcome Type : Change in Action Outcome Measure

2011:10	**2012:**10	**2013:**0	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 204 - Plant Product Quality and Utility (Preharvest)
- 211 - Insects, Mites, and Other Arthropods Affecting Plants
- 212 - Pathogens and Nematodes Affecting Plants

4. Associated Institute Type(s)

- 1862 Research

Outcome # 23

1. Outcome Target

# of new high-yielding, high-quality, and/or pest-resistant potato clones named and released by the Maine Potato Breeding Program

2. Outcome Type : Change in Knowledge Outcome Measure

2011:1	**2012:**0	**2013:**0	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 204 - Plant Product Quality and Utility (Preharvest)
- 205 - Plant Management Systems
- 211 - Insects, Mites, and Other Arthropods Affecting Plants
- 212 - Pathogens and Nematodes Affecting Plants

4. Associated Institute Type(s)

- 1862 Research

Outcome # 24

1. Outcome Target

Reduced pesticide use and/or improved marketable yields on acres planted to new pest-resistant potato cultivars in Maine

2. Outcome Type : Change in Condition Outcome Measure

2011:0	**2012:**0	**2013:**0	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 204 - Plant Product Quality and Utility (Preharvest)
- 205 - Plant Management Systems
- 211 - Insects, Mites, and Other Arthropods Affecting Plants
- 212 - Pathogens and Nematodes Affecting Plants

4. Associated Institute Type(s)

- 1862 Research

V(J). Planned Program (External Factors)

1. External Factors which may affect 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.)

Description

{NO DATA ENTERED}

V(K). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

Description

{NO DATA ENTERED}

2. Data Collection Methods

Description

{NO DATA ENTERED}

V(A). Planned Program (Summary)

Program # 2

1. Name of the Planned Program

Climate Change

2. Brief summary about Planned Program

As concern about the timing, magnitude, and rate of future climate change increases, it is crucial that we have a better understanding of both how the mechanisms that govern climate variability work and what potential impacts may be experienced in Maine.

Home to the Climate Change Institute, the University of Maine is a recognized leader in discovery research on global climate change. Maine's location creates a prime testing ground for research on climate change, as it falls along the northernmost extent of the range of some species and the southernmost extent of the range of others. Scientists in the Maine Agricultural & Forest Experiment Station investigate the effects of climate on Maine's natural resource-based industries, particularly, agriculture, forestry, marine fisheries, and outdoor recreation and tourism.

In the Climate Change program area, MAFES scientists are investigating the effects of climate on Maine plant and animal wildlife. Scientists are developing biochemical metrics for Maine's aquatic resources. To ensure a viable apple industry, scientists are investigating the interaction between climate and apple rootstocks.

3. Program existence : Mature (More then five years)

4. Program duration : Long-Term (More than five years)

5. Expending formula funds or state-matching funds : Yes

6. Expending other than formula funds or state-matching funds : Yes

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			5%	
112	Watershed Protection and Management			12%	
133	Pollution Prevention and Mitigation			8%	
135	Aquatic and Terrestrial Wildlife			25%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants			25%	
605	Natural Resource and Environmental Economics			25%	
	Total			100%	

V(C). Planned Program (Situation and Scope)

1. Situation and priorities

Climate data for the Northeast show that average annual temperatures have increased in the region by +1.8 F over the last century. The data also show a greater rate of warming during the winter months, a slight increase in length of the growing season, and an increase in the frequency of extreme precipitation events.

For Maine agriculture, these changes in climate may lead to changes in disease, weed, and pest pressures. Furthermore, certain crops that do well in cooler climates may not perform as well with warmer annual temperatures. Changes in precipitation may also require new crop varieties or new methods for dealing with field flooding and soil changes.

Since there is much uncertainty about the effects of climate change, it will be crucial for Maine farmers to have access to current scientific research on the best ways to adapt to the new conditions.

Potential new invasive plant and animal species will affect Maine's forest, fishery, and outdoor recreation and tourism industries. Changing ocean temperatures will have an effect on Maine's marine aquaculture and fisheries industries. Loss of particular tree species due to warming temperatures may have a negative impact on Maine's forest industry and its maple sugar producers, along with the tourism industry, which relies heavily on fall foliage tourism. Maine's wildlife attracts many hunters, anglers, and wildlife watchers, who may no longer visit the state if certain species no longer live within its borders. It will be important for people who manage these resources and for state policymakers to have a better understanding of the relationships between climate, habitat, and species composition. One of the challenges for successful environmental management, however, is the need for indicators that permit one to monitor the condition of the resource, to detect changes in the resource, to understand why a resource is changing, and to make predictions about the future condition of the resource.

In the Climate Change program area, experiment station scientist conduct basic and applied research on the effects of climate on Maine's forests, aquatic resources, wildlife, plant crops, along with the policy issues affecting land use. Much of the research in this program area, however, is funded by McIntire-Stennis and, as such, is outside of the scope of this Plan of Work.

2. Scope of the Program

- In-State Research
- Multistate Research
- Multistate Integrated Research and Extension

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

Funding will stay the same; staffing levels will stay the same; cooperation with scientists from state and federal research programs; climate change will affect weed, insect, and disease pressures and productivity of Maine crops; climate change will lead to new invasive plant and animal species; climate change will lead to change in range for some plant and animal species

2. Ultimate goal(s) of this Program

To develop a better understanding of the effects of climate change on Maine's natural-resource-based industries, particularly, agriculture, forestry, marine fisheries, and outdoor recreation and tourism.

