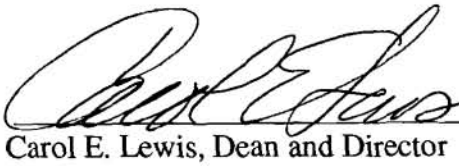
# AREERA PLAN OF WORK

# ANNUAL REPORT OF ACCOMPLISHMENTS AND RESULTS

## Agricultural and Forestry Experiment Station
## University of Alaska Fairbanks

**Submitted to:** United States Department of Agriculture Cooperative State Research, Extension and Education Service

**Certified by:**  3-28-07

Carol E. Lewis, Dean and Director — Date

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**Overview:** The University of Alaska Fairbanks' School of Natural Resources and Agricultural Sciences (SNRAS), Agricultural and Forestry Experiment Station (AFES), and Cooperative Extension Service

(Extension) are dedicated to providing research, education and outreach relevant to the sustainable development and use of Alaska's natural resources. We excel at helping the people of Alaska and the circumpolar north develop new economic opportunities and improve their quality of life. Certain general characteristics of the natural resource scene have to be recognized in planning a program of research and outreach in Alaska. Alaska is culturally diverse, with Alaska Native communities following traditional ways of life virtually side by side with modern sophisticated urban centers. Management and development of the natural resources of Alaska historically and presently have supported and stabilized the state's economy. Alaska is both productive and diverse for its northern location with extensive petroleum, mineral, land, forest, and fishery resources. However, the economy has demonstrated very little value-added activity or any type of sustained economic activity. This has resulted in a seemingly never ending series of boom and bust cycles.

The Agricultural and Forestry Experiment Station is the research arm of SNRAS. It is imbedded within the School and is a part of its research, education, and outreach activities. The School and Experiment Station (SNRAS/AFES) operate major facilities in Fairbanks and Palmer, research sites at Delta Junction, Nome, and Bonanza Creek and manage research projects located throughout Alaska. SNRAS/AFES is organized into four departments: Forest Sciences, Geography, Plant, Animal, and Soil Sciences, and Resources Management.

Growers in the agricultural sector produce products primarily for in-state consumption including fresh market potatoes and vegetables, forages, grains, and other livestock feeds, greenhouse vegetables, flowers and ornamentals, and a variety of niche market crops. The latter include berries, reindeer products, and native plant materials.

The Agricultural and Forestry Experiment Station is a leader in maintaining the sustainability of the use development of agricultural, forestry, and other natural resources in the state of Alaska. These efforts are jointly funded by federal formula funds, state matching funds, and other state, federal, and private sector funds. The report that follows summarizes the accomplishments of SNRAS/AFES in terms of outcomes and impacts to our stakeholders.

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# GOAL 1: Enhance Economic Opportunities for Agricultural Producers

Since 1975, the Alaskan economy has been dominated by activities related to development and production of oil. Other resources contributing to lesser degrees are fisheries, mining, tourism, timber, and agriculture. As oil production approaches its finite limits, economic diversification is becoming an ever-increasing necessity for both the public and private sectors. Alaska's location relative to the Pacific Rim and Asian markets makes export of agricultural and forest products of significant interest; however, currently there is little infrastructure in place for exporting Alaska agricultural products. Growers in the agricultural sector produce products primarily for on-state consumption and use including fresh market potatoes and vegetables, forages and grain, other livestock feeds, greenhouse flower, ornamentals, and vegetable and a variety of "niche" market crops. Animal enterprises include dairy, beef, reindeer, and alternative game animals such as bison, muskox, and elk.

**PLANNED PROGRAM: <u>High Latitude Agriculture</u>**

**Knowledge Areas:**
203 Plant Biological Efficiency and Abiotic Stresses Affecting Plant Growth
204 Plant Product Quality and Utility (Preharvest)
205 Plant Management Systems
301 Reproductive Performance of Animal
404 Instrumentation and Control Systems
302 Nutrient Utilization in Animals
307 Animal Management Systems
501 New and Improved Food Processing Technologies
502 New and Improved Food Products
601 Economics of Agricultural Production and Farm Management

Innovative Use of Natural and Supplemental Light for High Latitude Crop Production

Alaska's position at northern latitudes results in extreme temperatures and light fluctuations. The amount, the type or quality, and the length of light during a day are essential components for plant productivity and crop yield. Controlled environment production systems and technologies offer diverse opportunities to extend the growing season, increase productivity, improve quality, and allow local production of previously considered unfeasible crops.

**ALK 00-09** (KA 205) Impact: Light conditions are fundamental to plant growth and crop productivity. Technical, yet simple, modifications to traditional greenhouse and controlled environment production systems can significantly improve and provide for increased crop returns. For instance, combining and adapting long and short days to specific stages of development can produce highly desirable plants and crops. Information generated in this project on expected crop response, development and production efficiency from various types of light sources is implemented in the planning and running of a local geothermally heated and powered greenhouse. On the basis of our findings, perlite is now regularly used including in the Scandinavian countries, to produce short high quality lettuce, tomato and cucumber seedlings intended for greenhouse and field crop production. As rate of development and plant morphology are highly dependent on light, knowing amount and type of available light provides local producers with opportunities to exactly forecast crop progression and schedule crops for timely harvest.

Source of Federal Funds: Hatch General and Hatch Multistate
Scope of Impact: Multistate

Controlled Environment Production of Small Fruits, Berries, Floral Crops, and Greenhouse Adapted Food Crops

Raspberries have been found especially well suited for controlled environment production. To produce fresh raspberries continuously year round, cultivar types, management techniques, crop physiology, plant morphology and the biennial growth cycle need to be thoroughly understood. Advanced controlled environment production systems and technologies offer diverse opportunities to extend the growing season, increase productivity, improve quality and allow local production of earlier considered unfeasible crops. Although the emphasis initially will be on small fruits and berries, opportunities to develop controlled environment management procedures for crops such as salad greens and ornamental floral plants will be considered. The rapidly growing horticulture and landscape industries have extensive needs for year-round training. A properly designed modern controlled environment facility provides exceptional possibilities to meet these needs through education and demonstration of advanced production techniques to various cliental groups, students and the public.

**ALK 03-13** (KA 203, 204, 205, 601) Impact: Environment Production Controlled systems provide opportunities to meet year-round demand for locally produced perishable high quality fresh market berries, vegetable and floral crops in areas with inclement climatic conditions. The results recorded in this project show crop and quality advantages of high tunnels and low-tech greenhouses for intense field production, sequential multiple cropping and extension of the growing season. Exceptionally high quality raspberries are now produced locally in containers throughout the summer season using high tunnels or greenhouses. Recent advances using geothermal and waste energy for heating and electricity make year round fresh market greenhouse production realistic and reasonable.

Source of Federal Funds: Hatch General and Hatch Multistate
USDA Special Grants
Scope of Impact: Multistate

Horticultural Crop Production for Alaska

After five years, peonies have been successfully grown as cut flowers, and West Coast wholesale flower distributors have indicated a willingness to buy Alaska cut flowers. The top cultivars for yield and quality were Alexander Fleming, Felix Crouse, David Harum, Duchess de Nemours and Sarah Bernhardt. Disease and pest problems included western flower thrips, lygus bugs, birch aphids, and powdery mildew. Plant evaluations at the Georgeson Botanical garden included 1000 woody perennials, herbaceous perennials, annual flowers, herbs and vegetables.

**ALK-01-11** (KA 205) Impact: Twelve commercial businesses have planted trial plots of peonies for field cut flower production. More than 30 growers are exploring the potential for field grown cut flowers in Alaska. The tomato field experiment was requested by TerraCopia Inc (UT). The vegetable research is designed for small market gardeners and homeowners. It provides comparative trial information that is useful in developing regional truck farms and expanding produce choices as farmers' markets. The annual and perennial flower trials research is used by seed companies, nurseries, growers, landscapers, and home gardeners. They use it to identify hardy perennials, disease resistant annual flowers for home and commercial production. Specific trial information was requested by Johnny's Selected Seeds (ME), Territorial Seeds (OR), Pan American and Ball Seed Co.(IL), and Goldsmith Seeds (CA). Five undergraduate students completed internships in horticulture during the past year.

Source of Federal Funding: Hatch General
USDA Special Grant
Scope of Impact: Alaska Specific

Cultivar Selection, Production Methods, and Market Quality of Vegetables

**ALK 01-02** (KA 204,205,212) Impact: Salad greens are a wonderful crop suitable for most climates in Alaska, and related nutrient information is of value to home gardeners and commercial growers. Both cooked and salad greens are a good source of minerals in the human diet, though few differences in mineral levels were found between types. The information on white mold can lead to decreased crop loss at harvest.

