V(A). Planned Program (Summary)

Program # 6

1. Name of the Planned Program

Sustainable Energy

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
123	Management and Sustainability of Forest Resources	20%		0%	
125	Agroforestry	20%		0%	
131	Alternative Uses of Land	20%		0%	
205	Plant Management Systems	40%		50%	
511	New and Improved Non-Food Products and Processes	0%		50%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2014	Extension		Research	
	1862	1890	1862	1890
Plan	1.0	0.0	2.1	0.0
Actual Paid	1.7	0.0	0.3	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
65185	0	0	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
30482	0	8044	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
212682	0	7861	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

AFES researchers will concentrate primarily on yield potential of lignocellulosic crops and woody biomass and oilseed crops. If successful, this research will lead to development of "best practices" management regimes and genetics of bioenergy crops. In the future, we intend to conduct research in remote locations in Alaska to determine the feasibility of various crops in small villages where people often have little experience in agriculture. For this purpose, we will concentrate on crops likely to be successful in these situations, especially woody crops that will require little agricultural knowledge and simple technology.

AFES researchers are continuing to work on the utilization of low value biomass for fuels and chemicals, mostly through thermochemical means (gasification, pyrolysis, supercritical fluids). The chemical composition of alder, birch, hemlock, yellow cedar, Sitka spruce, red cedar, white spruce and aspen will be evaluated for biofuel production via supercritical liquefaction. CES is working with communities on the use of biomass products and with producers to develop value-added forest products.

AFES/CES researchers will seek to assimilate all existing information on the total forest and crop biomass available in Alaska into one database, and determine the gaps in the database and the information needed to fill the gaps,and the biological, physical, and economic feasibility of using Alaska biomass as biofuels.

CES and AFES outreach will include working with communities and organizations regarding the use of biomass and with producers interested in biomass production.

2. Brief description of the target audience

The target audience includes producers and consumers, communities, agriculture and forestry businesses, industry leaders, 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. Our efforts will be directed toward environmentally and economically sustainable development and conservation of our natural resources that will benefit all citizens and help them adapt and become resilient as the climate changes. Advisors and the target audience include State Board of Forestry, Society of American Foresters, Alaska Farm Bureau, and the Alaska Northern Forest Cooperative. Specifically, this program will provide new information on soil properties and classification to the USDA Natural Resource Conservation Service, the USDA Forest Service, the Alaska Department of Natural Resources, borough governments, and Alaska Native corporations. Information on impact of fires on soil organic matter will assist the Department of Natural Resources Division of Forestry and private landowners and managers.

3. How was eXtension used?

Forestry specialist developed content for the Climate, Forests and Woodlands Community of Practice.

V(E). Planned Program (Outputs)

1. Standard output measures

2014	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	709	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	2	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Output 1: Workshops, demonstrations, short courses, classes, field days and conferences organized and conducted.

Year	Actual
2014	20

Output #2

Output Measure

- Output 2: Bioenergy crop varieties tested.
  Not reporting on this Output for this Annual Report

Output #3

Output Measure

- Output 3: Bioenergy research projects conducted.

Year	Actual
2014	1

Output #4

Output Measure

- Output 4: Bioenergy crop and technology publications submitted.

Year	Actual
2014	0

Output #5

Output Measure

- Output 5: Community, organizations and one-on-one consultation concerning bio-based energy opportunities conducted.

Year	Actual
2014	20

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Outcome 1: Identify crops suitable for sustainable production of bio-based energy in Alaska.
2	Outcome 2: Identify new value-added by-products from bio-based energy crops and woody species.
3	Outcome 3: Compile a forestry biomass database.
4	Outcome 4: Monitor adoption of bioenergy technologies.
5	Outcome 5: Increase community awareness about the use of biomass.