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2011	0.0	0.0	1.4	0.0
2012	0.0	0.0	1.4	0.0
2013	0.0	0.0	1.4	0.0
2014	0.0	0.0	1.4	0.0
2015	0.0	0.0	1.4	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

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. Type(s) of methods to be used to reach direct and indirect contacts

Extension

Direct Methods	Indirect Methods
	● Newsletters ● Web sites

3. Description of targeted audience

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

V(G). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons(contacts) to be reached through direct and indirect contact methods

	Direct Contact Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2011	0	0	0	0
2012	0	0	0	0
2013	0	0	0	0
2014	0	0	0	0
2015	0	0	0	0

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

2011:0 **2012:**0 **2013:**0 **2014:**0 **2015:**0

3. Expected Peer Review Publications

Year	Research Target	Extension Target	Total
2011	1	0	0
2012	1	0	0
2013	1	0	0
2014	1	0	0
2015	1	0	0

V(H). State Defined Outputs

1. Output Target

- Number of other publications

2011:1	**2012:**1	**2013:**1	**2014:**1	**2015:**1

- Number of research projects completed

2011:0	**2012:**2	**2013:**1	**2014:**0	**2015:**1

V(I). State Defined Outcome

O. No.	Outcome Name
1	improvements in federal, state, local and private institutional decision-making with respect to managing public and private lands by reducing risks associated with natural hazards such as fire, invasive species, weather-related natural events, and climate change
2	Use of new rootstocks that are better suited to Maine's climate for commercial apple production in Maine
3	Increased profitability for Maine apple growers based on their use of better-adapted rootstocks
4	Better understanding of the effects of climate change on Maine agriculture
5	Better understanding of the effects of climate change on Maine salmon
6	Number of biogeochemical indicators or metrics that have been mapped in Maine watersheds

Outcome # 1

1. Outcome Target

improvements in federal, state, local and private institutional decision-making with respect to managing public and private lands by reducing risks associated with natural hazards such as fire, invasive species, weather-related natural events, and climate change

2. Outcome Type : Change in Condition Outcome Measure

2011:0	**2012:**0	**2013:**0	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 605 - Natural Resource and Environmental Economics

4. Associated Institute Type(s)

- 1862 Research

Outcome # 2

1. Outcome Target

Use of new rootstocks that are better suited to Maine's climate for commercial apple production in Maine

2. Outcome Type : Change in Action Outcome Measure

2011:0	**2012:**0	**2013:**0	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 203 - Plant Biological Efficiency and Abiotic Stresses Affecting Plants

4. Associated Institute Type(s)

- 1862 Research

Outcome # 3

1. Outcome Target

Increased profitability for Maine apple growers based on their use of better-adapted rootstocks

2. Outcome Type : Change in Condition Outcome Measure

2011:0	**2012:**0	**2013:**0	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 203 - Plant Biological Efficiency and Abiotic Stresses Affecting Plants

4. Associated Institute Type(s)

- 1862 Research

Outcome # 4

1. Outcome Target

Better understanding of the effects of climate change on Maine agriculture

2. Outcome Type : Change in Knowledge Outcome Measure

2011:0	**2012:**0	**2013:**0	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 102 - Soil, Plant, Water, Nutrient Relationships
- 203 - Plant Biological Efficiency and Abiotic Stresses Affecting Plants

4. Associated Institute Type(s)

- 1862 Research

Outcome # 5

1. Outcome Target

Better understanding of the effects of climate change on Maine salmon

2. Outcome Type : Change in Knowledge Outcome Measure

2011:0	**2012:**0	**2013:**0	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 135 - Aquatic and Terrestrial Wildlife

4. Associated Institute Type(s)

- 1862 Research

Outcome # 6

1. Outcome Target

Number of biogeochemical indicators or metrics that have been mapped in Maine watersheds

2. Outcome Type : Change in Knowledge Outcome Measure

2011:0	**2012:**3	**2013:**6	**2014:**10	**2015:**15

3. Associated Knowledge Area(s)

- 112 - Watershed Protection and Management
- 133 - Pollution Prevention and Mitigation

4. Associated Institute Type(s)

- 1862 Research

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

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

Description

{NO DATA ENTERED}

V(K). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

Description

{NO DATA ENTERED}

2. Data Collection Methods

Description

{NO DATA ENTERED}

V(A). Planned Program (Summary)

Program # 3

1. Name of the Planned Program

Sustainable Energy

2. Brief summary about Planned Program

Maine is the most heavily forested state in the nation with more than 90% of its landbase covered in forests. As the state looks to develop new uses for its forest products and develop new energy sources to reduce its dependence on foreign oil, it makes sense that it turns to its forest as a source for new biofuels and bioproducts.

Maine Agricultural & Forest Experiment Station researchers are deeply involved in efforts to use woody biomass from our forests to create new bioproducts, such as transportation fuels, wood-based chemicals, consumer products, and electrical energy to reduce our reliance on fossil fuels. Innovative uses for sustainably harvested wood have great potential to reinvigorate forest management strategies, help landowners conserve forest lands, and transform industrial facilities into bio-refineries that manufacture many valuable wood products at one location.

3. Program existence : Intermediate (One to five years)

4. Program duration : Long-Term (More than five years)

5. Expending formula funds or state-matching funds : Yes

6. Expending other than formula funds or state-matching funds : Yes

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			31%	
201	Plant Genome, Genetics, and Genetic Mechanisms			18%	
206	Basic Plant Biology			6%	
402	Engineering Systems and Equipment			33%	
511	New and Improved Non-Food Products and Processes			12%	
	Total			100%	

V(C). Planned Program (Situation and Scope)

1. Situation and priorities

The forest products industry is a major contributor to Maine's economy. Maine's forest products manufacturing industry, however, faces stiff international competition, and many jobs in traditional wood- and paper-industry sectors are being lost, primarily to foreign competition. Because many forest products manufacturers are small- to medium-sized firms, located in rural areas, this has also resulted in a disproportionate impact on rural economies. In addition, our current reliance on foreign fossil-based fuels, power, and products, presents a serious challenge to economic stability and national security. Increasing consumption of fossil fuels also poses environmental problems such as pollution and greenhouse-gas emissions. These challenges, however, may also present excellent opportunities for the Maine's forest products industry. The state's forests provide a vast storehouse of renewable domestic feedstock for production of biomass-derived fuels, power, and chemicals. Properly managed forests also provide important environmental benefits such as carbon sequestration, ecological balance, and wildlife habitats. Maine's forests have the potential to provide the biological resources needed to replace fossil-based energy and products with renewable, non-food based bio-energy resources and bio-products.

