

V(A). Planned Program (Summary)

Program # 4

1. Name of the Planned Program

Climate Change and Ecosystem Management

Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
101	Appraisal of Soil Resources	10%		10%	
122	Management and Control of Forest and Range Fires	10%		0%	
123	Management and Sustainability of Forest Resources	0%		70%	
132	Weather and Climate	70%		20%	
605	Natural Resource and Environmental Economics	10%		0%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2016	Extension		Research	
	1862	1890	1862	1890
Plan	1.0	0.0	5.0	0.0
Actual Paid	0.4	0.0	1.7	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
23234	0	174789	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
25417	0	238463	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
119435	0	19107	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Research documented weather factors and agricultural land characterization including soils and crop types. High latitude soil research centered on the evaluation of the relationship between local climate and soil carbon balance. Research, education and outreach activities included geographic information systems, maps and spatial data sets, and climate change adaptation as it relates to communities.

2. Brief description of the target audience

The target audience included producers and consumers, communities and small business entrepreneurs, individuals and groups concerned about the quality of the Alaska environment, public resource agencies, public and private resource managers, other faculty and researchers, and undergraduate and graduate students. Efforts were directed toward environmentally and economically sustainable development and conservation of our natural resources for the benefit all citizens to help them adapt and become resilient as the climate changes. Advisors and the target audience included various forestry organizations, USDA Natural Resource Conservation Service, the Alaska Department of Natural Resources, borough governments and Alaska Native corporations.

3. How was eXtension used?

Increased use of eXtension resources in FY16 has been valuable to Extension outreach in Alaska. Two agents continued as members of the Extension Disaster Education Network Delegates community. A program assistant had membership in the Extension Wildfire Information Network and the Climate, Forests and Woodlands. The access to Qualtrics provided through eXtension increased the online survey skills of the program assistant working on the Renewable Resources Extension Act and allowed for gathering input from stakeholders on their views of state priorities on issues like ensuring a healthy ecosystem and the effects of climate variability on resource management.

V(E). Planned Program (Outputs)

1. Standard output measures

2016	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	842	17765	192	935

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

Patent Applications Submitted

Year: 2016
 Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2016	Extension	Research	Total
Actual	0	1	1

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Output 1. Soils research will concentrate on the classification of permafrost soils, soil carbon properties in relation to climate change and soil disturbance dynamics in upland and lowland forest ecosystems. Publications and presentations are output measures.

Year	Actual
2016	10

Output #2

Output Measure

- Output 2. Long-term forest productivity data sets will be converted to formats compatible with existing megadata systems for compatibility with long-term ecological research, fire management and forest disturbance dynamics. Outputs measured will be publications and data sets converted.
Not reporting on this Output for this Annual Report

Output #3

Output Measure

- Output 3. Development of data sets providing information on wildlife and domestic (traditional and alternative) livestock impact on rangelands will continue. Output measures will be data sets developed and publications.
Not reporting on this Output for this Annual Report

Output #4

Output Measure

- Output 4. Curricula that train future and present land managers in ecosystem stability and geospatial technology will be developed and implemented. Output measure will be curricula implemented and updated.

Year	Actual
2016	9

Output #5

Output Measure

- Output 5. Research related to product development to include timber products and nontimber products including energy will continue. Forest management specific to fuel/energy demand will be initiated. Measurable outputs will be publications and presentations.

Year	Actual
2016	4

Output #6

Output Measure

- Output 6. Recreation opportunities are important in urban and rural forests and are a part of ecosystem services. Recreation management in northern ecosystems is a part of management of ecosystems research. Measurable outputs are publications and presentations.

Year	Actual
2016	5

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Outcome 1. Increase knowledge of arctic and subarctic soils and forest productivity among peer scientists, managers and governments. Knowledge outcome measures will be publications, conferences and workshops.
2	Outcome 2. Increase animal producer and wildlife manager knowledge on range use and animal impact. Measurable outcomes are publications, workshops and conferences.
3	Outcome 3. Increase knowledge through classroom and field course delivery. The outcome measures will be curricula delivered and number of students reached.
4	Outcome 4. Increase community and individual knowledge on the impact of climate change in northern ecosystems and effects on cultural lifeways, economies and individual well-being. Outcome measures will be publications, workshops and conferences.
5	Outcome 5. Provide research information that leads to product development and recreational opportunities. Outcome measures will be publications, conferences and workshops.