Source of Federal Funds: Hatch General
USDA Special Grants
Scope of Impacts: Alaska Specific

Alaskan Berries: Potential New Products and New Markets

**ALK 06-10** (KA 205) Impact: Alaskan grown crops are high in antioxidants exceeding levels of crops found at lower latitudes. Alaska wild-harvested berries, and potentially cultivated berry and non-berry crops, show a great deal of promise as the base for production of neutraceuticals and pharmaceuticals. We hope to encourage this developing industry through the establishment of a team of investigators who are now in place. The agricultural team will study production methods for controlled environment and cultivated field production for berry crops. The chemistry team has begun identifying specific chemicals in Alaska bog blueberries. They then track the paths these chemicals take to the brain and the targets in the brain that allow them to take action on the causes of a spectrum of diseases. The particular interest at this time is Alzheimer's disease. In June, 2006 our private industry partner, Denali Biotechnologies, L.C.C. opened a demonstration facility in Kenai, Alaska. This is a model, for technology transfer to Alaska communities, for the production of encapsulated neutraceuticals. The Alaska Blueberry Growers Association reported approximately 120 people attended informational meetings about ranching or blueberry farms. And they were able to provide plants or cuttings to 76 interested growers.

Source of Federal Funds: USDA Special Grant
Scope of Impact: Alaska Specific

Management Practices for Forage and Turfgrass at Northern Latitudes

**ALK-02-05** (KA 205,203) The winter of 2005-2006 marks the fifth overwintering evaluation of turfgrass cultivars. Since 2001, we have tested 39 turfgrass cultivars at the Matanuska Experiment Farm. . The 2006 season was the final evaluation of the sand-based green variety trials that were established in 2001. At the Matanuska Farm location, cultivars showing superior survival, early greenup, and overall quality through the 2005 season included Nugget Kentucky bluegrass, 18thGreen and Penn G-6 creeping bentgrasses, Velvet bentgrass, and Laser roughstalk bluegrass. Similarly, at the on-site research green at Settler's Bay Golf Course, 18th Green and Penn G-6 creeping bentgrass along with Velvet bentgrass (SRO7200) have consistently shown best overall quality and early greenup. New cultivars tested beginning in 2004 included Northstar and Avalanche. In an evaluation in late June 2006, Northstar was judged equal to Nugget in winter survival and overall quality, color, and texture. While promising, additional years of evaluation will be required. In 2006 we added Denali Kentucky bluegrass and Greuning alpine bluegrass (Poa alpina) to the fairway trials.

Impact: Information generated by this project is being utilized by golf course superintendents to change their turf management practices. Golf course superintendents at Settler's Bay and Palmer Fishhook golf courses will seed their greens to Penn G-6 and 18th Green, respectively. We expect other courses in southcentral Alaska to follow. Alaska Mill and Feed, which is the largest marketer of grass seed in Alaska, has followed our research and is marketing cultivars that do well in our research plots. In view of the large number of Alaskans that utilize turfgrass for home and recreation, the research will impact a large population over the next few years.

Source of Federal Funds: Hatch General
USDA Special Grants
Scope of Impact: Alaska Specific

Cicer Milkvetch, Forage Galega, and Lupinaster Clover as Potential Forage Crops for Alaska

**ALK-02-01** (KA 203, 204) Impact: Conventional forage legumes in the southern 49 states (i.e. alfalfa) do not produce well in Interior Alaska because of lack of sufficient winterhardiness and, in some cases, low survival in acidic soils. Cicer milkvetch is a long-lived, rhizomatous high quality forage and is currently being utilized in British Columbia in regions where alfalfa production and feeding (bloating) is problematic. This project will provide farmers in central Alaska with expanded options by providing information about management of new legume forage crops.

Source of Federal Funds: Hatch General
Scope of Impact: Alaska Specific

Selection, Variety Testing, and Evaluation of Cultural Practices for Alternative Agronomic Crops in Alaska

**ALK-02-06** (KA203) Impact: This study is a continuing collection of information that provides yearly updates on new and better adapted crop varieties, the response of agronomic crops to dryland farming conditions, and provides a database for local producers to determine the economic viability for those crops. Future studies of the effects of irrigation on these agronomic crops will broaden this information database.

Source of Federal Funds: Hatch General
Scope of Impact: Alaska Specific

Alaska Seed Growers' Assistance Program

The Alaska Seed Grower's Assistance Program is intended to coordinate seed production between producers and users. This work is a spin off of USDA-CSREES Special Grants Program.
This will be done through specification development, user education and producer education by means of written documents and one-on-one farm assistance. The ultimate goal is efficient native seed production that meets demand in a balanced fashion. Demand will be encouraged through education, demonstration and specification.

**ALK 03-11** (KA205, 512) Education and extension during 2006 was widespread. Fifteen plant flyers detailing the use and cultivation of Alaska native plant seeds were published to the Alaska Plant Materials Center (PMC) website and disseminated to hundreds of potential growers (http://www.dnr.state.ak.us/ag/ag_pmc.htm). The rough draft for the Interactive Revegetation Manual for Alaska is in evaluation mode with a web designer. Educational presentations on recent developments in seed production in Alaska were given at many Alaskan locations. Questions were answered for hundreds of people on topics such as invasive weeds, revegetation needs, specific plant growth protocols, and identification of unusual plants. The Alaska Seed Growers List-Serve was maintained and information disseminated throughout 2006. In order to allow Alaska native seed producers to meet Alaska's seed demands it is essential that weeds be controlled to provide enhanced stand longevity as well as improved seed production.

Impact: Alaska native seed growers benefit from this project economically by learning which native plants are needed for commercial projects and how to produce them - thus growers can practically plan for the future. By growing native plants which can out-compete invasive, non-native weeds, Alaska will be fulfilling a national mandate to revegetate with native plants. The educational component of this project reaches throughout Alaska, supporting companies, agencies, and individuals in their capacity to

make a difference in the environment. During 2006, 16 new publications were produced and viewed by hundreds of native plant seed growers and suppliers. The total publications for this project are 42.

Source of Federal Funds: USDA Special Grant
Scope of Impact: Alaska Specific

Alaska Ethnobotany Project

**ALK 04-11/05-05** (KA 610) Impact: The Alaska Ethnobotany Project is assisting in state management of its land for non-timber forest products. The appropriate balance is being sought between subsistence, personal, and commercial uses of these products, as residents of Alaska from a variety of perspectives, ethnicities, and backgrounds share these resources and each is allowed access under the State constitution. With new commercial markets opening up in the State for these products, an understanding of the plant or fungus' biological and ecological response to harvest, social and cultural importance, and existing laws and regulations governing them must be acquired. The Alaska Ethnobotany Project intends to assist the State as it develops responsible management of its ethnobotanically important non-timber forest products and to positively impact the associated regulations guiding their permitted harvest for commercial us

Source of Federal Funds: USDA Special Grant
Scope of Impact: Alaska Specific

Reproductive Performance in Domestic Ruminants

Domestic livestock, both dairy and meat animals, continue to account for the highest cash receipts (excluding aquaculture); however, alternative species are making headway among producers. Research within AFES has largely centered on alternative livestock species such as reindeer, muskox, and bison in direct response to requests by the livestock producers of Alaska. The objectives of this project are to determine means of improving reproductive management of domestic and alternative ruminant livestock both on-farms and the Experiment Station. The Experiment Station owns a small reindeer herd and has access to other reindeer and muskox at the Institute of Arctic Biology Large Animal Research Unit. Traditional livestock operations are addressed through extension demonstration, on-farm research, and one-on-one consultation with producers.

**ALK-00-01, W-112** (KA 301) Research objectives were to increase understanding of reproductive biology of high latitude ruminant species and to determine means of improving reproductive management of domestic ruminants on farms in Alaska. Research efforts involved cattle, reindeer and muskoxen. Research efforts during this time period accomplished 6 research studies concerning reproductive management of musk ox and 11 research studies concerning reproductive management of reindeer. Also during this time period, research associated with this project had resulted in two Master of Science Thesis for which the PI served as Chair, one book chapter, 11 peer reviewed journal articles (one submitted), eight peer reviewed scientific abstracts, four extension or lay press articles (one in press) and numerous scientific and extension meeting presentations.

Impact: Successful reproduction in herds of ruminant animals produced on farms in Alaska is paramount for the establishment of livestock production in the north and the economic viability and sustainability of Alaska livestock production enterprises. Results of these studies demonstrate the effectiveness of reproductive management technologies and techniques that can be used to improve reproductive efficiency on Alaskan livestock farms and ranches. Demonstrating the effectiveness of applying reproductive management techniques to diversified livestock provides the farmer low-cost tools without risking private stock. Not all technologies translate equally well from traditional livestock to more exotic species and our ability to identify those that are effective under Alaska conditions enhances the producers

ability to maximize productivity, and hence profits. The market value of the offspring (~$5000/muskox; $1500/reindeer) is a significant portion of the income generated by the Alaskan diversified livestock industry. Synchronizing and timing estrus results in highly synchronized, predictable calving, thereby reducing costly labor and maximizing calf survival. Enhanced understanding of reproductive biology and reproductive management of reindeer and musk ox will enhance the productive capacity of these animals and the sustainability of enterprises producing these northern latitude adapted species in Alaska.