In the Sustainable Energy program area, experiment station scientist conduct research on the use of woody biomass to create biofuels and other bioproducts. Researchers are also using sea slugs to advance our understanding of photosynthesis, with longer term implications for artificial photosynthesis and biofuels production. Since, most of the research in this program area is funded by McIntire-Stennis, it falls outside the scope of this Plan of Work.

2. Scope of the Program

- In-State Research
- Multistate Research
- Multistate Integrated Research and Extension

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

Funding will stay the same; staffing levels will stay the same; cooperation with scientists from state and federal research programs; creating new biofuels from renewable resources will become increasingly important to state policymakers and the people of Maine

2. Ultimate goal(s) of this Program

To help sustain Maine's forest products industries by developing new biofuels from Maine wood supplies.

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2011	0.0	0.0	1.8	0.0
2012	0.0	0.0	1.8	0.0
2013	0.0	0.0	1.8	0.0
2014	0.0	0.0	1.8	0.0
2015	0.0	0.0	1.8	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

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. Type(s) of methods to be used to reach direct and indirect contacts

Extension

Direct Methods	Indirect Methods
	● Newsletters ● Web sites

3. Description of targeted audience

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

V(G). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons(contacts) to be reached through direct and indirect contact methods

	Direct Contact Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2011	0	0	0	0
2012	0	0	0	0
2013	0	0	0	0
2014	0	0	0	0
2015	0	0	0	0

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

2011:0 **2012:**0 **2013:**0 **2014:**0 **2015:**0

3. Expected Peer Review Publications

Year	Research Target	Extension Target	Total
2011	1	0	0
2012	1	0	0
2013	1	0	0
2014	1	0	0
2015	1	0	0

V(H). State Defined Outputs

1. Output Target

- Number of other publications

2011:1 **2012:**1 **2013:**1 **2014:**1 **2015:**1

- Number of research projects completed

2011:0 **2012:**2 **2013:**0 **2014:**1 **2015:**0

V(I). State Defined Outcome

O. No.	Outcome Name
1	Develop in-process-line, real-time sensor components that incorporate NIRS information for process control and decision-making in woody biomass process stream
2	Development of products of value for use as bio-based fuel from the basic components of lignocellulosic materials
3	Novel wood adhesives containing the solid residues of biomass fermentation from biofuels/biochemical research that reduce or eliminate the use of petrochemical-based adhesive systems
4	Better understanding of synthetic photosynthesis as it relates to alternatives to biofuel production

Outcome # 1

1. Outcome Target

Develop in-process-line, real-time sensor components that incorporate NIRS information for process control and decision-making in woody biomass process stream

2. Outcome Type : Change in Knowledge Outcome Measure

2011:0	**2012:**0	**2013:**0	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 402 - Engineering Systems and Equipment

4. Associated Institute Type(s)

- 1862 Research

Outcome # 2

1. Outcome Target

Development of products of value for use as bio-based fuel from the basic components of lignocellulosic materials

2. Outcome Type : Change in Condition Outcome Measure

2011:0	**2012:**0	**2013:**0	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 123 - Management and Sustainability of Forest Resources
- 511 - New and Improved Non-Food Products and Processes

4. Associated Institute Type(s)

- 1862 Research

Outcome # 3

1. Outcome Target

Novel wood adhesives containing the solid residues of biomass fermentation from biofuels/biochemical research that reduce or eliminate the use of petrochemical-based adhesive systems

2. Outcome Type : Change in Condition Outcome Measure

2011:0	**2012:**0	**2013:**0	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 123 - Management and Sustainability of Forest Resources
- 511 - New and Improved Non-Food Products and Processes

4. Associated Institute Type(s)

- 1862 Research

Outcome # 4

1. Outcome Target

Better understanding of synthetic photosynthesis as it relates to alternatives to biofuel production

2. Outcome Type : Change in Knowledge Outcome Measure

2011:0	**2012:**0	**2013:**0	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 201 - Plant Genome, Genetics, and Genetic Mechanisms
- 206 - Basic Plant Biology

4. Associated Institute Type(s)

- 1862 Research

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

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

Description

{NO DATA ENTERED}

V(K). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

Description

{NO DATA ENTERED}

2. Data Collection Methods

Description

{NO DATA ENTERED}

V(A). Planned Program (Summary)

Program # 4

1. Name of the Planned Program

Childhood Obesity

2. Brief summary about Planned Program

Recent data from the U.S. Centers for Disease Control and Prevention show that obesity rates continue to rise for all age, gender and socioeconomic segments of the population. All adults who have a BMI of 25 or more are considered at risk for premature death and disability as a consequence of overweight or obesity. The higher the BMI, the higher the risk for premature death and disability. Overweight and obese individuals are at increased risk for many medical problems, including cardiovascular disease, Type 2 diabetes, and certain cancers. Over the past 20 years in the U.S., there have been huge increases in hospitalizations for children ages 6-17 for obesity-related diseases (436% for sleep apnea; 228% for gallbladder disease; 197% for obesity).

Health issues related to obesity cost the U.S. an estimated $75 to $117 billion annually. In Maine, more than $0.5 billion in health care dollars are spent on obesity every year, about 11% of the state's medical expenditures. Obesity-associated hospital costs for youth ages 6 to 17 have increased from $35 million to $127 million over the past 20 years.

In the Childhood Obesity program area, MAFES scientists use a model of community-based participatory research to work with target groups of young adults to identify and prioritize the problems related to nutrition issues. Scientists also are measuring the effects of certain fruits on appetite and serum glucose and insulin levels of obese and normal-weight volunteers. Through this research, nutritionists and food scientists are trying to reign in obesity rates, thereby improving quality and length of life and reducing health care costs for Maine people.