Outcome #1

1. Outcome Measures

Outcome 1. Increase knowledge of arctic and subarctic soils and forest productivity among peer scientists, managers and governments. Knowledge outcome measures will be publications, conferences and workshops.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	7

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Climate warming is projected to continue. The Alaska Public Lands Information Centers notes that permafrost can be found in various thicknesses in up to eighty-five percent of Alaska's surface. Also making Alaska's soils complex are multiple historically active volcanoes. Soil warmth, moisture and stability will impact agriculture, homeowners and forest land managers. Basic research provides information about weather, soil nutrients, moisture stress and insect predation.

What has been done

Researchers have collected data on permafrost, volcanic and farmed soils. Climate parameters have been collected from NOAA, and databases have been maintained on the Arctic Long Term Ecological Research website. The weather station at the Matanuska Experiment Farm has collected National Weather Service data since 1917, providing the longest available weather record from a single location in Alaska. A soils researcher was an author on a February 2016 paper on soil fertility after volcanic eruption on Alaskan's Aleutian islands, an August 2016 paper on technologies for scanning frozen soils, and was interviewed for an article on permafrost carbon published in CSA news, a crop and soil science magazine.

Results

Instruction on soils has led to increased dissemination of the soils research. There were 24 students enrolled in the Alaska soil geography field trip one-credit class in later summer 2015, and four enrolled in a special topics class on volcanic ash-derived soils in 2016. A documentary on arctic soils that was filmed in FY15 related to the field trip has been shown to limited audiences and is planned for release on public television in 2017. The researcher leading the classes also contributed to the Northern Circumpolar Soil Carbon Database. Another researcher gave a tour of the Georgeson Botanical Garden to the Pacific Northwest Soil Science Society

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources
132	Weather and Climate

Outcome #2

1. Outcome Measures

Outcome 2. Increase animal producer and wildlife manager knowledge on range use and animal impact. Measurable outcomes are publications, workshops and conferences.

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

Outcome 3. Increase knowledge through classroom and field course delivery. The outcome measures will be curricula delivered and number of students reached.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	207

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Nationwide, there is an increased interest in local and sustainable production and interdisciplinary approaches to managing ecosystems and combatting the effects of climate change. Alaska is a great natural classroom and attracts students who love the outdoors. To reverse the effects of man-made climate change it is essential to educate youth to care for the environment.

What has been done

Researchers teach a wide variety of classes for the natural resource majors and minors that include instruction on issues of climate change, ecology and sustainable management of resources. SNRE introduced a new sustainable agriculture minor in 2016. Two of the required classes are NRM 101, Natural Resources Conservation and Policy and NRM 210, Principles of Sustainable Agriculture. Students also need a class on natural resource economics and must

complete three additional classes from a list that includes introductory plant and animal science, soils and the environment, environmental ethics and environmental decision making.

Results

In FY16, there were 61 students in NRM 101, and 21 students in NRM 201. There were 31 students in NRM 111, an introduction to sustainability science. There were 18 students in NRM 277, an introduction to conservation biology that covered ecological developments and the status of important habitats and endangered species. There were 7 students in NRM 375, natural resource ecology. There were 32 students in NRM 403 on environmental decision making. Twenty-four students received credit for a soil geography field trip, NRM 489/689 and five students were enrolled in NRM 480, a class on soil management for quality and conservation.

