V(A). Planned Program (Summary)

Program # 4

1. Name of the Planned Program

Sustaining Natural Resources

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
102	Soil, Plant, Water, Nutrient Relationships			3%	
111	Conservation and Efficient Use of Water			6%	
123	Management and Sustainability of Forest Resources			12%	
131	Alternative Uses of Land			2%	
132	Weather and Climate			2%	
134	Outdoor Recreation			6%	
135	Aquatic and Terrestrial Wildlife			21%	
136	Conservation of Biological Diversity			14%	
202	Plant Genetic Resources			6%	
204	Plant Product Quality and Utility (Preharvest)			1%	
206	Basic Plant Biology			6%	
215	Biological Control of Pests Affecting Plants			6%	
301	Reproductive Performance of Animals			2%	
306	Environmental Stress in Animals			5%	
605	Natural Resource and Environmental Economics			6%	
723	Hazards to Human Health and Safety			2%	
	Total			100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2014	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	7.0	0.0
Actual Paid	0.0	0.0	8.4	0.0

Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
0	0	508897	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	949440	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	414231	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

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

2. Brief description of the target audience

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

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2014	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	0	0	0	0

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

Patent Applications Submitted

Year:	2014
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2014	Extension	Research	Total
Actual	0	41	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- # of other publications

Year	Actual
2014	10

Output #2

Output Measure

- # of websites http://www.tidalmarshbirds.org; www.vernalpools@me; http://ofpoolsandpeople.weebly.com

Year	Actual
2014	2

Output #3

Output Measure

- Gulf of Maine Bird Watch page on Facebook, which now has an international following

Year	Actual
2014	0

Output #4

Output Measure

- Extramural funds awarded to researchers in this program area:

Year	Actual
2014	2123202

Output #5

Output Measure

- Led educational field experiences on bird migration for six rural K-12 classrooms in Acadia National Park and presentation on the effects of climate change on birds to a further ten rural K-12 classrooms on the UMaine campus in Orono

Year	Actual
2014	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

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

Outcome #1

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
As Maine forest landscape continues to change in response to economic and societal expectations, it has become critical for researchers and natural resource managers to have access to the most advanced information and technologies to plan for the future. Adding further uncertainty to the future outlook for Maine?s forests is the eastern spruce budworm (SBW), a pest native to the Northeast and eastern Canada, which has historically infested these regions every 30 to 50 years, causing widespread defoliation and mortality of balsam fir and spruce trees. The last major SBW outbreak in Maine was in the 1970s.

What has been done
MAFES researchers are using time-series medium-spatial-resolution satellite imagery in combination with FIA data and spatial landscape disturbance models to predict and map the vulnerability of northern forest stands to spruce budworm defoliation.

Results
A SBW stand vulnerability map was developed under two U.S. Forest Service, Northern State Research Cooperative-funded research projects. The maps were made available to the Maine Forest Service and major forest landowners in northern Maine. The maps are being used to determine locations of high vulnerability stands where pheromone traps will be positioned all over northern and eastern Maine unorganized townships.

4. Associated Knowledge Areas

KA Code	Knowledge Area
136	Conservation of Biological Diversity

301 Reproductive Performance of Animals

Outcome #2

1. Outcome Measures

Adoption of strategies for protecting fish and wildlife habitat

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
River and stream ecosystems play a critical role in the Maine landscape as valuable habitats and fluvial connectors, linking upland watersheds with downstream aquatic and estuarine ecosystems through fluxes of water, matter, and energy. Increasingly, rivers and other aquatic ecosystems are facing pressures and threats associated with human population growth, climate changes, land development, invasive exotic species, and non-point pollution.

What has been done
In collaboration with the NSF-EPSCoR SSI program at the University of Maine, this project has examined the effects of urbanization on stream ecosystems and the potential impacts of future land use changes on small watersheds and streams in Maine.