3. Program existence : Mature (More then five years)

4. Program duration : Long-Term (More than five years)

5. Expending formula funds or state-matching funds : Yes

6. Expending other than formula funds or state-matching funds : Yes

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
502	New and Improved Food Products			7%	
702	Requirements and Function of Nutrients and Other Food Components			37%	
703	Nutrition Education and Behavior			56%	
	Total			100%	

V(C). Planned Program (Situation and Scope)

1. Situation and priorities

In Maine, obesity rates rose 100% from 12% in 1990 to 26% in 2006, and about 59% of Mainers are either overweight or obese. Approximately 30% of Maine children ages 10 to 17 are considered overweight or obese and 33% of kindergarteners have a body mass index in the 85th percentile or above. About one in three Maine children in poverty or on public health insurance is overweight or obese. Only seven other states had higher prevalence rates of obesity among white non-Hispanic children. Furthermore Maine children are less likely than their counterparts nationwide to exercise for at least four days per week, but they're also less likely to spend two or more hours in front of a television or computer screen.

Recent epidemiological studies have documented that young adulthood is a critical time in which adverse changes in body weight are likely to occur, and that men and women aged 18 to 25 are at particularly high risk for weight gain. Being mildly or moderately overweight at 20 to 22 years old is linked with substantial incidence of obesity by age 35 to 37. Yet there have been few interventions designed to prevent obesity in college-age individuals.

In the Childhood Obesity program area, experiment station scientists are working with young adults in Maine to develop methods and material for promoting healthful eating and/or prevention of weight gain in this population. Researchers are also investigating the factors that prompt consumers to seek or avoid healthy foods.

2. Scope of the Program

- In-State Research
- Multistate Research
- Integrated Research and Extension
- Multistate Integrated Research and Extension

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

Funding will stay the same; staffing levels will stay the same; cooperation with scientists from other research programs; obesity will continue to be a serious health problem for Maine youth

2. Ultimate goal(s) of this Program

To improve the health of Maine people through improved nutrition, in particular to reduce rates of childhood obesity

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2011	0.0	0.0	1.2	0.0
2012	0.0	0.0	1.2	0.0
2013	0.0	0.0	1.2	0.0
2014	0.0	0.0	1.2	0.0
2015	0.0	0.0	1.2	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

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. Type(s) of methods to be used to reach direct and indirect contacts

Extension

Direct Methods	Indirect Methods
	• Newsletters • Web sites

3. Description of targeted audience

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

V(G). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons(contacts) to be reached through direct and indirect contact methods

	Direct Contact Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2011	0	0	0	0
2012	0	0	0	0
2013	0	0	0	0
2014	0	0	0	0
2015	0	0	0	0

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

2011:0 **2012:**0 **2013:**0 **2014:**0 **2015:**0

3. Expected Peer Review Publications

Year	Research Target	Extension Target	Total
2011	1	0	0
2012	1	0	0
2013	1	0	0
2014	1	0	0
2015	1	0	0

V(H). State Defined Outputs

1. Output Target

- Number of other publications

2011:1	**2012:**1	**2013:**1	**2014:**1	**2015:**1

- Number of completed research projects

2011:1	**2012:**1	**2013:**0	**2014:**0	**2015:**0

V(I). State Defined Outcome

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 Target

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

2. Outcome Type : Change in Knowledge Outcome Measure

2011:0	**2012:**0	**2013:**0	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 703 - Nutrition Education and Behavior

4. Associated Institute Type(s)

- 1862 Research

Outcome # 2

1. Outcome Target

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. Outcome Type : Change in Knowledge Outcome Measure

2011:0	**2012:**0	**2013:**0	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 703 - Nutrition Education and Behavior

4. Associated Institute Type(s)

- 1862 Research

Outcome # 3

1. Outcome Target

Improved weight-gain-prevention programs

2. Outcome Type : Change in Condition Outcome Measure

2011:0	**2012:**0	**2013:**0	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 703 - Nutrition Education and Behavior

4. Associated Institute Type(s)

- 1862 Research

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

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

Description

{NO DATA ENTERED}

V(K). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

Description

{NO DATA ENTERED}

2. Data Collection Methods

Description

{NO DATA ENTERED}

V(A). Planned Program (Summary)

Program # 5

1. Name of the Planned Program

Food Safety

2. Brief summary about Planned Program

With several recent outbreaks of foodborne infections and intoxicants in the U.S., the issue of food safety and pathogen control has become a central concern for consumers and food producers alike. Foodborne illnesses account for billions of dollars of economic losses annually.

In the Food Safety program area, Maine Agricultural & Forest Experiment Station food scientists are developing new methods and technologies aimed at ensuring the quality of Maine food products and preventing foodborne illnesses. Scientists are also investigating how consumers respond to and perceive health-related information about food.

3. Program existence : Mature (More then five years)

4. Program duration : Long-Term (More than five years)

5. Expending formula funds or state-matching funds : Yes

6. Expending other than formula funds or state-matching funds : Yes

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			10%	
315	Animal Welfare/Well-Being and Protection			10%	
501	New and Improved Food Processing Technologies			8%	
603	Market Economics			4%	
607	Consumer Economics			4%	
701	Nutrient Composition of Food			10%	
703	Nutrition Education and Behavior			4%	
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources			10%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins			40%	
	Total			100%	

V(C). Planned Program (Situation and Scope)

1. Situation and priorities

Food production and processing is important in several key sectors in Maine: dairy, fisheries, potatoes, blueberries, and other fruits and vegetables. Control of foodborne pathogens and the reduction in the potential health risks to consumers from

pathogens is one of the most urgent problems confronting the food industry. Maine food producers need new rapid techniques to test for the presence of pathogens. Although food producers have long used chemical agents with antimicrobial activity to control foodborne pathogens, consumers today are increasingly concerned about the safety of these chemical additives in foods and prefer natural and unadulterated foods. Using Maine crops, such as blueberry and cranberry, to develop antimicrobial compounds will benefit the growers, food producers, and consumers. Maine's food producers and processors need help assessing the quality of their products, along with new techniques and technologies for preserving food quality and extending shelf life.

