

Department of Agriculture

The Department of Agriculture supports and conducts research to improve the understanding, use, and management of natural resources at high latitudes. Research is directed toward solving problems in agriculture, forestry, and the environment and improving technology for enhancing the economic well-being and quality of life for Alaskans.

	Funding (thousands)	
	FY 04	FY 05
Agricultural Research Service	2,000	2,000
Coop. State Res., Ed. and Ext. Serv.	1,389	1,389
Forest Service	653	653
Natural Res. Cons. Service	260	260
Total	4,302	4,302

Agricultural Research Service

The research activities of the Agricultural Research Service (ARS) are focused on 22 multi-disciplinary and cross-cutting National Program Areas of high priority designed to develop a knowledge base to promote timely responses to technical agricultural problems of broad scope and national interest. Programs in the Arctic or adjacent northern regions are limited in scope. They are, however, providing critical information necessary to solve issues in such diverse areas as preservation of plant germplasm, integrated pest management for grasshoppers, and biodiversity of pathogens and parasites in northern ruminants. This research addresses the sustainability of renewable natural resources in the Arctic and has implications for managing plants and animals elsewhere. Currently the mission of the unit is:

- To improve the understanding and control of invasive plant pests, plant pathogens, weeds of agricultural importance in Subarctic cropping, and Alaskan natural systems;
- To collect and preserve important Arctic plant germplasm resources;
- To develop virus-free potato germplasm; and
- To develop effective and economical utilization of fish processing byproducts.

Since its establishment in Alaska, USDA-ARS has released more than 40 cultivars of potatoes, barley, raspberry, and grasses. The research of USDA-ARS has enhanced the productivity, profitability, and environmental quality of Alaska's farming and fishing industries and natural resource

areas by reducing threats posed by wind and water erosion, invasive insect pests, weeds, and pathogens through research and technology transfer resulting in the introduction of new and innovative IPM (integrated pest management) strategies suitable to northern latitudes; an increased utilization of seafood byproducts; and the collection, conservation, and characterization of germplasm adapted to Arctic and Subarctic environments.

Arctic, Subarctic, and Alpine Plant Genetic Resources Conservation, Research, and Information Management

Agricultural development in Arctic, Subarctic, and alpine regions depends on the availability of improved plant cultivars adapted to the limiting growing conditions. However, the biological properties of high-latitude species and crops are not known or are poorly documented. Adequate characterizations of germplasm and subsequent documentation in appropriate databases are critical for germplasm management, utilization, and the development of new crops at northern latitudes and high altitudes. The Subarctic Agricultural Research Unit is the only unit of the Agricultural Research Service's National Plant Germplasm System (NPGS) that addresses Arctic, Subarctic, and alpine germplasm research.

The goals of this project are to conserve, evaluate, and distribute a broad spectrum of genetic resources of plants adapted to short, cool seasons and long photoperiods; to generate and manage associated information; and to provide a scientific base for its use in research and crop improvement. Its objectives are:

- To conserve, evaluate, characterize, and distribute Arctic, Subarctic, and alpine-adapted plant germplasm and associated information to scientists worldwide;
- To characterize diseases and their etiological agents on selected crop and native plant

species from Arctic, Subarctic, and alpine ecosystems; and

- To identify key insect pests on selected crop and native plant species from Arctic, Subarctic, and alpine ecosystems.

The project supports the NPGS in the regeneration of accessions of seed and clonal germplasm not adapted to other NPGS locations.

Collection, Evaluation, and Maintenance of Arctic Plant Germplasm

The objectives of this project are to maintain and improve a plant germplasm repository specifically targeted for the acquisition, evaluation, maintenance, and regeneration of Arctic species or crop species adapted to Arctic conditions, and to conduct a research program to improve methods for disease-free propagation and conservation of Arctic germplasm.