Source of Federal Funds: Hatch General and Hatch Multistate
USDA Special Grants
Scope of Impact: Multistate

Spatially Modeling the Distribution of Beef Cattle and Reindeer on Ranges at High Latitudes

Alaska imports more than 90 percent of its food supply, including most red meat. With the current market structure, imported food is generally less expensive than Alaskan-grown food. This is principally caused by a lack of marketing and distribution infrastructures since existing ranching enterprises cannot support processing, distribution, and marketing investments. Much effort and research is currently being devoted to increasing production of meat animals, thereby stimulating economic development in Alaska.

**ALK-03-03** (KA 205, 512) This is the fourth year of our five-year study. We continued with our series of visual observations of the UAF beef cattle herd located at the Matanuska Experiment Farm outside of Palmer, Alaska.

Impact: Using the results of our research, Alaskan livestock producers will be able to better predict optimum areas for animal activities, thereby making their operations more efficient and profitable. Land managers will also be able to predict animal distribution patterns to better prepare for mitigation of the adverse effects of animal use on certain areas on the landscape.

Source of Federal Funds: Hatch General
Scope of Impact: Alaska Specific

Feed and Forage to Optimize Reindeer Production and Meat Quality

**ALK-04-07** (KA 302) Impact: The supplementary use of pasture in an intensive reindeer feeding regime reduces consumption of a milled ration by 38% using Smooth bromegrass and 34 % by using Kentucky Nugget Bluegrass as the forage source. Animal performance, measured as feed efficiency was better using Kentucky Nugget Bluegrass. Reindeer producers now can evaluate the cost/benefit of developing pastures to supplement the feeding of reindeer in an intensively managed operation.

Source of Federal Funds: Hatch General
USDA Special Grant
Scope of Impact: Alaska Specific

Mineral Flux in Reindeer Animal Health

**ALK-03-07** (KA 302) Impact: Nutritional requirements of reindeer vary seasonally and the composition of a summer diet needed to support growth and lactation should contain relatively high crude protein and mineral concentrations. Soybean meal or fishmeal represents supplements that are commonly added to milled reindeer rations to increase protein concentration. The bioavailability of Cu and Zn found in the two protein sources were found to be high and very similar. Both protein sources can be incorporated into reindeer diets with the additional benefit of providing a source of digestible trace minerals to promote good animal health.

Source of Federal Funds: Hatch, Animal Health
Scope of Impact: Alaska Specific
New Crops and Livestock Opportunities V

**ALK 04-10** (KA 204, 205, 301, 502, 503) Impact: UAF is in the forefront of endocrinology in northern ruminants .For the first time leptin was characterized in REINDEER and muskoxen using a ruminant specific assay. Hormones link nutrition and reproductive events, and understanding seasonal patterns is critical to efficient management. Buyers at the wholesale markets in Los Angeles and San Francisco are willing to purchase Alaska PEONIES at $1.25 per stem and will pay shipping costs. More than 20 people attended the first meeting of Alaska Peony Growers in Fairbanks, and another 10 listened by phone. Two growers, in Homer and in Fairbanks, have 3000 and 2000 peonies planted, respectively. Other attendees had fields of 25 to 250 plants. A Blog was developed to enhance communication among growers. IRRIGATION: Information will help farmers in Alaska determine agronomic and economic feasibility of irrigating their crops and will help researchers and extension agents develop recommendations on good management practices in interior Alaska. This was the first region-wide tree-ring and climate study of any species conducted in SE Alaska. A status review would now conclude that YELLOW-CEDAR is not endangered. Managers now know where the species can be grown and sustained as a crop and the levels of risk throughout its distribution. CANOLA has the potential to become an important rotational crop in interior Alaska. A small processing plant is being established to process canola oilseed into biodiesel as a direct result of this New Crops project. It is expected that this crop will become a significant crop with ready markets in Alaska.

Source of Federal Funding: USDA Special Grant
Scope of Impact: Alaska Specific

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**Expenditures:**

| | |
|---|---|
| Hatch General: | $616,160 |
| Hatch Multistate: | $ 57,342 |
| Hatch Animal Health | $ 3,481 |
| McIntire-Stennis: | $0 |
| State Match: | $582,747 |
| Total FTE (SY): | 5.0 |

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# GOAL 2: Support Increased Economic Opportunities and Improver Quality of Life in Rural America

**Overview:**
Alaska faces many choices, challenges and problems in the use of its natural resources. As with most western states, the relatively large land areas controlled by federal agencies, land use decisions are largely

out of state and private industry control. Lands now owned by the state of Alaska and Alaska Native corporations were selected to provide an economic base of support for the population and economy of the state. The sustained productivity of this land base will remain a priority issue in Alaska's public policy. Both the people of Alaska and the United States as a whole have set high standards for the management of the state's resources, as reflected in strong cultural and emotional attachment to the land, national and international media interest, and strict adherence to state and federal laws. Research at the Agricultural and Forestry Experiment Station under Goal 4 in the last five year cycle has centered on opportunities to properly manage resources for long term sustainability requires the development and application of knowledge for resource development in an economically and environmentally protective manner. A significant portion of SNRAS/AFES research and education efforts are directed toward environmental issues raised by conflicts among multiple users, nonrenewable resource development, renewable resource production, and economic and environmental sustainability. Hatch and McIntire-Stennis projects under this goal address these issues.

**Knowledge Areas**
608 Community Resources Planning and Development
610 Domestic Policy Analysis
903 Communication, Education, and Information Delivery

## PLANNED PROGRAM: Natural Resource Use and Allocation

Innovative Methods of Involving the Public in Environmental Decisions

**ALK 02-07** (KA 602, 610, 803) In the past ten years, as geographic information systems (GIS) became more affordable and user-friendly; their use in less affluent communities has increased worldwide. Citizen activists, grassroots organizations and others are using GIS and other mapping techniques for individual and community empowerment and sustainability initiatives. The purpose of this study is to evaluate the extent to which one type of community mapping empowers citizens to take an active role.

Impact: Global interest in sustainable communities has mushroomed in recent years. From the tropics to the Arctic, communities are looking for ways to live in greater harmony with the world around them. If community mapping is as powerful as its proponents claim, it is a process that the rest of the world should know about-and it is one that should be backed up by more than just anecdotal evidence. If, on the other hand, the claims for Green Mapping are not supported by empirical evidence, that information also is important.

Source of Federal Funds: Hatch General
Scope of Impact: Alaska Specific

When Laws Affecting the Environment Conflict: Focus on Public Lands

**ALK 05-01** (KA 610) We have conducted an examination of whether the State of Alaska intensive management statute conflicts with the National Park Services wildlife management criteria as established by Congress in the Park Service Organic Act and the Alaska National Interest Lands Conservation Act. Through an analysis of the applicable statutes and case law such a conflict has come to light.

Impact: The work related to the Park Service should be of interest to Park Service land managers in Alaska who would like to avoid running afoul of the law and risking expensive and time consuming legal challenges. This analysis may also be of interest to Park Service managers in other states faced with

similar state statutes and should provide federal land managers with a clearer understanding of their duties and responsibilities and provide state managers with a better understanding of the laws that constrain their federal counterparts.

Source of Federal Funds: Hatch General
Scope of Impact: Alaska Specific

**Expenditures:**

| | |
|---|---|
| Hatch General: | $ 39,812 |
| Hatch Multistate: | $39,023 |
| McIntire-Stennis: | $0 |
| State Matching: | $125,390 |
| FTE (SY) | 1.7 |

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# GOAL 3: Enhance Protection and Safety of the Nations Agriculture and Food Supply

**Knowledge Areas:**
204 Plant Product Quality and Utility (Preharvest)
212 Pathogens and Nematodes Affecting Plants

**PLANNED PROGRAM: High Latitude Agriculture**

Production Practices, Cultivars, and Disease of Potato and Other Horticultural Crops

**ALK-01-09** (KA 204, 212, 123) Potato, well adapted to generally cool conditions, constitutes an important part of the commercial vegetable industry in Alaska. To remain competitive, potato growers need to enhance productivity and quality while maintaining or reducing the cost of production. Alaska potato and vegetable growers have identified plant pests as the most important deterrents to increasing profits in recent years. In 2005, after a five-year absence, late blight again infested a number of grower fields in southcentral Alaska. Identification of disease resistant varieties, pest monitoring, weed control, integrated pest management, and biological control methods are the primary avenues of investigation being pursued by Alaska horticulture and plant pathology researchers.