2. Scope of the Program

- In-State Research
- Multistate Research
- Integrated Research and Extension
- Multistate Integrated Research and Extension

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

Funding will remain constant; staffing levels will remain the same. Maine's food commodity groups will remain stable. Concern over food-borne pathogens will remain the same or increase.

2. Ultimate goal(s) of this Program

To improve the safety of Maine food products and help Maine food producers and processors to become more profitable

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2011	0.0	0.0	2.6	0.0
2012	0.0	0.0	2.6	0.0
2013	0.0	0.0	2.6	0.0
2014	0.0	0.0	2.6	0.0
2015	0.0	0.0	2.6	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

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. Type(s) of methods to be used to reach direct and indirect contacts

Extension

Direct Methods	Indirect Methods
	• Newsletters • Web sites

3. Description of targeted audience

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

V(G). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons(contacts) to be reached through direct and indirect contact methods

	Direct Contact Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2011	0	0	0	0
2012	0	0	0	0
2013	0	0	0	0
2014	0	0	0	0
2015	0	0	0	0

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

2011:0 **2012:**0 **2013:**0 **2014:**0 **2015:**0

3. Expected Peer Review Publications

Year	Research Target	Extension Target	Total
2011	1	0	0
2012	1	0	0
2013	1	0	0
2014	1	0	0
2015	1	0	0

V(H). State Defined Outputs

1. Output Target

- Number of other publications

2011:1	**2012:**1	**2013:**1	**2014:**1	**2015:**1

- Completed research projects

2011:1	**2012:**1	**2013:**1	**2014:**1	**2015:**0

V(I). State Defined Outcome

O. No.	Outcome Name
1	Federal food safety agencies may alter the way they calculate the benefits of food safety programs and may change their food safety program priorities
2	Percentage of Maine food industry and food producers adopting new effective methods to eliminate microbial contaminations
3	Percentage of Maine food industry and food producers using ingredients with natural antimicrobial properties in food products to control foodborne pathogens
4	Safer food supply and protection against foodborne illness and bacterial infection for the people of Maine
5	Increased number of regional dairy farmers using an alternative teat dip
6	Reduction in use of disinfectant teat dips will increase level of human health
7	Development of analytical methods for monitoring organic chemicals in food

Outcome # 1

1. Outcome Target

Federal food safety agencies may alter the way they calculate the benefits of food safety programs and may change their food safety program priorities

2. Outcome Type : Change in Action Outcome Measure

2011:0	**2012:**0	**2013:**0	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 501 - New and Improved Food Processing Technologies
- 603 - Market Economics
- 607 - Consumer Economics
- 703 - Nutrition Education and Behavior

4. Associated Institute Type(s)

- 1862 Research

Outcome # 2

1. Outcome Target

Percentage of Maine food industry and food producers adopting new effective methods to eliminate microbial contaminations

2. Outcome Type : Change in Action Outcome Measure

2011:30	**2012:**50	**2013:**60	**2014:**80	**2015:**0

3. Associated Knowledge Area(s)

- 712 - Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

4. Associated Institute Type(s)

- 1862 Research

Outcome # 3

1. Outcome Target

Percentage of Maine food industry and food producers using ingredients with natural antimicrobial properties in food products to control foodborne pathogens

2. Outcome Type : Change in Knowledge Outcome Measure

2011:3	**2012:**10	**2013:**20	**2014:**30	**2015:**0

3. Associated Knowledge Area(s)

- 712 - Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally

Occurring Toxins

4. Associated Institute Type(s)

- 1862 Research

Outcome # 4

1. Outcome Target

Safer food supply and protection against foodborne illness and bacterial infection for the people of Maine

2. Outcome Type : Change in Condition Outcome Measure

2011:0	**2012:**0	**2013:**0	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 712 - Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

4. Associated Institute Type(s)

- 1862 Research

Outcome # 5

1. Outcome Target

Increased number of regional dairy farmers using an alternative teat dip

2. Outcome Type : Change in Action Outcome Measure

2011:0	**2012:**0	**2013:**0	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 311 - Animal Diseases
- 315 - Animal Welfare/Well-Being and Protection

4. Associated Institute Type(s)

- 1862 Research

Outcome # 6

1. Outcome Target

Reduction in use of disinfectant teat dips will increase level of human health

2. Outcome Type : Change in Knowledge Outcome Measure

2011:0	**2012:**0	**2013:**0	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 311 - Animal Diseases
- 315 - Animal Welfare/Well-Being and Protection

4. Associated Institute Type(s)

- 1862 Research

Outcome # 7

1. Outcome Target

Development of analytical methods for monitoring organic chemicals in food

2. Outcome Type : Change in Knowledge Outcome Measure

2011:0	**2012:**0	**2013:**0	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 701 - Nutrient Composition of Food
- 711 - Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources

4. Associated Institute Type(s)

- 1862 Research

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

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

Description

{NO DATA ENTERED}

V(K). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

Description

{NO DATA ENTERED}

2. Data Collection Methods

Description

{NO DATA ENTERED}

V(A). Planned Program (Summary)

Program # 6

1. Name of the Planned Program

Sustaining Maine's Natural Resources

2. Brief summary about Planned Program

When most people think of Maine, they think of its natural resources: its lakes, streams, and rivers, its scenic coastline, its forests, and the fish, animal, and plant species these areas support. Maine citizens value these resources highly, and judging by Maine's $3 billion tourism industry, people from across the country and around the world also value them. Therefore, it is a critical part of the Maine Agricultural & Forest Experiment Station's mission to provide the research necessary to conserve and preserve these resources.

The Sustaining Maine's Natural Resources program area comprises discovery research projects that focus on aspects of Maine's natural resources: water, soil, and air quality and conservation of Maine's plant and wildlife species. MAFES water research is monitoring the health and quality of Maine's ground water, rivers, and lakes. Wildlife biologists are investigating the status, distribution, and habitat requirements of harbor and gray seal. Other research examines the effects of resource availability and quality on individual growth, breeding success, and survival of migrant and resident birds populations and ways to improve stream habitat for fish.

Some of the Experiment Station's research on Maine's natural resources is funded through the McIntire-Stennis Act and does not fall under the scope of this document.