Germplasm increase and conservation priorities will be conducted in consultation with National Crop Germplasm Committees, the NPGS, and ARS's Plant Exchange Office in Beltsville, Maryland, and in collaboration with Alaska Department of Natural Resources' Division of Agriculture. Germplasm received at Palmer will be logged in to the Germplasm Resources Information Network (GRIN) so that passport and other data are available to the user community. The seeds will be stored in refrigerated, dry conditions to delay loss of viability. Evaluation data will be collected from scientists at Palmer and other cooperators. Research will focus on factors influencing seed and/or propagule quality, both from the genetic and viability/longevity standpoints.

Arctic germplasm preservation will be improved by the ability to detect and understand the biology of viruses in native plant species living in natural environments. A study of diseased twisted-stalk in Denali State Park and near Skwentna revealed two viruses, which were partially characterized from the plants with either single or multiple infections from each site. The significance of this study is the added biological knowledge of plant pathogens in native plants and, in this specific case, the unexpectedly high number of infected plants in two isolated natural habitats.

Integrated Pest Management for Alaska Agriculture

The objectives of this project are to enhance the productivity, profitability, and environmental quality of Alaska's farming industry and natural resource areas by reducing threats posed by inva-

sive insect pests, weeds, and pathogens through research and technology transfer resulting in the introduction of new and innovative IPM strategies, and to develop IPM applications suitable to northern latitudes that support viable crop and nursery production systems and the sustainability of natural resource areas. This project will develop IPM systems incorporating biologically based control, host resistance, cultural control, resistance management, and application technology for the control and suppression of major insect, pathogen, and noxious weed pests affecting field, vegetable, and horticultural crops, as well as rangeland ecosystems in the Delta Junction region and other areas of Alaska.

Cooperative State Research, Education and Extension Service

CSREES's unique mission is to advance knowledge for agriculture, the environment, human health and well-being, and communities by supporting research, education, and extension programs in the Land-Grant University System and other partner organizations. CSREES doesn't perform actual research, education, and extension but rather helps fund it at the state and local level and provides program leadership in these areas. CSREES collaborates or has working partnerships with many institutions and individuals. The key partners are the institutions of higher learning making up the Land-Grant University System. However, CSREES also partners with other Federal agencies, within and beyond USDA; non-profit associations; professional societies; commodity groups and grower associations; multistate research committees; private industry; citizen groups; foundations; regional centers; the military; task forces; and other groups. CSREES and its partners focus on critical issues affecting people's daily lives and the nation's future. The advanced research and educational technologies empower people and communities to solve problems and improve their lives on the local level.

The Alaska Native-Serving and Native Hawaiian-Serving Institutions Education Grants Program promotes and strengthens the ability of Alaska Native-serving and Native Hawaiian-serving (ANNH) institutions to carry out education, applied research, and related community development programs within a broadly defined arena of food and agricultural sciences. The ANNH program aims to attract, retain, and graduate outstanding students capable of enhancing the

nation's food and agricultural scientific and professional workforce. Projects may involve individual institutions, consortia, or cooperative initiatives between two or more ANNH institutions or with other colleges and universities, units of government, or the private sector. In 2004 and 2005, the following Alaska institutions received grants.

Ilisagvik College

Ilisagvik College successfully developed and implemented a USDA-funded project titled "Arctic Subsistence Education and Experience: Joining Traditional Knowledge and Modern Education." The project introduced students to the scientific and traditional Inupiat methods and ways of observing and learning about the environment. Students attended experiential training in traditional hunting, fishing, and gathering and bridged that knowledge with Western scientific methods of observing and learning about the environment. Initial instruction was delivered in a classroom setting at the campus in Barrow. Students were taken for field experience to a remote location in the Arctic tundra, where they learned the local geography and traditional knowledge of traveling in the ocean and up rivers, weather attributes, and the nature and use of local land and sea animals and birds. Twenty-five students benefited from the courses; all were encouraged to pursue future training and employment in wildlife, land management, and other related fields. All students gave presentations on their experiences in this program and shared with other students their perspectives on the similarities and differences between Western science and traditional knowledge and how both can be used to build life skills. The Inupiaq Land Use Values and Resources course was so successful that the North Slope Borough School District has requested a special offering for teacher development.

