Management of Ecosystems- AFES

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V(A). Planned Program (Summary)

1. Name of the Planned Program

Management of Ecosystems- AFES

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
121	Management of Range Resources	0%		10%	
122	Management and Control of Forest and Range Fires	0%		20%	
123	Management and Sustainability of Forest Resources	0%		25%	
131	Alternative Uses of Land	0%		10%	
132	Weather and Climate	0%		15%	
136	Conservation of Biological Diversity	0%		20%	
	Total	0%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of professional FTE/SYs expended this Program

Year: 2008	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	3.6	0.0
Actual	0.0	0.0	4.6	0.0

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

Extension		Research	
Smith-Lever 3b & 3c 0	1890 Extension 0	Hatch 150772	Evans-Allen 0
1862 Matching 0	1890 Matching 0	1862 Matching 154964	1890 Matching 0
1862 All Other 0	1890 All Other 0	1862 All Other 552018	1890 All Other 0

V(D). Planned Program (Activity)

1. Brief description of the Activity

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Forest Stand Characterization and Growth and Yield for the Alaska Northern Forest.

The forest survey and the consequent forest inventory database enables quantification of forest resources in interior Alaska, the knowledge of which is important for social and economic development of Alaska, especially for rural communities. The database also is vital to many natural resource studies in Alaska, such as forest growth and yield, forest management, biomass, agroforestry, mined land reclamation, and fuelwood. Study on large wildland fire suppression expenditures has revealed that federal wildfire suppression expenditures are substantially influenced by private properties within or near the fire perimeter. The results are especially important for fire managers and legislators to adjust current fire fighting policies in order to reduce the skyrocketing suppression expenditures. Study on forest management policies has improved our knowledge on the decision-making in forestry and relevant subjects. This research shows the pros and cons of some existing forest management policies, and explores how to improve these policies to accommodate our needs of renewable energy, and sustainable, diverse, and healthy forest ecosystems.

L**ong-term Ecosystem monitoring and GIS Modeling of the Taiga Forest Dynamics.**

Progress was accomplished on four primary projects during 2008. First, significant progress on establishment of the snowmelt removal studies was accomplished. Treatment structures in all of the upland sites have been constructed. The first year of treatment was initiated, this fall 2008, at the same time the summer throughfall removal treatment was packed away for the winter. The set-up and take-down of the two treatments will be dovetailed for the next five years. This will lead to a detailed understanding of ecosystem dynamics that are tied to the timing of precipitation in the boreal forest. The treatments for the floodplain sites were started but not completed. These will be finished in the current summer (2009) and put in place starting in the fall of 2009. Second, field work on a foliage sampling project was finished. This work was set up to look at the effects of fertilization, and drought treatment on the foliage chemistry on the successional sequence of forest ecosystems in both upland and floodplain landscape positions. The laboratory analysis on the foliage chemistry is currently in progress. The green foliage will be analyzed for C, N, P, K, Ca, and Mg. This will be directly comparable to samples collected in 1990, 1991, 1992 and 1994. Third, the long-term forest growth monitoring program, started in 1968, and tied to a number of thinning and fertilization treatments in white spruce (Picea glauca), aspen (Populus tremuloides) and birch (Betula neoalaskana) stands in a variety of age classes within interior Alaska was continued. This monitoring is being used to address long term impacts of thinning and fertilization treatments within climate change on the growth of trees in stands of various age classes. Four, annual sampling of the log decomposition monitoring was accomplished. All data being collected from these projects will be entered into the BNZ-LTER data catalog.