Impact: Potatoes are a nutritious crop to be included in the Alaska diet. Planting more seed tubers per acre was associated with increased marketable yields per acre for the commercial varieties evaluated. Flame weeding did reduce yields a bit but may still offer a viable weed control strategy to the organic growers in the state. A potato demonstration day was held to show the many varieties available to growers and industry buyers. There was significant interest in the heirloom and uniquely colored potatoes

Source of Federal Funds: Hatch General
USDA Special Grants
Scope of Impacts: Alaska Specific

**Expenditures:**

| | |
|---|---|
| Hatch General: | $ 9,180 |
| Hatch Multistate: | $0 |
| McIntire-Stennis: | $0 |
| State Matching: | $ 10,971 |
| FTE (SY) | 0.5 |

# GOAL 5: Protect and Enhance the Nation's Natural Resource Base and Environment

**Knowledge Areas:**
102 Soil, Plant, Water, Nutrient Relationships
104 Protect Soil from Harmful Effects of Natural Elements
112 Watershed Protection and Management
122 Management and Control of Forest and Range Fires
123 Management and Sustainability of Forest Resources
125 Agroforestry
132 Weather and Climate
403 Waste Disposal, recycling, and Reuse

**PLANNED PROGRAM: Management of Ecosystems**

Alaskans live in an environment, the circumpolar north that is unlike any other in the United States, with unique features such as permafrost, the boreal forest, and continuous summer daylight alternating with sustained winter darkness. Alaska's resources must be properly managed and cared for in order for its people to survive socially and economically, and for the long-term health of its living systems. The soils, forests, tundra, grasslands, and animals of Alaska have long been valued by its people. They have either lived close to these resources for many generations, or who face the need to adapt to a changing environment. Alaska's resources offer many opportunities, but also many natural limitations that must be known and respected if they are to be developed successfully, and in a way that can be sustained over the long term. AFES will play a pivotal role in teaching and providing information about management of Alaskan and northern ecosystems. Management of the boreal and southeast Alaska forests will play an increasing role in fire disturbance and adaptation to climate change. Their understory and tree species will be instrumental in providing market products developed from ethnic botanicals. Recreation opportunities will continue to be attractive for tourists and residents providing business opportunities for Alaskans but also requiring a closer attention to ecosystem management. Communities will increasingly depend on Alaska's natural resources for viable economic development to sustain their communities and promote family wellbeing. Policy to sustain this growth that mirrors sociological and technological change will be critical.

Forest Stand Characterization and Growth and Yield for Alaskan Northern Forest

**ALK-03-12** (KA 123,125) Credible data and information are critical requirements for responsible forest management decision-making and financial investment. Much growth and yield data, currently available, are suspect, inadequate, or insufficiently precise. Goals are to quantify tree fiber production of Alaskan

Northern Forest lands and to provide resource managers with appropriate equations, tables, and graphs essential for basic, state-of-the-art forest resource management decision-making and stand prescriptions.

Impact: Alaska Northern Forest Cooperative is benefiting owners and managers through dialogue, collaboration, and the CD research compendium. 2006 workshop addressed birch growth and uses of the tree species. SITE INDEX curves are used to assess forest land productivity to better manage forests, e.g., compare land for fiber production & investment purposes, prepare stand prescriptions for habitat, & carbon sequestration. LOGS plantations relate empirical height/diameter to trees/acre; thus, help managers make cost effective prescriptions for planting, natural regeneration, and spacing; PSPs provide fiber yield, data on stand composition, structure, and succession for management and ecological modeling. Accurate cubic-foot TREE VOLUME EQUATIONS are critical tools for predicting stand volume (total & commercial), biomass, standing fuel, and carbon sequestration. Use of small trees and slash for FOREST RESOURCE MANAGEMENT COMMUNITY TYPES will standardize land classification and prescription development and improvement forest resource management, reduce critical mistakes, and improve economic decision-making. Soils information complements the community type data set and identifies soils limiting factors and treatment hazards. Both soils and community types expand the ecologic knowledge of the Northern Forest FOREST VEGETATION SIMULATOR is an important management tool in modeling growth and changes to forests both natural and after treatment.
Source of Federal Funds: McIntire-Stennis
USDA Special Grants
Scope of Impact: Alaska Specific

University of Alaska Southeast Forest Products Program

**ALK 02 –08** (KA 123,125,403) Work commenced summer of 2006 on the Birch Physical/Mechanical and Birch Bark projects. Sites for collecting birch trees were keyed to information from the AFES growth and yield sites which have been monitored for as long as 20 years. We chose 4 sites around the greater Fairbanks area and 4 sites in the Wasilla area and 30 ft tree logs were shipped to Ketchikan Wood Tech Center where the physical and mechanical properties will be determined. Bark was shipped to University of Minnesota, Duluth for chemical analysis and work has begun to characterize and measure the chemical content.

Impact: We predict that lumber from Alaska birch will be stronger and clearer than birch found in the lower 48, and will therefore be more valuable. Preliminary results have demonstrated that Alaska birch tree bark compared to lower 48 trees has a higher content of betulin and betulinic acid, compounds that have anti-HIV and anti-cancer properties. There are many other nutraceutical, pharmaceutical and cosmetic applications which represent potential for new products from Alaska utilizing birch wood and bark. Subjective data have been collected on local response to small scale nontimber forest products (NTFP) harvesting. This indicates that small scale commercial harvesting has social and economic impact similar to subsistence harvesting. Non-timber forest products are important to timber managers because they could influence the survival and growth of commercially valuable trees. Management decisions for timber can also influence production of potential non-timber forest products. The emerging NTFP industry is critical to rural economic development in small remote communities in Southeast Alaska. Value added products such as tea, health and beauty aids, and food sources are still an underdeveloped commodity in southeast Alaska. This project will help facilitate the continued success of local businesses which contribute to the social capitol of small communities.

Sources of Funding: USDA Special Grant
Scope of Impact: Multistate

Black Spruce Forest Soils in Boreal Regions of Alaska: Their Characterization, Organic Carbon Pool and Relationship to Forest Management

Very little information exists regarding the characteristics of soils associated with black spruce and a great need exists for a soils information baseline for modeling climate change, boreal forest management, and future soil inventory. An understanding of black spruce dominated sites is important for both ecological modeling and for land management.

**ALK-03-02** (KA 123, 125) The physical environment and properties of soils formed under black spruce in the boreal region of Alaska was investigated. The study sites were selected to be associated with existing Permanent Sampling Plots and the Site Index Plots of the on-going Growth & Yield Program so the results of both studies can be tied together. A total of 33 soil pits were sampled since the beginning of the project. The black spruce plots, thus soils study sites, are on nearly all segment of the landform including ridge top, shoulder slope, back slope, footslope and flood plains with drainage from somewhat excessive to poorly. The slope ranges from steep to level.

Impact: This study found that black spruce grows on almost all landforms in interior Alaska and on soils with a wide range of properties. Volcanic ash has been newly recognized as a result of this study as a critical element in maintaining forest productivity on eastern Tanana Valley uplands, because this ash layer holds more available water than underlying sand. We also found that charcoal and charred material resulting from forest fire often leads to overestimation of soil organic matter and yields a wide carbon-to-nitrogen ratio. This leads to overestimation of nitrogen need to the ecosystem. The soil properties investigated here will be used to interpret the factors affecting the forest growth and yield and also help to establish forest management guidelines.

Source of Federal Funds: Hatch General,
USDA-NRCS, and NSF
Scope of Impact: Multistate

Soil Carbon Balance and Nitrogen Dynamics Following Disturbance by Wildfire and Logging in Interior Alaskan Forests

Because boreal forest soils constitute a huge reservoir of carbon, a clearer understanding of the responses of boreal forest soil respiration to disturbance will be critical to successfully assessing its likely future role in atmospheric carbon balance. The expanding role of forestry in Alaska and in the circumpolar north requires a clearer understanding of the responses of boreal forest floor microbial dynamics to disturbance is a key to sustaining productivity over the long term.

**ALK 01-07** (KA 102,104, 122, 123) The objective of this project is to examine the impacts on soil respiration and nutrient dynamics of two disturbance agents in interior Alaskan forests: fire, currently the dominant stand-initiating disturbance, and logging, currently of minor import by any measure (but potentially growing). The project began in the summer of 2001. In previous reports, we summarized several lines of evidence suggesting that: 1.post-fire heterotrophic respiration declines relative to pre-fire conditions; 2.changes in forest floor chemistry are not responsible for the declines in heterotrophic respiration; 3.loss of root turnover (production and senescence of fine roots) appears to be the major cause of the decline in heterotrophic respiration.