Prince William Sound Community College

"Welcome to Alaska's Copper River Valley!" That's the headline of a newly published map for visitors to rural Alaska. The informative, colorful map is among the products of regional economic development efforts that began with "Development of Local Tourism" workshops sponsored by Prince William Sound Community College. The series of ecotourism workshops involved seven Native villages and six communities. Several classes were offered in hospitality services including safe food handling, culinary arts, developing small businesses, marketing and web design. A publica-

tion, "Tourism in Rural Alaska: A Community Education Curriculum, 2nd Edition," was completely revised, expanded, and reprinted for use throughout Alaska in regions where people are interested in starting or expanding tourism-based programs. This publication has gained wide recognition and was presented at an international hospitality and tourism conference in 2003 in Costa Rica. The curriculum is used by universities, businesses, and agencies around the world.

Sheldon Jackson College

Sheldon Jackson College used CSREES grants to advance its environmental sciences and fisheries programs in several areas. Water supply to the college hatchery has been improved. Incubators, net pens, and other supportive materials, including safety, electronic, and science field education resources, have been obtained, and the infrastructure has been upgraded. Well-qualified hatchery staff have been employed. Student hands-on learning and fieldwork research have been enhanced by obtaining boats and charters. Appropriate professional development for science faculty and hatchery personnel has increased, and computer equipment has been made available to faculty for teaching, research, and communication purposes. Recruitment of students has been improved through print and electronic media and financial assistance.

University of Alaska Fairbanks: College of Rural Alaska

At the University of Alaska Fairbanks (UAF): College of Rural Alaska, CSREES funded improvements in student and community education; the goal is for students to apply their education to improve their communities and quality of life. The continuing impact of the project is manifest in:

- The increased numbers of community leaders and stakeholder groups that are becoming involved in the collaborative efforts of their respective regional consortium/alliance in identifying and resolving critical issues (such as education and economic development) that are affecting the quality of life of the people in their region;
- The increased number of educators in rural secondary schools who are developing and implementing creative projects (mini-grants) designed to facilitate secondary education students' mastery of mathematics and science concepts through the use of natural resources education (subsistence agriculture);

- The development and validation of eight curriculum units that integrate mathematics and science concepts through natural resources education and are adapted to regional and cultural usage; and
- The establishment and active functionality of a UAF clearinghouse dedicated to promoting mathematics, science, and natural resources education at the middle and secondary school levels.

University of Alaska Southeast Sitka

The University of Alaska Southeast Sitka Campus has used CSREES funding to expand an existing 12-credit Community Wellness Advocate (CWA) program. Offered in partnership with the Southeast Alaska Regional Health Consortium (SEARHC) and targeted at rural Alaska Natives in underserved areas, the program has added training that is heavily focused on nutrition and healthy lifestyle choices as the basis for health promotion and disease prevention for women, infants, and children as well as other rural community residents. The program is distance-delivered throughout the state. Specific goals met include:

- Creating a 30-credit CWA certificate program that increases educational opportunities and provides career advancement for practicing CWAs;
- Expanding the program statewide to increase the number of professionals trained to serve in rural, underserved areas of Alaska;
- Involving other Native health corporations; and
- Helping them to better serve needs of people living in their regions of the state.

Efforts are underway to institutionalize the program throughout the University of Alaska system.

Forest Service

The Pacific Northwest (PNW) Research Station is part of the Research Branch of the Department of Agriculture's Forest Service and comprises ten research laboratories in Oregon, Washington, and Alaska, as well as the headquarters office in Portland, Oregon. The PNW Research Station is one of eight Forest Service research facilities throughout the United States. Forest Service Research develops and provides scientific and technical knowledge for all 1.6 billion acres of forests and rangelands in the United States, including, but not limited to, the National Forests. The Forest Service has the most extensive and productive program of

integrated forestry research in the world. The PNW Research Station is a group of about 522 scientists, professionals, technicians, administrative staff employees, and research managers. Station expertise is in biological, physical, and social sciences. Their mission is to generate and communicate scientific knowledge that helps people understand and make informed choices about people, natural resources, and the environment.