Outcome #1

1. Outcome Measures

Outcome 1: Identify crops suitable for sustainable production of bio-based energy in Alaska.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Wood-fired biomass boilers are being put into municipal buildings in villages for heat and power, often saving those villages, organizations and school systems significant amounts of money spent on fuel oil. Local resources are necessary, which means that trees are being cut. A sustainable supply of biomass is needed as well as a fast-growing biomass crop that can be easily planted in the forest. Fast growing poplar can be cut on a 5- to 10-year (or less) rotation and they coppice (root sprout) after being cut. These sprouts will be the future crop.

What has been done
A team from AFES, CES and the Department of Natural Resources collected and stored poplar whips in 2014 for the second year of stooling bed research aimed at biomass utilization. In June, they soaked them in water for 4-7 days and then planted them in Palmer and Delta on previously logged state lands. They also planted some at the UAF research farms in Delta and Palmer. They also acquired 500 hybrid poplar from Canada and 200 natural balsam poplar from Alberta, which they planted and documented as a potential biomass source.

Results
This second year of the stooling bed project was more successful than 2013, when many cuttings died because of drought conditions. In 2014, researchers returned to the sites where poplar whips were planted to assess the results. The hybrid poplar and the poplar from Alberta had the greatest growth, surpassing the native trees. Researchers feel more research is needed to create an Alaska hybrid from balsam poplar trees in Canada and Alaska. With temperature zones shifting northward a quarter mile a year, researchers will have to look at species from lower latitudes. That's why Alberta trees are being studied in Alaska.

4. Associated Knowledge Areas

KA Code	Knowledge Area
125	Agroforestry
131	Alternative Uses of Land
205	Plant Management Systems

Outcome #2

1. Outcome Measures

Outcome 2: Identify new value-added by-products from bio-based energy crops and woody species.

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

Outcome 3: Compile a forestry biomass database.

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

Outcome 4: Monitor adoption of bioenergy technologies.

Not Reporting on this Outcome Measure

Outcome #5

1. Outcome Measures

Outcome 5: Increase community awareness about the use of biomass.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	131

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Energy costs remain high, particularly in rural communities. Biomass can offer a lower-cost source of heat in areas where the forest supply is plentiful. These communities want to know that their local resource can sustain harvest, be renewable, provide wildlife habitat, recreation and access to other resources and be compatible with their local lifestyles and traditions.

What has been done
CES coordinated the 2014 Alaska Wood Energy Conference, which included information about biomass, including woody biomass research, community evaluation of biomass options, barriers to biomass project development and new technologies. Participants included community officials considering wood heating options, individuals selling biomass product and others who were in the market for them. Forty participants toured a wood pellet mill in North Pole before the conference. A forester has also made many presentations and workshops to communities and public entities about biomass options.

Results
The conference was attended by 131 technical providers, facility managers, foresters and community leaders. The conference was essentially a professional development training but public awareness and interest increased as a result of media coverage. Participants who filled out evaluations cited the session content and networking as their top reasons for attending, and the "most useful" sessions, included presentations on biomass pellet use, forestry practices to produce fuel and economics of biomass projects. The conference evaluations also provided suggested topics for the next conference, in 2016. Conference and workshop presentation outreach has been well attended by stakeholders interested in biomass heat and power options, and now they are able to discuss the topic more knowledgeably with others in their communities.

4. Associated Knowledge Areas

KA Code	Knowledge Area
123	Management and Sustainability of Forest Resources
125	Agroforestry
511	New and Improved Non-Food Products and Processes

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.)

Brief Explanation

Less than average moisture has stressed trees, which have become susceptible to insect infestation. An increased number of wildfires have also reduced the biomass harvest in some areas of the state. Interest in the use of biomass to heat public facilities has increased, but falling oil prices have made biomass a less attractive option.

The production of oil has decreased, the price of oil has fallen and the calculation of oil revenues to the state has changed, creating funding stream losses that are negatively affecting higher education. Until revenues are replaced, research support through the state will be less than previously enjoyed.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Wood energy conference participants who filled out evaluations cited the session content and networking as their top reasons for attending and the "most useful" sessions included presentations on biomass pellet use, forestry practices to produce fuel and economics of biomass projects. The conference evaluations also provided suggested topics for the next conference, in 2016.

Key Items of Evaluation