Impact: Attention increasingly is being focused on finding ways to sequester carbon to offset anthropogenic carbon emissions. Boreal forest soils are one potential locus of carbon sequestration, but also, as currently very large reservoirs of carbon, represent a very large risk of potential carbon source to the atmosphere under changing conditions. This program of research has constrained the likely post-fire response of carbon emissions by showing that fire does not cause accelerated decomposition and C emissions in boreal forests, and indeed slows rates of C release from soils relative to unburned forests.

Using Remote Sensing to Investigate Landscape Fire Interactions in Boreal Forest Dynamics

**ALK 05-03** (KA 122) Based on previous research supported by USDA funding, the Normalized Burn Ratio (NBR) was one of the most accurate of 13 remotely sensed indices tested for mapping burn severity in the Alaskan boreal forest. The correlations between a field-based Composite Burn Index (CBI) exceeded 0.70 for several burns from wildfires in 1999 and 2001 (published in 2005 Remote Sensing of Environment 96:328-339.) Suprisingly, when NBR was tested within black spruce forests that had been burned in 2004, there were poor correlations between NBR and field-based CBI. Because 2004 was an extreme drought year and our samples were restricted to highly flamable black spruce stands, most of our plots had high burn severity (CBI value greater than 2.0).

Impact: The Normalize Burn Ratio (NBR) is being applied routinely by the USGS to map burn severity in Alaska National Parks and National Wildlife Refuges throughout Alaska. Our research shows that this remotely sensed index is correlated with field-based CBI across a broad range of burn severities, including unburned plots. The NBR was only weakly correlated with field-based CBI from plots measured in 2005. This was most likely due to the extreme drought of 2004 creating extreme fire conditions and concentrating the burn severity of most of our plots to severe to very severe burn severity classes. The post-fire depth of organic soil is an important control on potential soil erosion and sedimentation, regeneration of important moose browse species such as Salix/Populus, and regeneration of highly-flammable black spruce stands versus lower flammability broadleaf stands. Our research shows that it is possible to map post-fire organic soil depth using the remotely sensed NBR, but only after stratifying the landscape to non-wetland black spruce class.

Source of Federal Funds: McIntire-Stennis and NSF funds.
Scope of Impact: Alaska Specific

Evapotranspiration from Boreal Forest Landscapes in Interior Alaska

**ALK 05-04** (KA 112) Data collected on lake level under the ice indicated a pronounced decline throughout the winter. The net rate of groundwater outflow appeared to increase sharply in late winter. This may have been due to a reduction in groundwater inflow as the watershed soils froze progressively deeper through the winter. Additional winter season measurements will be needed to determine whether this is a repeatable pattern or just the response to that particular year's conditions.

Impact: The data collected to date and the preliminary analysis have been shared with the State of Alaska Dept. of Natural Resources, the U.S. Natural Resources Conservation Service, and the Salcha-Delta Soil & Water Conservation District for the planning and implementation of a lake level restoration project for Harding Lake. Rogge Creek, historically the major feeder stream to Harding Lake, is scheduled to be re-diverted into the lake by this coming spring. This should afford an opportunity to test predictions of the lake model and provide a new water balance regimen to test our understanding of the lake's hydrology. Modeling results should also be useful to Alaska Dept. of Fish & Game who will manage the lake level for pike habitat after the diversion takes place. In a more general context, the expected results of this project should help managers estimate lake and landscape evapotranspiration. This capability will be useful immediately to consultants and managers working in Alaska, but also help researchers on Arctic climate change to sort out how evaporation rates might change in response to atmospheric temperature and moisture scenarios. The recent scientific literature has documented that, contrary to most expectations, pan evaporation in many regions of the world has declined as temperatures have increased. We hope to look at the historical pan data for Alaska and compare it to historical temperature data to see if similar a relationship is evident in Alaska. This study is currently supporting one undergraduate Senior Thesis research project.

Long-term Forest Ecosystem Monitoring and GIS Modeling of Taiga Forest Dynamics

A total understanding of the interaction between the environmental dynamics that regulate forest growth at the landscape scale in interior Alaska is just starting to develop. The purpose of this study is to develop a computer model on the functional aspects of forest ecosystem dynamics at a broad landscape scale in interior Alaska.

**ALK 01-01** (KA 123, 125) The duration of the studies has been 35 years in the upland stands and 14 years in the LTER study. The primary results of the studies included information on tree level dynamics, stand level dynamics, and landscape level dynamics related to tree growth. At the stand level young aspen stands were nutrient limited but this limitation decreased as the stands aged. Birch stands did not show a nutrient limitation. Although in the one single application study coupled with a thinning treatment birch growth did improve 10 years after treatment.

Impact: Forest growth in interior Alaska is controlled by a number of well-defined environmental state factors. There growth limiting factors include (1) soil and air temperature, (2) soil moisture dynamics, and (3) nutrient availability. The structure of these factors is also dependent on the topographic location of the ecosystem. For example on north facing slopes the temperature dynamics, both air and soil, will be the primary limiting controls on ecosystem processes and tree growth. On south facing slopes, temperature dynamics will control the length of the grown

Source of Federal Funds: McIntire-Stennis and NSF funds.
Scope of Impact: Alaska Specific

Assessing Nitrogen Mineralization And Other Diagnostic Criteria To Refine Nitrogen Rates For Crops And Minimize Losses

**ALK 05-02/NC 218** (KA 102) Results on the Illinois Soil Nitrogen Test (ISNT), based on estimating amino sugar nitrogen (AS-N) content was presented for the third year from ongoing NC-218 research projects. As from the previous year's results, this year's results continue to question the value of the ISNT as a predictor of in season N availability. In a positive note, the ISNT continues to show a strong correlation with total soil organic matter (SOM) suggesting that total SOM or some fraction of SOM may be useful in developing a modified INST or new method to estimate specific field fertilizer nitrogen recommendations. Temporal variation in ISNT values continued to be inconsistent and show nonsignificant relationships to fertilizer nitrogen applications at both nonresponsive and responsive sites at all sites being examined by NC-218 investigators.

Impacts: Development of more accurate nitrogen fertility tests is critical to addressing the need to maintain high levels of production that is economical and environmentally acceptable. NC218 has provided strong leadership in proposing, developing and testing new methods to assess N fertility in soils. Each member through there individual state efforts have contributed a great deal of information to outreach efforts to address efficient fertilizer nitrogen application to maintain crop yield and prevent environmental degradation. We continue in our efforts to develop soil tests that make it possible to identify soils that require additional N inputs to improve crop growth and soils that are non-responsive and should not have recommended levels fertilizer N applied.

Source of Federal Funds: Hatch Multistate
Scope of Impact: Multistate

Yield and quality of barley and bromegrass as affected by zero/minimum tillage, fertilizer rate, and cutting regimes

**ALK-04-03** (KA 102) The objectives of the project are: 1) to determine optimal N fertilizer application rate and cutting frequency on yield and quality of bromegrass hay; 2) to analyze barley yield from different tillage, straw management; and N fertilizer application rate since 1983; 3) to determine soil carbon quantity and quality affected by different land management and tillage; and 4) to quantify the potential mineralizable N in agricultural land under different management practices. Impact: The results from N-15 plant and soil samples will indicate the N use efficiency for bromegrass in subarctic environment. Even though the weather condition was less than idea in 2005, the results will provide some guidance for N management on bromegrass in interior Alaska. This is especially important under high energy and global warming perspectives. The results in tillage research showed that no tillage benefits soil conservation and barley yield. From the past tillage research results, a new tillage experiment was conducted in 2006, and this new tillage experiment will provide much needed information on weeds management for no tillage systems in the subarctic environment when there is no rotational crops.

Source of Federal Funds: Hatch General
Scope of Impact: Alaska Specific

<u>The Response of Forest Ecology and Growth to Climate Variability in Alaska: Patterns, Controls, and Strategies for Management</u>

**ALK-01-08** (KA 125) Long-term records of daily, seasonal, and yearly temperature and precipitation data were compiled with the help of the Alaska Climate Research Center and compared to significant events affecting forests, land management, and agriculture. The strongest and steadiest trend in the records (80 to 100 years in length) is the rise of daily low temperatures, especially in the warm season (May through August) in Interior Alaska stations. Another major trend in all of Alaska is an increase in mean winter temperatures and a decrease in episodes of extreme winter cold since a statewide climate regime shift in 1977.