The USDA Forest Service's PNW is responsible for boreal forest research in Alaska through the Boreal Ecology Cooperative Research Unit (BECRU) located on the campus at the University of Alaska Fairbanks. The research activity of BECRU is, in part, a commitment to the NSF-sponsored Long-Term Ecological Research (LTER) conducted at the Bonanza Creek Experimental Forest (BCEF). The BCEF-LTER seeks to understand the Alaskan boreal forest as an integrated regional system in which climate, disturbance regime, and ecological processes are interactive components, with the objective to document the controls over these interactions and their ecological consequences. Research focuses on four major disturbance types—fire, flooding, forest harvest, and beetle outbreaks—and is organized around three major themes—forest dynamics; changing boreal carbon cycle; and landscape controls over a changing disturbance regime. These themes operate at different scales and have key societal relevance but require improved understanding of the basic scientific processes.

The BECRU is located within the Ecosystem Processes Program Core. Areas of study include:

- Understanding interactions between climate, disturbance, and ecosystems in central and northern Alaska;
- Developing conceptual and real models of multiple spatial and temporal scales of patterns in Alaska vegetation; and
- Leading cooperative research at the Bonanza Creek Long-Term Ecological Research site.

Invasive Species and Floodplain Wildlife Habitat

Alaska's glacial rivers are dynamic, with frequent changes in water level and river course. Floodplains are constantly in flux, and recently deposited surfaces have been found to be susceptible to invasion by certain exotic plant species. These sites are often highly productive with lush plant growth, which makes them prime habitat for moose, an ecologically and economically important species in the state. Such floodplain surfaces are often dominated by willows, an important

browse species for moose. In interior Alaska, for example, the Tanana Flats supports more than 15,000 animals, or more than three moose per square mile. The willow stands along the Tanana River provide critical winter forage for this population. However, in a survey of floodplain plant species composition, scientists found sweet clover, an invasive flowering plant belonging to the pea family, invading the floodplains of three Alaskan rivers, moving from south to north. Sweet clover has come to dominate the lower reaches of the Stikine River in southeast Alaska, is a major component of portions of the Matanuska River floodplain in south-central Alaska, and has been detected in small amounts on the floodplain of the Nenana River in interior Alaska. Although sweet clover has not yet been found on the floodplains of the Tanana or Yukon Rivers, it is common along roadsides that cross or are adjacent to those habitats. As sweet clover invades and establishes itself on the floodplains of Alaska's major river systems, significant changes in critical moose habitat may occur. Because of concerns that sweet clover may replace native floodplain species, research has begun to examine competitive interactions between sweet clover and willows to better understand potential effects on native plants, wildlife forage, and habitat quality.

Bonanza Creek Experimental Forest

The Bonanza Creek Experimental Forest is an ecological research forest in interior Alaska. The BCEF and the Caribou-Poker Creeks Research Watershed are the only two boreal forest research facilities in the boreal forest, or taiga, zone of Alaska. The forest provides a place to conduct ecological and forestry research, unencumbered

by other management objectives. BCEF is leased to the PNW Research Station by the State of Alaska. University research activities are coordinated through the Boreal Ecology Cooperative Research Unit (BECRU) formed through a cooperative agreement between the University of Alaska and the USDA Forest Service.