3. Program existence : Mature (More then five years)

4. Program duration : Long-Term (More than five years)

5. Expending formula funds or state-matching funds : Yes

6. Expending other than formula funds or state-matching funds : Yes

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			13%	
123	Management and Sustainability of Forest Resources			1%	
133	Pollution Prevention and Mitigation			4%	
135	Aquatic and Terrestrial Wildlife			48%	
136	Conservation of Biological Diversity			3%	
206	Basic Plant Biology			8%	
306	Environmental Stress in Animals			4%	
314	Toxic Chemicals, Poisonous Plants, Naturally Occurring Toxins, and Other Hazards Affecting Animals			8%	
721	Insects and Other Pests Affecting Humans			8%	
723	Hazards to Human Health and Safety			3%	
	Total			100%	

V(C). Planned Program (Situation and Scope)

1. Situation and priorities

Maine is a state rich in water resources. It includes more than 3,500 miles of coastline, 6,000 lakes and ponds, and 32,000 miles of rivers and streams. These waters represent a valuable part of the natural resource base in the state of Maine. They provide important ecological habitats, diverse recreational activities, valuable social amenities, unique scenic attractions, and abundant resource-based economic opportunities within the state. Unfortunately, aquatic resources in Maine and throughout the U.S. are at risk from pressures and threats associated with human population growth, climate changes, land development and sprawl, invasive exotic species, and non-point pollution. Conservation and wise management of these natural waters requires ongoing research efforts to monitor the ecological health of these systems and to detect changes and trends associated with degradation of these aquatic resources.

Maine's wild plant and animal species are another valuable part of Maine's natural resource base. Wildlife and their habitats attract anglers, hunters, and tourists to Maine, but they also serve as indicators of overall health of Maine's environment and improve quality of life for all Maine citizens. To better protect and conserve these species, the state needs more information about their genetic makeup and the relationship between these species and their environment.

The natural resources program area needs answers to basic questions about how these systems work, what effects changes in one aspect have on the system as whole. Therefore the outcomes for this program area mainly represent changes in our knowledge base. MAFES scientists are laying the foundation for further research and for other agencies to develop applications that help manage Maine's natural resources.

2. Scope of the Program

- In-State Research
- Multistate Research
- Multistate Integrated Research and Extension

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

Funding will stay the same; staffing levels will stay the same; research space will be available; collaborations with the Maine Departments of Environmental Protection and Inland Fisheries and Wildlife, Atlantic Salmon Commission, U.S. Fish and Wildlife Service and the National Marine Fisheries Service and citizen groups will continue; permits for fish sampling will be approved.

2. Ultimate goal(s) of this Program

To increase our understanding of and knowledge about Maine's natural resources to help the state manage these resources sustainably

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2011	0.0	0.0	5.0	0.0
2012	0.0	0.0	5.0	0.0
2013	0.0	0.0	5.0	0.0
2014	0.0	0.0	5.0	0.0

Year	Extension		Research	
	1862	1890	1862	1890
2015	0.0	0.0	5.0	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

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. Type(s) of methods to be used to reach direct and indirect contacts

Extension

Direct Methods	Indirect Methods
	• Newsletters • Web sites

3. Description of targeted 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

V(G). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons(contacts) to be reached through direct and indirect contact methods

	Direct Contact Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2011	0	0	0	0
2012	0	0	0	0
2013	0	0	0	0
2014	0	0	0	0
2015	0	0	0	0

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

2011:0 **2012:**0 **2013:**0 **2014:**0 **2015:**0

3. Expected Peer Review Publications

Year	Research Target	Extension Target	Total
2011	6	0	0

Year	Research Target	Extension Target	Total
2012	6	0	0
2013	6	0	0
2014	6	0	0
2015	6	0	0

V(H). State Defined Outputs

1. Output Target

- # of other types of publications

2011:8 **2012:**8 **2013:**8 **2014:**8 **2015:**8

- # of research projects completed

2011:1 **2012:**5 **2013:**1 **2014:**2 **2015:**3

V(I). State Defined Outcome

O. No.	Outcome Name
1	# of new software programs created to evaluate borehole flow profile data collected using borehole geophysics
2	# of new ground-water-modeling programs created to simulate ground-water flow
3	# of streams identified as promising or critical candidates for native salmonine conservation, based on potential perturbation from invasive species and/or riparian zone management
4	# of natural resource managers or biologists incorporating research results on conservation of native fishes into official policy and management plans
5	Number of management agencies using empirical data and model systems to draft recommendation on fish management and conservation
6	Percentage savings for the U.S. government in the cost of estimating the number of harbor seals after a new protocol for estimating the number of harbor seals has been adopted as a standard for the Northeast.
7	Recovery actions will be implemented to conserve the endemic Clayton's copper butterfly and its habitat
8	Increase in the distribution and abundance of migratory fish in Maine
9	Population monitoring plan will be instituted for the long-term use of the Maine Dept. of Inland Fisheries & Widlife biologists to ensure the conservation and recovery of Clayton's copper butterly
10	Scientists, fishermen, and other stakeholders will adopt participatory approaches for producing and using knowledge for marine fisheries management

Outcome # 1

1. Outcome Target

# of new software programs created to evaluate borehole flow profile data collected using borehole geophysics

2. Outcome Type : Change in Knowledge Outcome Measure

2011:1	**2012:**1	**2013:**0	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 111 - Conservation and Efficient Use of Water
- 133 - Pollution Prevention and Mitigation

4. Associated Institute Type(s)

- 1862 Research

Outcome # 2

1. Outcome Target

# of new ground-water-modeling programs created to simulate ground-water flow

2. Outcome Type : Change in Knowledge Outcome Measure

2011:1	**2012:**1	**2013:**0	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 111 - Conservation and Efficient Use of Water
- 133 - Pollution Prevention and Mitigation

4. Associated Institute Type(s)

- 1862 Research

Outcome # 3

1. Outcome Target

# of streams identified as promising or critical candidates for native salmonine conservation, based on potential perturbation from invasive species and/or riparian zone management