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources
123	Management and Sustainability of Forest Resources
132	Weather and Climate
605	Natural Resource and Environmental Economics

Outcome #4

1. Outcome Measures

Outcome 4. Increase community and individual knowledge on the impact of climate change in northern ecosystems and effects on cultural lifeways, economies and individual well-being. Outcome measures will be publications, workshops and conferences.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	22

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Over the past 50 years, Alaska has warmed at over twice the rate of the rest of the United States. Alaska continues to see hundreds of wildfires each summer that result in millions of acres burned. Alaska has also seen substantial flooding in populated areas, and the state experiences earthquakes on a frequent basis. As the climate warms, Alaska's coastlines recede and

permafrost melts. Extreme weather events may increase in both frequency and severity, hence a need for continuing emergency and disaster preparedness training for the public to mitigate potential damages to property and life.

What has been done

Twenty-two workshops covered topics like emergency cooking, food safety in an emergency, emergency energy, wildfire defensible space and emergency preparation at both the individual and community levels. Extension kept abreast of research-based best practices through its relationship with the Extension Disaster Education Network. The energy specialist raised awareness of 85 people with a presentation on climate change in Alaska at the Extension Climate Science Conference.

Results

Extension personnel across program areas helped Alaskans plan for the aftermath of extreme weather events such as floods and fires with research-based information to help people prepare for emergencies. AFES maintained important community connections. A researcher has been the director of Alaska Center for Climate Assessment and Policy since 2006, director of the Alaska Fire Science Consortium since 2009, and is the stakeholder liaison for the Scenarios Network for Alaska and Arctic Planning.

4. Associated Knowledge Areas

KA Code	Knowledge Area
122	Management and Control of Forest and Range Fires
123	Management and Sustainability of Forest Resources
132	Weather and Climate

Outcome #5

1. Outcome Measures

Outcome 5. Provide research information that leads to product development and recreational opportunities. Outcome measures will be publications, conferences and workshops.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	7

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

In Alaska, federal agencies control 65% of the land. It is necessary for the Bureau of Land Management (BLM) to assess user demand for and satisfaction with recreation areas. However, without the necessary staffing and expertise in survey methodologies, data collection will be difficult. Developing partnerships can augment federal capacity to assess recreational opportunities and challenges.

What has been done

SNRE partnered with the BLM, National Park Service, Fish and Wildlife Service, and Forest Service on a collaborative visitor transportation project. Surveyors trained by SNRE collected 3,039 surveys and the results can be used to refine the methodology for other states interested in surveying land use. The researcher is partnering with colleagues at Arizona State and Colorado Mesa University to develop a research center that can lead more survey efforts for the BLM. A pilot project was set up with colleagues at the University of Montana.

Results

The BLM has benefitted from the researcher's work developing and disseminating surveys of land use for over a decade. A project report was submitted to the National Park Service regarding the recreation study that assessed characteristics of recreation trips in the Interior. Presentations were also made at a multistate annual meeting, to Bureau of Land Management personnel in Washington D.C. In addition to promoting recreation, AFES researchers continued to investigate the best ways to manage Alaska's natural resources and published papers in FY16 on products including sablefish, grouse, and the trapping industry..

4. Associated Knowledge Areas

KA Code	Knowledge Area
605	Natural Resource and Environmental Economics

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

Alaska has been severely impacted by the falling price of crude oil. The university is funded largely through the state legislature, and UAF has experienced several consecutive years of reductions. Almost half of SNRE funding comes from the state. The overall university budget gap of \$20 million in FY16 dramatically affected programs. In FY16 the university president called for a freeze on all unnecessary travel and hiring. The faculty member studying the effects of climate change on arctic soils retired in FY16 and no replacement is planned. .

V(I). Planned Program (Evaluation Studies)

Evaluation Results

A program assistant with the Renewable Resources Extension Act (RREA) surveyed stakeholders about how they would rank the importance of cross-cutting issues, including invasive species, urbanization, wetlands, wildlife and fisheries, and rangeland services. Results will assist Extension in setting goals and prioritizing efforts to ensure healthy ecosystems in Alaska. The 35 respondents included federal and state agency partners, tribal organizations, private landowners, natural resource professionals, and natural resource users.

Key Items of Evaluation

SNRE continued to show excellent engagement with the public. Agents conducted needs assessments to gather stakeholder input and incorporated the results into program planning.