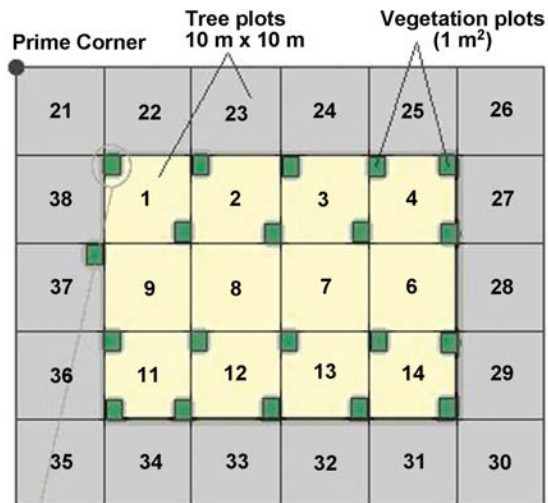
The majority of the research being conducted at BCEF is organized under the Bonanza Creek Long-Term Ecological Research (LTER) program. The LTER research program at BCEF is designed to study ecosystem structure and function by examining controls over successional processes in taiga forests of interior Alaska. This study tests hypotheses in two successional sequences; three replicates each of six successional stages of primary succession on the floodplain of the Tanana River and three stages of succession following wildfire on south-facing slopes in the uplands. The Bonanza Creek LTER program focuses on improving our understanding of the long-term consequences of changing climate and disturbance regimes in the Alaskan boreal forest. Its overall objective is to document the major controls over forest dynamics, biogeochemistry, and disturbance and their interactions in the face of a changing climate.

The forest dynamics theme addresses successional changes in population and community processes following disturbance, emphasizing the relative importance of historical legacies, stochastic processes, and species effects in determining successional trajectories and the sensitivity of these trajectories to climate. Changes in the carbon cycle during succession hinge on changes in forest dynamics and other element cycles, but they also influence nutrient availability and microenvironment and therefore successional changes in forest dynamics. Regional and landscape control over disturbance regimes focuses on regional and landscape processes that are responsible for the timing, extent, and severity of disturbance.

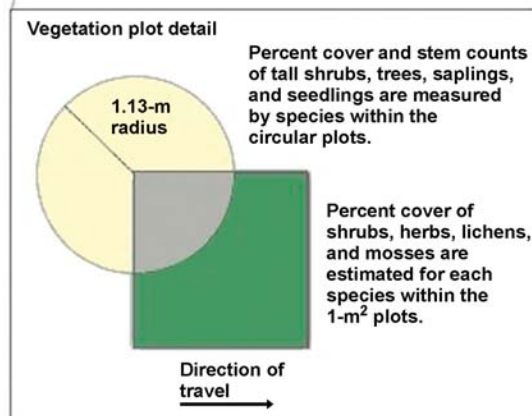
The research design uses experiments and observations in intensive sites in three successional sequences (floodplains, south-aspect uplands, north-aspect uplands) to document the processes that drive successional change. The regional context for these intensive studies is established by analysis of ecosystem processes in two large regions, one in a relatively uniform region in interior Alaska and a second along a climate gradient from the warmest to the coldest areas in Alaska. Species effects on ecosystem and landscape processes explores how species characteristics and

Location of the Bonanza Creek Experimental Forest, site of the Bonanza Creek Long-Term Ecological Research project.





Plot is shown with a left azimuth configuration. The layout is reversed in a right azimuth configuration.



Bonanza Creek Long-Term Ecological Research plot layout.

diversity influence biogeochemistry and disturbance regime. Spatio-temporal scaling provides the conceptual basis for linking process and pattern. Ecosystem sustainability explores how the positive and negative feedbacks that operate within ecosystems influence the sensitivity of ecosystems to perturbations such as changes in climate and disturbance regime.

Research at this LTER site has contributed substantially to understanding the relationship between “independent” state factors and internal ecosystem dynamics in causing successional change in the boreal forest of Alaska. Major findings of the program include the following:

- Species effects are strong in the boreal forest.
- Successional changes in species composition are not a simple consequence of changes in competitive balance but involve species-driven changes in biogeochemistry and the physical environment.
- Vertebrate herbivores are a powerful force driving successional change through their

effects on plant competitive interactions and biogeochemistry.

- Succession influences exchanges of CH₄, CO₂, water, and energy in ways that could feed back to climate.

This research on succession raises important questions about the broader regional context in which succession occurs. The current phase of LTER addresses the question: How do changes in climate and disturbance regime alter the functioning of the Alaskan boreal forest?