Results
MAFES scientists developed biogeochemical indicators based on dissolved organic matter characteristics and fluorescence analysis that help to identify thresholds of impairment in streams

affected by urbanization. These indicators were compared with existing biometrics used by Maine DEP, and were found to provide a strong biogeochemical complement to those approaches. Their complementary work on modeling land use suitability sets the stage for ongoing research aimed at predicting streams and watersheds at risk of impairment from future land use changes. Our interactive land use modeling results have been made available to all interested professionals and citizens through our online website at www.mainelandusefutures,org.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
131	Alternative Uses of Land

Outcome #4

1. Outcome Measures

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

Not Reporting on this Outcome Measure

Outcome #5

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
In response to the increased traffic congestion, wildlife habitat degradation and air and noise pollution plaguing federal recreation areas due to exponential growth in visitation, many recreation areas have begun implementing alternative transportation systems, primarily in the

form of transit buses. The federal government allocated 1.2 billion dollars for transit planning and implementation over the last five years alone, however, the majority of this funding was swallowed up in capital costs, leaving a small portion for research. As a result, transit systems are rapidly popping up across recreation lands, yet no formal performance-measurement system currently exists for evaluating the effectiveness of transit. Without a standardized system for quantifying system performance, transit systems may fail to fulfill their destiny as transportation solutions for recreation managers, but rather lead to more inefficient and unsustainable transportation.

What has been done
Building on transit performance-measuring in traditional urban settings, MAFES researchers are investigating transit performance-measures, given the inherent differences in federal land management agency missions, visitor motivation and expectation associated with transportation for leisure purposes.

Results
Based on their findings, MAFES researchers created a technical report, which has been made available to transit managers, natural resource managers, and policymakers. The report examines transit indicators used by different natural resources agencies such as the National Park service, Forest Service, and US Fish and Wildlife Service and suggests a means to improve the development of monitoring key indicators.

4. Associated Knowledge Areas

KA Code	Knowledge Area
134	Outdoor Recreation
136	Conservation of Biological Diversity
206	Basic Plant Biology

Outcome #6

1. Outcome Measures

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

Not Reporting on this Outcome Measure

Outcome #7

1. Outcome Measures

Improve knowledge of ways to protect wildlife habitat

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The single defining challenge to our modern biological resources is one of rapid landscape evolution. To manage these impacts and make informed choices concerning the tradeoffs between biological conservation, economic prosperity, and the Maine way(s) of life, we need to understand what species and communities are most at risk to different disturbances.

What has been done
MAFES scientists censused the tidal marsh bird and plant communities from Maine to Virginia for the second bird breeding season following the passage of Hurricane Sandy.

Results
The scientists have proofed these data and begun analysis to describe the sensitivity of the community to large storm events. The data showed that marsh specialists are more sensitive than generalists. The researchers presented this information at three professional meeting (one scientific, one applied, and one with stakeholders at the Region 5 office of USFWS).

4. Associated Knowledge Areas

KA Code	Knowledge Area
131	Alternative Uses of Land
132	Weather and Climate
135	Aquatic and Terrestrial Wildlife
136	Conservation of Biological Diversity

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Evaluations are currently conducted at the project and program levels. At the project level, all projects are reviewed by an internal research council and external peer reviewers when initiated and again at completion by the research council. During the research council final evaluation, the focus is on determining if terminating projects met their stated objectives, secured extramural funding, and produced peer-reviewed publications. For FY14, 3 projects went through the review process in this program area. As for other measures of successful research programs, faculty in this program area published 41 peer-reviewed articles and secured more than $2,123,202 in extramural funding. Researchers use a variety of methods to evaluate their own research projects including evaluations retrospectively, before-after, and during the life of the project; case studies; and comparisons between treatment/intervention and nontreatment/nonintervention.
At the program level, external NIFA review teams are asked to review the research programs of schools/departments. These teams provide input on the impact and productivity of research programs supported through the station. The station is working to develop a standard program-level evaluation process, which will be used to evaluate each station program area. Our current plans include an approach based on use of expert panels as recommended by the federal Government Accounting Office with individual program evaluations occurring every four to five years on a staggered time table.

Key Items of Evaluation

For FY14, 3 projects went through the review process in this program area. As for other measures of successful research programs, faculty in this program area published 41 peer-reviewed articles and secured more than $2,123,202 in extramural funding.