2. Outcome Type : Change in Knowledge Outcome Measure

2011:6	**2012:**10	**2013:**10	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 135 - Aquatic and Terrestrial Wildlife

4. Associated Institute Type(s)

- 1862 Research

Outcome # 4

1. Outcome Target

# of natural resource managers or biologists incorporating research results on conservation of native fishes into official policy and management plans

2. Outcome Type : Change in Action Outcome Measure

2011:3	**2012:**6	**2013:**6	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 135 - Aquatic and Terrestrial Wildlife

4. Associated Institute Type(s)

- 1862 Research

Outcome # 5

1. Outcome Target

Number of management agencies using empirical data and model systems to draft recommendation on fish management and conservation

2. Outcome Type : Change in Knowledge Outcome Measure

2011:3	**2012:**3	**2013:**3	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 135 - Aquatic and Terrestrial Wildlife

4. Associated Institute Type(s)

- 1862 Research

Outcome # 6

1. Outcome Target

Percentage savings for the U.S. government in the cost of estimating the number of harbor seals after a new protocol for estimating the number of harbor seals has been adopted as a standard for the Northeast.

2. Outcome Type : Change in Condition Outcome Measure

2011:0	**2012:**0	**2013:**0	**2014:**50	**2015:**0

3. Associated Knowledge Area(s)

- 135 - Aquatic and Terrestrial Wildlife

4. Associated Institute Type(s)

- 1862 Research

Outcome # 7

1. Outcome Target

Recovery actions will be implemented to conserve the endemic Clayton's copper butterfly and its habitat

2. Outcome Type : Change in Action Outcome Measure

2011:0	**2012:**0	**2013:**0	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 135 - Aquatic and Terrestrial Wildlife

4. Associated Institute Type(s)

- 1862 Research

Outcome # 8

1. Outcome Target

Increase in the distribution and abundance of migratory fish in Maine

2. Outcome Type : Change in Condition Outcome Measure

2011:0	**2012:**0	**2013:**0	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 135 - Aquatic and Terrestrial Wildlife

4. Associated Institute Type(s)

- 1862 Research

Outcome # 9

1. Outcome Target

Population monitoring plan will be instituted for the long-term use of the Maine Dept. of Inland Fisheries & Widlife biologists to ensure the conservation and recovery of Clayton's copper butterly

2. Outcome Type : Change in Action Outcome Measure

2011:0	**2012:**0	**2013:**0	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 135 - Aquatic and Terrestrial Wildlife

4. Associated Institute Type(s)

- 1862 Research

Outcome # 10

1. Outcome Target

Scientists, fishermen, and other stakeholders will adopt participatory approaches for producing and using knowledge for marine fisheries management

2. Outcome Type : Change in Knowledge Outcome Measure

2011:0	**2012:**0	**2013:**0	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

4. Associated Institute Type(s)

- 1862 Research

V(J). Planned Program (External Factors)

1. External Factors which may affect 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)

Description

Natural disasters, weather extremes, and climate change all have the potential to affect the outcomes of MAFES natural resources research. New invasive species may affect Maine's plant and animal wildlife. Funding for university research is affected by the economy and other policy changes.

V(K). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

- Before-After (before and after program)
- During (during program)
- Comparison between locales where the program operates and sites without program intervention

Description

All MAFES projects are evaluated by the research council as the project ends and before the researcher is allowed to develop another project. Field tests compare results between plots/fields where inputs are changed and plots/fields where inputs are not changed.

2. Data Collection Methods

- Sampling
- Unstructured
- Observation
- Tests
- Journals

Description

Scientists collect data by sampling, conducting tests and observations, reviewing the literature.

V(A). Planned Program (Summary)

Program # 7

1. Name of the Planned Program

Support for Maine's Rural Economy

2. Brief summary about Planned Program

Although Maine's rural population has grown in total numbers since 1980, the percentage of the state's population living in rural areas has dropped from 44% to 42% over that time period. Poverty and unemployment rates are also both higher in rural areas of the state. Maine's rural economies rely on several key industries (agriculture, forestry, tourism and recreation, and marine fisheries), most of which have been hard hit by the recent economic downturn and global competition. Some of Maine's rural areas are facing intense development pressure, with the concomitant issues of sprawl and debates concerning land use.

The Support for Maine's Rural Economies program area comprises research on a range of issues affecting Maine's rural people and communities. Researchers are looking for ways to increase the profitability of Maine's horticultural and green industries. They are addressing the issues surrounding management of Maine's commercial fisheries. Researchers are also providing their expertise on nature-based tourism and rural labor markets and studying the effects on human health of exposure to certain environmental and/or occupational toxicants.

3. Program existence : Mature (More then five years)

4. Program duration : Long-Term (More than five years)

5. Expending formula funds or state-matching funds : Yes

6. Expending other than formula funds or state-matching funds : Yes

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			5%	
111	Conservation and Efficient Use of Water			5%	
123	Management and Sustainability of Forest Resources			1%	
134	Outdoor Recreation			11%	
136	Conservation of Biological Diversity			5%	
201	Plant Genome, Genetics, and Genetic Mechanisms			1%	
202	Plant Genetic Resources			5%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants			2%	
205	Plant Management Systems			6%	
206	Basic Plant Biology			6%	
605	Natural Resource and Environmental Economics			16%	
608	Community Resource Planning and Development			28%	
723	Hazards to Human Health and Safety			9%	
	Total			100%	

V(C). Planned Program (Situation and Scope)

1. Situation and priorities

As a rural state, Maine must balance the needs of communities for growth with the challenges, both economic and environmental, of sprawl and changes in land-use patterns. Community leaders need to understand the economic impacts of land-use change, such as changes in the costs of providing public services, property tax revenues, and transport costs; social impacts such as changes in community character, aesthetics, and recreation access; and ecological impacts, such as loss of habitat, fragmentation of habitat, and alteration of the hydrological regime. The relative magnitude of these impacts is often uncertain. As a result, communities and government agencies often make decisions related to land use with imperfect information.