Natural Resources Conservation Service

The Natural Resources Conservation Service (NRCS) cooperates with and provides assistance to private, Alaska Native, state, and Federal landowners. NRCS field office personnel and other cooperating agencies in Alaska work together to provide technical resource planning and application assistance to landowners, users, and planners. Coordinated resource management plans, allotment management plans, or interim plans are developed. Engineering assistance is provided to individual landowners and managers and to Alaska Native villages, both to assist in sound resource management and to assist in overcoming natural threats including flooding and accelerated coastal and stream erosion. Soil data are collected, with maps and interpretations prepared for private, Alaska Native, and government lands in Alaska. The NRCS provides assistance to all landowners with USDA Farm Bill programs. NRCS also cooperates with the University of Alaska Fairbanks and the Pacific Northwest Research Station with research on permafrost soils and wetland soils.

The research activities of the NRCS are done in cooperation with several universities. The major joint project is monitoring soil temperature and moisture, along with several above-ground parameters, to study changes to the active layer and other possible changes that may be taking place as the level of atmospheric greenhouse gases increases, creating possible global warming. Sites have been established along the Dalton Highway in the area of Barrow and other locations in Alaska. Similar sites have been established in the Himalayas and in Antarctica. At each of the sites the soils are sampled and completely characterized (chemical, mineralogical, and physical properties are measured). The soil moisture data are being reviewed to see if there is any warming and if the thickness of the active layer is changing. Early data suggest

that the active layer thickness is increasing, which may suggest warming. Longer-term monitoring will be needed to see if this trend continues. Soil climate monitoring stations were maintained and/or upgraded throughout the state. Sites are now established on the North Slope, in western Alaska, and along the populated road/rail corridor extending from Fairbanks to Homer. The data collected at all soil climate monitoring sites in Alaska are also being incorporated into USDA's overall national study on global climate change. Wetland soil study sites have also been established in southeast Alaska. Data from these sites will be used to help develop an Alaska-specific field manual for wetlands covered by the Clean Water Act. Several of the sites are now connected to a USDA telemetry network so that the analyzed data are readily available.

Alaska NRCS Snow Programs

The NRCS Alaska Snow, Water and Climate Services is a highly collaborative network providing monthly, daily, and hourly information. The monthly information is available in published Basin Outlook Reports, where more than 200 snow courses and precipitation gauges are measured across Alaska. Historical snow course data are available from active and discontinued snow course sites in Alaska and the Yukon Territories. Various analyses are available in the form of snow-pack maps, reports, and precipitation reports. Raw daily and hourly information may be obtained from 31 SNOTEL (SNOW TELEmetry) sites. The information from these sites varies. The site sensors may have temperature (current, maximum, minimum, and average), precipitation, snow water

equivalent, snow depth, wind speed and direction, relative humidity, solar radiation, and soil temperature/moisture.

NRCS information helps landowners and communities select the best sites for homes, schools, airfields, roads, landfills, and agriculture. Soil surveys provide a scientific inventory of soil resources for making maps and identifying physical and chemical properties of soils, as well as supplying current information on potential uses and limitations of each soil.

Alaska Major Land Resource Area Soil Survey

The Alaska MLRA Soil Survey Office coordinates the collection of soils and related natural resource data for Alaska. This office is one of 17 offices nationwide coordinating soil survey data. All work is done in partnership with other Federal, state, and local agencies, as well as private landowners and community groups. This partnership comprises the National Cooperative Soil Survey (NCSS). The data and associated information assistance are provided to the public to aid in wise land use management and planning. The Alaska MLRA Soil Survey Office also coordinates the Alaska portion of the National Resource Inventory (NRI). This inventory is an on-going effort to monitor the changes and trends in natural resource use and condition over time.

The new Web Soil Survey site provides public access to the national soils information system. This web site allows online viewing of soil survey maps and reports. This new application greatly enhances access to information on soils. The site operates similarly to Internet sites that provide locator and directional information.