Impact: The Alaska yellow-cedar study was the first region-wide tree-ring and climate study of any species conducted in Southeast Alaska. An explanation of cedar decline was needed to inform forest management programs about where the species can be grown and sustained as a crop versus where the risk of decline is too great. Overall climate trends during the time of cedar decline were favorable for growth, not unfavorable. But specific thaw/freeze events kill trees at low elevations and in the outer coast and southern portion of its distribution in Alaska. A particularly strong thaw/freeze occurred in 1987. With climate temperatures since the climate regime shift of 1977 improved growth resources for some crops, but the resulting moisture stress limited a few. Survival and reproductive success of forest-damaging insects are known to be enhanced by mild winters and warm summers in the boreal forest. Simultaneous outbreaks of many such insects have appeared over a large portion of the forest area of Alaska since strong warming began in 1977. The large number of warm days in 2004 and 2005 were directly associated with extensive wildland fires that burned the greatest and 3rd greatest area in the 56-yr Alaska fire record. Based on this research project, near lethal acute drought conditions were inferred in 2005, and symptoms consistent with acute drought stress and acute drought death were detected in Alaska birch trees in 2005 and 2006.

Source of Federal Funds: McIntire-Stennis and NSF Funds
Scope of Impact: Alaska Specific

**Overview:** Because of shifting needs and the diversity of rural economic markets, impact analyses addressed under this project have, by necessity, also shifted. We added the Alaska snow crab impact analysis in 2002 then scaled it back in 2003 after withdrawal of the processors. The Alaska snow crab fishery, and other crab fisheries of the Bering Sea and Aleutian Islands, will be managed through a transferable quota program, that includes a harvester quota and for the first time in a U.S. fishery, a

processor quota. In addition, a regionalization program will be included that is intended to protect fishery dependent communities by placing constraints on where harvested crab can be processed. The ongoing crab management research program presented here is intended to contribute to evaluation of this important new fishery rationalization program.

Impact Analysis for Alaska Natural Resources

**ALK 01-01, WERA 109** (KA 605) The economic analysis of the Alaska crab industry was continued this year. Last year, the Impact Analysis for Alaska Natural Resources project presented a market model for the Alaska snow crab industry. This year the market model project was expanded to include Alaska king crab in the modeling framework. The integrated international equilibrium market model for Alaska king crab and snow crab is the most comprehensive model ever developed of the Alaska crab industry. The development of this market model was particularly timely as the Alaska crab industry completed its first full year under a rationalization program.
Our principle objectives: 1. target the primary determinants of Alaska crab prices and allocation (snow crab & king crab); 2. estimate the relationship between Alaska crab landings and dockside (exvessel) prices and harvester revenues; and 3. set a foundation for future analysis of crab rationalization. The model explicitly incorporates the allocation of Alaska king crab, Alaska snow crab, and Canadian snow crab to the two principal markets, Japan and the United States. Snow crab and king crab supplies from Russia (and Greenland) are also included in the modeling structure as substitutes for U.S. and Canadian crab. Russian production of snow crab and king crab has grown considerably in recent years.

Impact: The Alaska snow crab industry is confronted with major competition from Canada and Russia. Canada is the price leader in snow crab markets. The growth of the Canadian industry has placed significant downward pressure on snow crab prices. Russian snow crab and king crab exports have introduced a further drag on snow crab prices. Furthermore, the Alaska King Crab Industry is confronted with major competition from Russia. Russia is the king crab price leader and growth of the Russian king crab fisheries has placed severe downward pressure on king crab prices. The future growth of the Russian Barents Sea king crab fishery represents s a particular challenge to the Alaska crab industry. For example, in model simulations, Alaska king crab revenues would have been $19.5 million higher in 2004 if Russian crab exports had been reduced in half. Also, the simulated Alaska king crab harvest revenue maximum was found to be $28.3 million greater with the reduced Russian exports than that achieved with the current Russian and Greenland crab exports. Finally, Canadian snow crab was found to be a substitute for king crab. This is the first time this relationship has been statistically established. The model results support a dim outlook for substantial economic improvements in Alaska snow crab and king crab prices despite crab rationalization. Alaska has little ability to influence crab prices. Major factors that the Alaska crab industry should pay close attention to are snow crab and king crab supplies coming from Canada and Russia.

Source of Federal Funds: Hatch General, Hatch Multistate
Scope of Impact: Multistate and Alaska Specific

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|---|---|
| **Expenditures:** | |
| Hatch General: | $ 181,297 |
| Hatch Multistate: | $ 41,071 |
| McIntire-Stennis: | $ 466,711 |
| State Matching: | $ 912,225 |
| **FTE (SY)** | **7.5** |

**Total Expenditures (All Goals)**

| | |
|---|---|
| Hatch General: | $789,336 |
| Hatch Multistate: | $137,436 |
| McIntire-Stennis: | $523,824 |
| State Matching: | $1,631,333 |
| FTE (SY): | 14.7 |

**Stakeholder Input Process**

The following actions have been taken since the inception of the AREERA requirements to seek stakeholder input and participation in the research planning process for projects funded by Hatch, Hatch Multistate, and McIntire-Stennis federal formula funds.

- In 2000, the SNRAS/AFES Board of Advisor with the cooperation of SNRAS/AFES faculty and students developed and made available on the SNRAS/AFES web site, a strategic planning survey to solicit stakeholder input from all Alaska citizens including traditional stakeholders and underserved populations. The results of that survey were published as an Experiment Station Bulletin and are available on request.

- An abbreviated version of the input survey was made available in hard copy at various stakeholder-attended meetings around the state in 2001, 2002, 2003, 2004, 2005, and 2006. These meetings were attended by the Director and/or Associate Director of the Agricultural and Forestry Experiment Station and other representatives of AFES to answer questions and take comments and recommendations. These included:

    1) Greenhouse and Nursery Conference January 27-28, 2006 (Attendance ~88)
    2) Potato and Vegetable Growers Conference March 14 - 15, 2006 (Attendance ~ 100+)
    3) Alaska Reindeer Herders Association Meeting March 8, 2006. (Attendance ~30)

    - In 2001, results of the surveys are presented to the SNRAS/AFES Board of Advisors for use in their program assessment and recommendation process and continue to be reported at semi-annual Board meetings. Board of Advisors meetings were held March 29-30, 2001, October 25-26, 2001, May 1-2, 2002, November 21-22, 2002, April 16, 2003, December 4-5, 2003, April, 2004, October 27-28, 2004, January 6-7, 2005, and April and October of 2006. As in previous years, the participation of the Board of Advisors in the stakeholder input process included gaining input from stakeholders that individual B of A members represent.

Results of stakeholder input processes are presented to SNRAS/AFES faculty and staff annually. The new Strategic Plan ("Working for Alaskans: A Wealth of Knowledge", Strategic Plan 2004) was adopted by the faculty and the Board of Advisors in 2003 and published in 2004. The Strategic Plan will be the basis of our new POW for the period 2007 through 2011. Copies are available on request.

We also initiated a process in 2004 to develop a Matanuska Experiment Farm (MEF) Master Plan. The UAF Chancellor appointed a committee consisting of faculty, selected administrators and two members representing the community. A draft of the academic plan was presented to and rejected by the committee in 2005 and was further refined in 2006. The Board of Regents of the University of Alaska provided $160,000 to obtain assistance preparing the MEF Master Plan. In 2006, the University hired

Bezek Durst Seiser, Inc. to prepare a current Experiment Farm facilities inventory and recommended remedial action required. The final version of the Plan has been drafted.

**Program Review Process**

All new and revised Hatch General and McIntire-Stennis project proposals within the Agricultural and Forestry Experiment Station undergo scientific peer review using Hatch and McIntire-Stennis Administrative Manual's Appendix F "Essentials of a Project Proposal". All proposals are submitted to the Director of the Agricultural and Forestry Experiment Station. The peer review panel is composed of a minimum of three members and is appointed by the Director. The panel consists of competent authorities in the discipline of the proposal or related disciplines and will include at least one authority from a supporting discipline. Each reviewer completes a Peer Review Form consisting of specific criteria, provides other comments and suggestions, and makes a recommendation to the Director. Reviews are returned to the Director for transmittal to the author(s) of the proposal. The author(s) review all comments and recommendations of the reviewers and make adjustments or explanations. The Director reviews all comments and recommendations from the reviewers as well as the revised proposal. The signature of the Director on Form AD 416 submitted to USDA-CSREES will indicate approval of the project by the Director and will certify that the proposal has been recommended by a majority of the Peer Review Panel.

Scientific peer reviews of multistate projects are carried out for individual projects under the aegis of the Western Association of Agricultural Experiment Station Directors' and the Western Cooperative Extension's Regional Coordinating and Implementation Committee (RCIC). The specific review process can be found under Appendix C of the Supplementary Guidelines for Western Multistate Research and Integrated Research/Extension/Teaching " Peer Review Guidelines: Performance Standards and Operational Guidelines for State Agricultural Experiment Stations". This can be found on-line at http://www.colostate.edu/Orgs/WAAESD. Additional access to the multistate review process is available on the NIMSS website (http://www.nimss.umd.edu ) established by SAES Directors.

