V(A). Planned Program (Summary)

Program # 4

1. Name of the Planned Program

Climate Change

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
101	Appraisal of Soil Resources	10%		50%	
132	Weather and Climate	10%		50%	
807	Disaster Preparedness, Mitigation, Response, and Recovery	80%		0%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	1.0	0.0	4.0	0.0
Actual Paid	0.7	0.0	0.2	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
9802	0	38799	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
8124	0	9768	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

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 focused on climate change adaptation as it relates to communities, including emergency preparedness in the face of extreme weather events.

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 to help all citizens adapt and become resilient as the climate changes. Advisors and the target audience included various emergency planning organizations, USDA Natural Resource Conservation Service, the Alaska Department of Natural Resources, borough governments and Alaska Native corporations.

3. How was eXtension used?

The use of eXtension resources in FY18 has been valuable to Extension outreach in Alaska. Three agents were members of the Extension Disaster Education Network Delegates Community of Practice (CoP). Another agent was a member of the Climate, Forests and Woodlands CoP.

V(E). Planned Program (Outputs)

1. Standard output measures

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	512	0	244	0

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

Patent Applications Submitted

Year:	2018
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Output 1. Soils research will concentrate on the 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
2018	3

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.

Year	Actual
2018	1

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
2018	6

Output #5

Output Measure

- Output 5. Research providing base line data for modeling timber availability will continue. Forest management specific to fuel/energy demand drives the research. Measurable outputs will be publications and presentations.
  Not reporting on this Output for this Annual Report

Output #6

Output Measure

- Output 6. Recreation opportunities are important in urban and rural forests. Recreation

management in Alaska are primarily tied to national and state parks and forest. Measurable outputs are publications and presentations.

Year	Actual
2018	8

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 knowledge through classroom and field course delivery. The outcome measures will be curricula delivered and number of students reached.
3	Outcome 3. Respond to community and individual knowledge needs 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.
4	Outcome Measure #4: Demonstrate effective collaboration between research and Extension to resolve issues.

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
2018	2

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Water quality is increasingly threatened as human populations grow, industrial and agricultural activities expand, and climate change threatens to significantly alter water flow and distribution. With climate change deteriorating Alaska's ice and permafrost, soil and groundwater contamination is emerging as a great concern. Non-Newtonian fluids, or those with non-constant viscosity, present a possible avenue for better addressing soil contaminants. However, the flow of such fluids like Guar gum solution has not been well studied in cold temperatures.

What has been done

Viscosity differences and other characteristics of various concentrations of Guar gum and Xantham gum were tested at five different temperatures. Equipment including an OFITE model 900 viscometer and Tantec contact angle meter were used to record changes. Based on initial results, three temperatures were chosen to study flow characteristics of both Newtonian and non-Newtonian fluids, and those flow experiments are in progress.

Results

Interdisciplinary collaboration and sharing of results with the winder scientific community will better inform soil remediation efforts. In terms of viscosity change, Xantham gum was found to be more insensitive to temperature than Guar gum. Progress and results were presented to audiences at a university Water and Environmental Research Center seminar and an American Geophysical Union fall meeting. A graduate student in Geological Engineering is producing a thesis from this project.

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 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
2018	153

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 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 FY18, there were 33 students in NRM 101, and 21 students in NRM 210. There were 12 students in NRM 111, an introduction to sustainability science. There were 15 students in NRM 277, an introduction to conservation biology that covered ecological developments and the status of important habitats and endangered species. There were 22 students in NRM 375, natural resource ecology. There were 28 students in NRM 403 on environmental decision making. Five students completed NRM 595 on signs of arctic change. Seven students completed NRM 647 on global to local sustainability, and 10 students completed NRM 697 on resilience and citizen science. One student was recognized for a dean's choice award for a research poster on changes to shrub cover and consequences for wildlife. Another student completed their dissertation on

arctic transitions and sustainability modeling.

4. Associated Knowledge Areas

KA Code	Knowledge Area
132	Weather and Climate

Outcome #3

1. Outcome Measures

Outcome 3. Respond to community and individual knowledge needs 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
2018	5

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

Extension kept abreast of research-based best practices through its relationship with the Extension Disaster Education Network. 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. Another researcher has taken on grant work to create climate change educator trainings in Alaska.

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. A publication on how to prepare and respond to a natural disaster in Alaska saw 95 new downloads in FY18. The energy specialist maintained a blog that addresses issues like climigration and energy effects on climate, and helped communities better connect with their Local Emergency Planning Committees. Workshops covered topics like emergency energy, emergency food, and disaster preparation for seniors.

4. Associated Knowledge Areas

KA Code	Knowledge Area
132	Weather and Climate
807	Disaster Preparedness, Mitigation, Response, and Recovery

Outcome #4

1. Outcome Measures

Outcome Measure #4: Demonstrate effective collaboration between research and Extension to resolve issues.

Not Reporting on this Outcome Measure

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Public Policy changes
- Government Regulations
- Competing Public priorities

Brief Explanation

Alaska continues to be severely impacted by the falling price of crude oil. The state provides a significant portion of the university's funds, and the university has experienced several consecutive years of reductions. About 40 percent of SNRE funding comes from the state. Between 2014 and 2018, the university system's budget dropped from $378 million to $317 million. SNRE, in particular, has faced difficulties with the combination of budget cuts and fixed-cost increases.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Attendees were surveyed at a two-part training on climate change education. The morning session covered climate change basics and asked respondents use a retrospective pre-post instrument to rate their knowledge of climate change in Alaska before and after the session. Three of the 11 respondents indicated a change in knowledge; the majority of respondents already had a basic understanding of climate change and were interested in networking. Comments on how they planned to use the information included facilitating dialogue with skeptics and highlighting scenario planning. The afternoon session covered

communicating about climate change efforts. Of the nine respondents, five who did not previously have an elevator pitch about climate change agreed they had one after the workshop, and three improved their confidence about getting others involved in climate change efforts.

Public feedback was collected at three fairs to assess the general interest of adults in receiving more forestry-related information from Extension. Of the 61 adult responses, the majority (40) indicated an interest in foraging information, such as how to identify and harvest berries or mushrooms from local forests. The next most popular topic was climate, with 27 respondents indicating an interest in learning the effects of climate change on Alaska's forests. Thirty-three respondents indicated they had not previously used Extension to gather forest-related information, with many noting that they either had not heard of Extension or did not know it was a resource for forestry information. While 14 were not interested in a future forestry workshop or training, 36 did indicate they would be interested in expanding their general knowledge about forestry, such as judging the health of trees. Feedback included "great service" and "additional public information about wildfire prevention would benefit Alaskans."

Key Items of Evaluation

Climate change is affecting Alaska's forest health and wildfire risk. Members of the public have indicated an interest in receiving more information about climate change effects from Extension and research. Grassroots efforts to increase climate literacy are gaining momentum.