As with most of the rest of the United States, Maine is losing many of its natural-resource-based manufacturing jobs. As these industries decline in number of firms, payrolls, and output value, communities are searching for other enterprises to fill the economic void. A better understanding of the factors that affect rural labor markets and a focus on improving Maine's already-strong tourism industry will help communities maintain their viability.

Support for remaining rural industries, such as agriculture, commercial fisheries, and tourism is an important mission of the experiment station.

2. Scope of the Program

- In-State Research
- Multistate Research
- Multistate Integrated Research and Extension

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

Funding will stay the same; staffing levels will stay the same; continued decline in natural-resource-based industries; continued interest in tourism; continued development pressure.

2. Ultimate goal(s) of this Program

To increase the sustainability of Maine's rural communities

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2011	0.0	0.0	4.8	0.0
2012	0.0	0.0	4.8	0.0
2013	0.0	0.0	4.8	0.0
2014	0.0	0.0	4.8	0.0
2015	0.0	0.0	4.8	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

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. Type(s) of methods to be used to reach direct and indirect contacts

Extension

Direct Methods	Indirect Methods
	• Newsletters • Web sites

3. Description of targeted audience

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

V(G). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons(contacts) to be reached through direct and indirect contact methods

	Direct Contact Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target

	Direct Contact Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2011	0	0	0	0
2012	0	0	0	0
2013	0	0	0	0
2014	0	0	0	0
2015	0	0	0	0

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

2011:0 **2012:**0 **2013:**0 **2014:**0 **2015:**0

3. Expected Peer Review Publications

Year	Research Target	Extension Target	Total
2011	3	0	0
2012	3	0	0
2013	3	0	0
2014	3	0	0
2015	3	0	0

V(H). State Defined Outputs

1. Output Target

- Number of research projects completed

2011:0 **2012:**3 **2013:**4 **2014:**1 **2015:**0

- Number of other publications

2011:6 **2012:**6 **2013:**6 **2014:**6 **2015:**6

V(I). State Defined Outcome

O. No.	Outcome Name
1	Use of information on occupational/agricultural chemicals by Maine state toxicologists and other regulators to make decisions about safe levels of exposure to toxicants in the workplace
2	Number of state agencies and regional tourism development groups that will use research results in planning types and locations of new nature-based tourism initiatives in the northern forest region
3	Better understanding among community leaders and citizens of the dynamics of labor markets and businesses and their effects on rural communities
4	Development of models that predict how plant water use is affected by the greenhouse environment.
5	Better understaning of the ability of the land base to support specific industries or recreation opportunities; the consequences of changing preferences on the remote and rural character of communities; and the design of management and policy tools in Maine's predominantly private landscape with multiple owners.
6	Maine growers will carry more "new" and unusual" plants for their production list and share their knowledge on these plants with their customers.
7	Maine growers will have new plants bred from Maine and increase their market-share locally, regionally, and national-wide.

Outcome # 1

1. Outcome Target

Use of information on occupational/agricultural chemicals by Maine state toxicologists and other regulators to make decisions about safe levels of exposure to toxicants in the workplace

2. Outcome Type : Change in Action Outcome Measure

2011:0	**2012:**0	**2013:**0	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 723 - Hazards to Human Health and Safety

4. Associated Institute Type(s)

- 1862 Research

Outcome # 2

1. Outcome Target

Number of state agencies and regional tourism development groups that will use research results in planning types and locations of new nature-based tourism initiatives in the northern forest region

2. Outcome Type : Change in Action Outcome Measure

2011:0	**2012:**1	**2013:**0	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 134 - Outdoor Recreation
- 608 - Community Resource Planning and Development

4. Associated Institute Type(s)

- 1862 Research

Outcome # 3

1. Outcome Target

Better understanding among community leaders and citizens of the dynamics of labor markets and businesses and their effects on rural communities

2. Outcome Type : Change in Knowledge Outcome Measure

2011:0	**2012:**0	**2013:**0	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 608 - Community Resource Planning and Development

4. Associated Institute Type(s)

- 1862 Research

Outcome # 4

1. Outcome Target

Development of models that predict how plant water use is affected by the greenhouse environment.

2. Outcome Type : Change in Knowledge Outcome Measure

2011:0	**2012:**0	**2013:**0	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 102 - Soil, Plant, Water, Nutrient Relationships
- 111 - Conservation and Efficient Use of Water

4. Associated Institute Type(s)

- 1862 Research

Outcome # 5

1. Outcome Target

Better understaning of the ability of the land base to support specific industries or recreation opportunities; the consequences of changing preferences on the remote and rural character of communities; and the design of management and policy tools in Maine's predominantly private landscape with multiple owners.

2. Outcome Type : Change in Knowledge Outcome Measure

2011:0	**2012:**0	**2013:**0	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 605 - Natural Resource and Environmental Economics
- 608 - Community Resource Planning and Development

4. Associated Institute Type(s)

- 1862 Research

Outcome # 6

1. Outcome Target

Maine growers will carry more "new" and unusual" plants for their production list and share their knowledge on these plants with their customers.

2. Outcome Type : Change in Action Outcome Measure

2011:0	**2012:**0	**2013:**0	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 202 - Plant Genetic Resources
- 205 - Plant Management Systems
- 206 - Basic Plant Biology

4. Associated Institute Type(s)

- 1862 Research

Outcome # 7

1. Outcome Target

Maine growers will have new plants bred from Maine and increase their market-share locally, regionally, and national-wide.

2. Outcome Type : Change in Condition Outcome Measure

2011:0	**2012:**0	**2013:**0	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 202 - Plant Genetic Resources
- 205 - Plant Management Systems
- 206 - Basic Plant Biology

4. Associated Institute Type(s)

- 1862 Research

V(J). Planned Program (External Factors)

1. External Factors which may affect 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.)

Description

{NO DATA ENTERED}

V(K). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

Description

{NO DATA ENTERED}

2. Data Collection Methods

Description

{NO DATA ENTERED}