Evapotranspiration from Boreal Forest Landscapes in Alaska

The outputs of this project continue to include: data, models, and analysis. Lake level data and pan evaporation data were collected for the 2008 summer period. In addition, another set of winter lake level measurements were obtained. The data and preliminary analysis continue to be shared with the State of Alaska Dept. of Natural Resources, the U.S. Natural Resources Conservation Service (NRCS), the Salcha-Delta Soil & Water Conservation District, and the Alaska Dept. of Fish & Game. In May of 2008 a continuous, self-running powerpoint show was shown at the Harding Lake landowner's association annual meeting. On December 2, 2008 representatives of the aforementioned agencies and the Harding Lake Association met with researchers to discuss the status and outlook on lake level recovery. A poster presentation on this aspect of the project has been accepted for the American Water Resources Association Spring Specialty Conference, to be held in Anchorage, AK in May 2009. A model of Harding Lake was used to estimate undocumented contributions of Rogge Creek to the lake in the 1980's. The model was tested against the 5-year lake level measurement data, including periods with and without contributions from Rogge Creek. These results will be useful to Alaska Dept. of Fish & Game who will manage the lake level for pike habitat. One undergraduate Senior Thesis research project was completed this past year.

Climate sensitivity affecting tree growth and ecosystem change:

Forest growth was measured and monitored at Bonanza Creek Long Term Ecological Research site (BNZ LTER) in central Alaska in 6 large (1 or 2 hectare) plots representing 3 forest types (white spruce, aspen, Alaska birch) including an example of mature and of young post-fire regenerating forest of each type. A wave of tree mortality and forest health problems, above the levels of tree death typical of the second half of the 20th century (the period of most observation and records in boreal Alaska) was previously documented in BNZ LTER. The evidence at the Caribou Crossing Research Natural Area (CBX) is consistent with recent forest decline as well. In the Yukon Gulch old-growth white spruce plot at CBX, 18% of the trees alive at the start of monitoring in 1986 died by 2008. A notable number of the largest trees on the plot died and snapped as the result of wood decay in the center of the lower stem. Most of the major factors that it appears were responsible for the high tree mortality, including temperature-induced moisture stress, beetle outbreaks (which inoculate trees with wood-rotting fungi), and snow breakage of tree crowns are either triggered or intensified by warm temperatures. However, summer weather in 2008 provided significant relief from stress generated by recent warmth. Cool July and August temperatures and persistent rain allowed height growth of post-fire (1983) white spruce at RSW plot in BNZ to reach the highest levels in the 21-yr. record. Essentially, at RSW the severe reduction of growth caused by extreme warmth from 2004 through 2007 was overcome and the increase in growth rate expected in young, rapidly-expanding trees was resumed. The termination of recent high temperature stress by cooler weather in 2008 also may have averted an additional wave of accelerated tree death. A large hatch of spruce budworms appeared in early summer 2008, but as predicted by the temperature model, the outbreak collapsed. Heavy budworm defoliation in 2008 would have been the 3rd successive year, and likely would have caused severe reduction in growth and tree survival. Our analysis of the control of climate over growth of floodplain trees has demonstrated that precipitation explains a significant amount of the residual of the variability in growth not explained by temperature alone. This is the first time that precipitation has been shown to have strong predictive value of growth in Alaska boreal trees, but it is a secondary or supplemental effect. Along the Kuskokwim River black and white spruce tree growth is well-predicted by climate.

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Absolute rates of mature white spruce growth on the Kuskokwim floodplain is greatest yet measured north of the Alaska Range on a sustained basis. In inland parts of the Kuskokwim watershed, black and white spruce grow least in warm summers and best in cool summers, similar to high-temperature drought stress documented elsewhere in boreal Alaska. In stands located closest to the Bering Sea coast where summers are cooler, tree growth is greatest in warm summers and least in cool summers. Further climate warming will very likely decrease spruce growth in the inland stands and possibly cause increased rates of tree death, while increasing tree growth in the smaller area of coastward stands. Photo monitoring of forest development at BNZ since the 1983 fire suggests that the lateral expansion of white spruce crowns may be an important factor in obtaining an advantage over competing broadleaf trees and shrubs.