**Evaluation of the Success of Multi and Joint Activities**

Alaska participates in the following multistate research and coordinating committees:

**W-1147:** Managing Plant-Microbe Interactions in Soil to Promote Sustainable Agriculture (**Participation terminated in 2006**)
**W-112:** Reproductive Performance in Domestic Ruminants
**W-192:** Rural Communities and Public Lands in the West: Impacts and Alternatives
**NC-218 (Renewal as W-1035)** Assessing Nitrogen Mineralization And Other Diagnostic Criteria To Refine Nitrogen Rates For Crops And Minimize Losses.
**4-NRSP/IR4:** A National Agricultural Program to Clear Pest Control Agents for Minor Uses.
**NCR –101:** Controlled Environment Technology and Uses

**W-112:**

Estrus, estrous synchronization and AI.

1) In reindeer, we found a difference in gestation length between the EARLY and LATE groups (P = 0.002) and a negative correlation (r = -0.754; P = 0.002) between gestation length and breeding date. There was no difference in the birth weight of the calves. 2) We are analyzing reindeer milk for %fat, %protein, %lactose and % solids-not-fat at 3 stages of lactation (15, 45, and 75 d post-calving) from 12 female reindeer. Milk component data from each cow will be correlated with

their calf's growth rate and survival. 3) Use of Modified CIDR-b for Estrous Synchronization in Reindeer Bovine CIDR modifications (following manufacturer's directions) produced systemic progesterone levels consistent with luteal phase progesterone and had 100% retention rate. Pregnancy rate following synchronization was 88%. 4) Radiotelemetric Estrous Detection in Reindeer. Placement of radiotelemetric transmitters lower on the female's rump, coupled with shaving only the top 1.5 cm of hair, were tried in an effort to improve estrous detection in reindeer with this technology. 5) Modifications of the standard CO-Synch + CIDR estrous synchronization program that included: a. shortening the interval from the initial GnRH injection to CIDR withdrawal/PGF2± from 7 to 5 d, b. administering two PGF2± doses 12 h apart and c. increasing the interval from PGF2± to the second GnRH from 60 to 72 h; increased timed-AI pregnancy rates in postpartum beef cows by 13.3%. 6) Development of dominant follicles occurs early after calving and lack of follicular development does not delay return to estrus. It seems to be obligatory for most cows to have a silent ovulation with formation of functional luteal tissue before return to normal estrous cyclicity. 7) Early weaning at the start of a synchronized breeding season increased AI pregnancy rates and cow weights at the time of normal weaning. The magnitude of improvement in AI pregnancy rate is greater than has been reported with temporary calf removal (48 h) indicating the effects of permanent calf removal may be manifested through improved pregnancy maintenance. Early weaning may be a viable alternative to culling cows during periods of low forage production in semi-arid rangelands. We are evaluating the fertility of heifers developed under early and normal weaned strategies. 8) Liver and skeletal muscle progesterone concentrations did not differ from control values in ewes receiving CIDR for 5 or 14 d. Therefore, the levels of progesterone in CIDR treated ewes were within limits allowable for slaughter and increased the chances of CIDRs being approved for utilization in regulation of sheep estrous cycles. 9) Fenceline contact of cows with bulls can accelerate resumption of ovarian cycling activity but it is not as effective as close physical contact between cows. The nature of the biostimulatory effect of bulls appears to be related to the intensity of the pheromonal stimulation. Limiting the intensity of the biostimulatory stimuli of bulls directly limits that biostimulatory effect of bulls on primiparous cows. Thus, a major factor involved in the mechanism of the biostimulatory effect of bulls is intensity of the stimuli (frequency of exposure, duration of exposure, and quantity of stimuli) provided by bulls. 10) Continuous presence of bulls stimulates resumption of luteal activity and is coincident with increased cortisol concentrations. We hypothesize a possible association between adrenal activation and the biostimulatory effect of bulls in postpartum anestrus cows. This may be a critical mechanism for this effect. The biostimulatory effect of bulls alters the progesterone response in an ES protocol that included GnRH, PGF2±, GnRH and TAI, and that progesterone concentrations after the first GnRH injection may determine the success rate of GnRH-based ES protocols in primiparous beef cows. 11) Comparison of CIDR to MGA in a 7-11 Co-synch protocol with timed insemination. Previous research has shown that the 7-11 Cosynch protocol using melengestrol acetate (MGA) is effective in synchronizing beef heifers. This study compared a vaginal insert containing progesterone (CIDR) to MGA in the 7-11 Cosynch protocol on beef heifers. No difference in pregnancy rate was observed between the CIDR (46%) and MGA (47%) treatments.

**Impacts**

1. Advances were made in understanding how nutrition impacts fetal development, placental efficiency, heifer development, estrous cycles, development of more viable offspring.

2. Significant progress in understanding how behavior, exposure to male biostimulation, and disease may affect general overall health, feed and reproductive efficiency.

3. Progress was made in identifying factors that can be commercialized for pregnancy detection, and immunocastration techniques continue to be fine tuned to be more producer friendly

**W-1147**

Alaska terminated their participation in W1147 in 2005.

**W-192:**

Ranch-level models reflecting the impacts of limited access to federal grazing were just about complete (as proposed for the Fund for Rural America project due the summer of 2002). In addition, two reports were prepared by the PACWPL technical committee. The first dealt with the pinyon-juniper pine as a potential energy source. The second dealt with the potential listing of the sage grouse as an endangered species. More information will be available next year as the FRA project will be complete and additional work will be completed by the PACWPL.

**Impacts**

1. A regional committee of policy analysts will examine specific policy issues by applying the best research currently available. This committee will provide timely analysis of current public lands policy issues. Ties with the Policy Analysis Center for Western Public Lands will be maintained for technical support, project teams and long-term research efforts on public land policy. A set of standardized social and economic impact assessment tools for evaluating the impacts of public land management.

The W192 technical committee submitted a new proposal to the RCIC in 2006 entitled "Economic, Social, and Ecological Issues of Rangeland Fragmentation that Affect Rangeland and Rural Communities". (W_TEMP 1781)

**NC-218: (**NC 218 terminated in 2006 and was replaced by NC 1035)

In 2005-2006 research continued on assessing the Illinois soil nitrogen test (ISNT) for its use predict nitrogen (N) mineralization and fertilizer N requirement for corn. Results showed that ISNT values were not related to observed economic optimum N rates (EONR) in field corn N response experiments and that the ISNT had no ability to separate N responsive from non-responsive sites. ISNT values were strongly correlated with the soil organic matter content of the experimental sites suggesting that the ISNT is measuring a constant fraction of the soil organic N rather than the readily mineralizable N component. Soil organic N fractions were not related to corn N response (percent yield increase due to added N fertilizer relative to control plot yield) although these experiments included cropping systems ranging from first year corn following alfalfa to continuous corn and showed marked differences in yield response to N fertilizer additions. Specifically, results showed that the soil amino sugar-N fraction was not related to observed corn N fertilizer response. Likewise, relationships between corn N fertilizer response and other hydrolyzable N fractions including hydrolyzable ammonium-N, (amino sugar + ammonium)-N, amino acid-N, and total hydrolyzable-N were also poor. A strong correlation was found between ISNT results and amino sugar-N, but ISNT was also strongly related to soil organic matter, soil total N, and soil total C. These results confirm the conclusion that the ISNT is measuring a constant fraction of the soil organic N instead of the readily mineralizable fraction of soil N. Results from this work indicate that the ISNT or the soil organic N fractions studied are not reliable predictors of corn N response. Compilation of data from 2001-2005 across the multiple states was begun. This data will be placed into a database and further analysis of the ISNT and glucosaminidase tests as a means to predict N mineralization and corn response to N fertilizer on a regional basis will be performed.

**Impacts**

1. In 2005-2006 the ISNT has received much popular press as a new tool to refine N rates. However, results show that the ISNT is not a useful tool for predicting soil N mineralization, corn N response, or N fertilizer recommendations.

2. Results of this work have demonstrated that in many situations farmers can use application rates lower than currently recommended and still attain optimum yield.

3. Results of this project have been communicated to farmers and consultants across the region through Extension newsletter articles (internet and mail) and local/state/regional Extension meetings/conferences. It is estimated that more than 2,000 people across the country with responsibilities for making N rate decisions have been educated.

**Integrated Research and Extension Activities**

Alaska submitted Form CSREES-Waiver requesting a waiver for FY2000 Integrated Activities from Hatch Act Funds. CSREES granted the waiver and approved our projected Integrated Activities for the 2001-2004 and 2005-2006. The form CSREES-REPT reporting Integrated Activities for 2006 is included here.