2. Brief description of the target audience

The target audiences include producers and consumers of agricultural and forestry products, including communities and small business entrepreneurs, users of land and water resources, individuals and groups concerned about the quality of the Alaska environment, and public resource agencies. Our efforts will be directed toward environmentally and economically sustainable development and conservation of our natural resources that will benefit all citizens. In 2005, we met with the following stakeholders to discuss research priorities for this program:

- Statewide Board of Advisors
- Alaska Forest Association
- Society of American Foresters
- Alaska Farm Bureau
- Alaska Northern Forest Cooperative

From annual reports:

Evapotranspiration: State of Alaska Dept. of Natural Resources, the U.S. Natural Resources Conservation Service (NRCS), Salcha-Delta Soil & Water Conservation District, Alaska Dept. of Fish & Game, Harding Lake Watershed Association, and the Harding Lake landowners association. Forest managers and researchers; Students and educators; Federal, state, and local government agencies; Private landowners; Indigenous people organizations.: High School Summer Research Internship Program (HSSRIP) of the BNZ LTER and the Experimental Program to Stimulate Competitive Research (EPSCoR); UNCF (United Negro College Fund) SEED (Student Excellence Equals Degree) project. Led a summer class of 30 students and 8 instructors from 6 historically black colleges for a 2-day field measurement exercise at Bonanza Creek LTER monitoring plots and UAF Smith Lake Arboretum; conducted a training session for resource management and information staff of Kenai Fiords National Park, April 22; presented a training session for Alaska National Wildlife Refuge Alaska Rural Information Technicians (RIT); RITs are made up of mostly Alaska Natives working in 100 of Alaska's 300 villages and are considered elders in their communities. They also represent the USFWS as tribal meetings and communicate wildlife information to village leaders; field trip to BNZ LTER for Luis Tupas, National Program Leader for Global and Climate Change USDA-CSREES and Diana Jerkins, National Program Leader, Competitive Programs, USDA liaison officers for state Agricultural and Forestry Experiment Stations; Evening Public Lecture, Alaska Public Lands Information Center, August 07, Fairbanks, AK. ; National Association of State Wetlands Managers. ; State Legislature - briefings of 2 members; Alaska Board of Forestry; News Media; Science News, Reuters News Service, ClimateWire, National Public Radio; : These projects are designed for development of basic knowledge on the functioning of boreal forests in interior Alaska. As a result the target audiences are primarily other research folks, and eventually forest managers that will be trying to design management alternatives that will be tied to the changing climate in interior Alaska.

Forest Stand and Yield:
Climate sensitivity
LTER

V(E). Planned Program (Outputs)

1. Standard output measures

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

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	**Target**	**Target**	**Target**	**Target**
Plan	350	2000	0	0
2008	350	2000	0	0

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

Patent Applications Submitted

Year	**Target**
Plan:	0

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2008: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

	Extension	Research	Total
Plan	0	35	
2008	0	22	22

V(F). State Defined Outputs

Output Target
Output #1

Output Measure
Identify agricultural and forestry management practices that minimize environmental risks
Not reporting on this Output in this Annual Report

Output #2

Output Measure
Models developed

Year	Target	Actual
2008	0	0

Output #3

Output Measure
Databases for land resources planning, policy, and law as it relates to human activity and annual updates for tourism.
Not reporting on this Output in this Annual Report

Output #4

Output Measure
Developed a predictive index for severity of budworm population increases based on temperature.

Year	Target	Actual
2008	{No Data Entered}	1

Output #5

Output Measure
Students and interns who were exposed to ecosystems management issues.

Year	Target	Actual
2008	{No Data Entered}	44

V(G). State Defined Outcomes

O No.	Outcome Name
1	Changes in land-use patterns that will support sustainable development
2	Adoption of models for ecosystem management.
3	Regulatory agency and private sector adoption of soil and wetlands criteria for Alaska
4	Reduce instances of surface water contamination related to resource development
5	Adoption of criteria for effective conflict resolution

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Outcome #1

1. Outcome Measures

Not reporting on this Outcome for this Annual Report

2. Associated Institution Types

3a. Outcome Type:

3b. Quantitative Outcome

Year	Quantitative Target	Actual

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area

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

Brief Explanation

Climate change continues to be an external factor which requires research as well as the economy. When fuel oil costs $8.00 a gallon in rural towns and village resource management becomes even more essential.

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

1. Evaluation Studies Planned

Before-After (before and after program)
During (during program)

Evaluation Results

Key Items of Evaluation