Agronomic Crops and Soils

Integrated activities continue to address best management practices for production of livestock feed crops, primarily forages and small grains as well as investigating turfgrass cultivars and management practices. AFES researchers and CES agents continued collaborative work at Delta Junction, Fairbanks, Palmer, and the Kenai Peninsula. From the AFES perspective, these projects include applied research investigating alternative forage and cereal grain varieties, effects of tillage, fertilizer, and cutting regimes on crop and soil quality. In cooperation with Extension agents in Fairbanks, Delta Junction and the Kenai Peninsula AFES researchers provided a database for producers to determine the economic viability for these crops. Outreach publications included: “Reproductive Management of Alaska Livestock”, “Canola Quality in Alaska: 2004 and 2005 Harvests” and “Dragonhead Mint as a Potential Agronomic Crop for Alaska”.

Potato and Vegetable Crops

In 2006, AFES researchers and CES counterparts carried out applied research, demonstration, and outreach activities primarily related to variety selection, disease control and management, and invasive weed control. Two project leaders with split appointments in AFES/CES at Palmer evaluated potatoes, lettuce, and cabbage varieties, potato and vegetable management trials, comparison of overhead and drip tape irrigation on vegetables, soil moisture monitoring in transplanted lettuce, and proposed hoop house evaluations. The Fairbanks field horticulture research included peonies field trials offer opportunities for Alaskan producers with a blooming period in July and August offer potential cut flower markets of $70,000 per acre. The horticulture researchers at the Palmer Research and Extension Center and Fairbanks Research Center working closely with CES agents in Palmer, Anchorage, Soldotna, Fairbanks, and Delta Junction provide the core for this working group. This information is presented annually to CES/AFES jointly sponsored workshops including: The Greenhouse and Nursery Conference, the Potato and Vegetable Growers Conference, and the Delta Farm Forum. Outreach publications “Restaurant Interviews to Determine Demand for Baby Greens in Alaska” and “Taste is Important! Consumer Opinions about Alaska Food Products”.

Greenhouse Management/Nursery

Research and demonstration efforts at the Georgeson Botanical Gardens evaluated woody perennials, herbaceous perennials, annual flowers, herbs and vegetables for survival and productivity at northern latitudes. The latter had a high degree of volunteer and extension involvement. Outreach efforts have included one-on-one contacts with growers and the public, presentations at CES workshops, master gardener program, and the annual CES/AFES Alaska Greenhouse and Nursery Conference, and lay publications including: "Checklist of Landscape Plant Materials for the Tanana Valley" and "Annual Flower Plant Evaluations", Leveraged funds through USDA special grants included work involving AFES horticulture researchers and CES food testing center to extend University research on the cultivation of wild and domestic plants to individuals interested in developing value-added food products.

Reindeer Production

Reindeer producers on the Seward Peninsula want to enhance their operations by delivering a high-quality product from animals slaughtered outside the winter months. AFES scientists continued to carry out a number of research and demonstration projects in cooperation with the CES on the Seward Peninsula. These include seasonal variation in carcass quality of reindeer from the Seward Peninsula, reproduction and disease management, and range management and reindeer nutrition. Reindeer have great potential for value added products and through cooperative work with Cooperative Extension's food development program, it is being evaluated for consumer acceptance. The Extension livestock specialist works with AFES researchers and other agencies (i.e. NRCS, AFG, and BIA), and the herders themselves and facilitates annual meetings and workshops. The work on the Seward Peninsula reindeer continued this summer with the recovery of several self-recording thermistors which we had put out earlier on the landscape but were unable to locate on previous attempts. All the thermistors, except for one, were recovered and contained a good record of landscape temperatures taken at 20-minute periods. A graduate student has created interpolated thermal maps from this data and is currently comparing the daytime thermal maps to solar insolation maps generated by our own software program, Kinectic Resource and Environmental Spatial System (KRESS). We are hoping that easily modeled solar insolation maps will be a good surrogate for the thermal maps which require time and energy to collect pertinent data.

Animal Reproduction

The joint research animal scientist/livestock position (CES, 51%; AFES, 49%) addressed reproductive performance of ruminant animals under the aegis of multistate research (W-112) which addresses both traditional and alternative animal species. Most of this research and outreach is accomplished on-farm, directly involving the local extension agents and the producers. In 2006, outreach activities included a series of workshops around Alaska, including the more rural areas of the state covering topics that included animal nutrition, genetics and animal breeding, reproductive management and artificial insemination, lactation and calf raising, and animal disease and herd health. Other outreach activities included presentations at Delta Farm Forum, and presented his research at the Kawerak Reindeer Herders meetings in Nome. He was Alaska's representative to the USDA Small Farms Program, Alaska State Johnes Disease Detection and Management Committee, and Alaska Scrapie Disease Certification Committee. His project has become the cornerstone of our Integrated Activities in livestock with Cooperative Extension. It encompasses all the desirable elements of a multistate, integrated research and extension activities.

Forest Production/Protection

Forest Resource Management Community Types: understory vegetation and soils, initiated integrating existing ecological data, PSP data, USDA Forest Service FIA data; in collaboration with Dr. C-L Ping. We compiled PSP data and established initial classification of data into community types; FVS: provided tree growth and site data to US Forest Service personnel to help develop an Alaska variant of FVS model. The AFES forester working in the area of growth and yield has worked cooperatively with CES and State and Private forestry in cooperation with the state Division of Forestry and the U.S. Forest Service. In cooperation with the Alaska Northern Forest Cooperative, revised compendium of Alaska Northern Forest research projects and presented results of 20-year birch growth study at a 2-day workshop in Wasilla.

Community and Rural Development

No Integrated Activities this reporting period.

Other Integrated Activities

1) Greenhouse and Nursery Conference January 27-28, 2006 (Attendance ~88)
2) Delta Farm Forum Feburary 25, 2006 (Attendance ~65)
3) Potato and Vegetable Growers Conference March 14 - 15, 2006 (Attendance ~ 100+)
3) Alaska Reindeer Herders Association Meeting March 8, 2006. (Attendance ~30)

**U.S. Department of Agriculture**
**Cooperative State Research, Education, and Extension Service**
**Supplement to the Annual Report of Accomplishments and Results**
**Actual Expenditures of Federal Funding for Multistate Extension and Integrated Activities**
(Attach Brief Summaries)
**Fiscal Year: 2006**

**Select One:** ☐ **Interim** ☑ **Final**

**Institution:** University of Alaska Fairbanks

**State:** Alaska

| | Integrated Activities (Hatch) | | Multistate Extension Activities (Smith-Lever) | | Integrated Activities (Smith-Lever) | |
|---|---|---|---|---|---|---|
| ***Established Target %*** | 4.0 | % | 3.0 | % | 5.5 | % |
| ***This FY Allocation (from 1088)*** | 926,772 | | 1,036,654 | | 1,036,654 | |
| ***This FY Target Amount*** | 37,071 | | 31,100 | | 57,016 | |
| **Title of Planned Program Activity** | | | | | | |
| Agronomic Crops and Soils | 8,242 | | | | 9,806 | |
| Potato and Vegetable Crops | 4,834 | | | | 15,918 | |
| Greenhouse Management/Nursery | 7,176 | | | | 5,890 | |
| Reindeer Production | 13,011 | | | | 0 | |
| Animal Reproduction | 8,980 | | | | 18,804 | |
| Forest Production/Protection | 576 | | | | 0 | |
| Other Integrated Activity | 2,574 | | | | 12,981 | |
| Community and Rural Development | 0 | | | | 0 | |
| **Title of Planned Program Activity** | | | | | | |
| Regional WQ Project | | | 5,638 | | | |
| Western Region SARE | | | 3,113 | | | |
| Western Public Policy Ed. Committee | | | 1,329 | | | |
| National 4H | | | 4,689 | | | |
| Small Farms Committee | | | 2,498 | | | |
| Western Ext. Leadership Devel. Conf. | | | 2,046 | | | |
| Tufts Univ./OSU Strong Women | | | 5,309 | | | |
| WRPP Diagnostic Network | | | 3,093 | | | |
| Western Region IPM Center | | | 2,659 | | | |
| Western Forestry Ext. WEB Ed. | | | 1,330 | | | |
| Other Multistate Activities | | | 3,346 | | | |
| **Total** | $45,393 | | $35,050 | | $63,399 | |
| **Carryover** | 0 | | 0 | | 0 | |

**Certification:** I certify to the best of my knowledge and belief that this report is correct and complete and that all outlays represented here accurately reflect allowable expenditures of Federal funds only in satisfying AREERA requirements.

Director CES — Date: 3/19/07

Director AFES — Date: 3-15-07