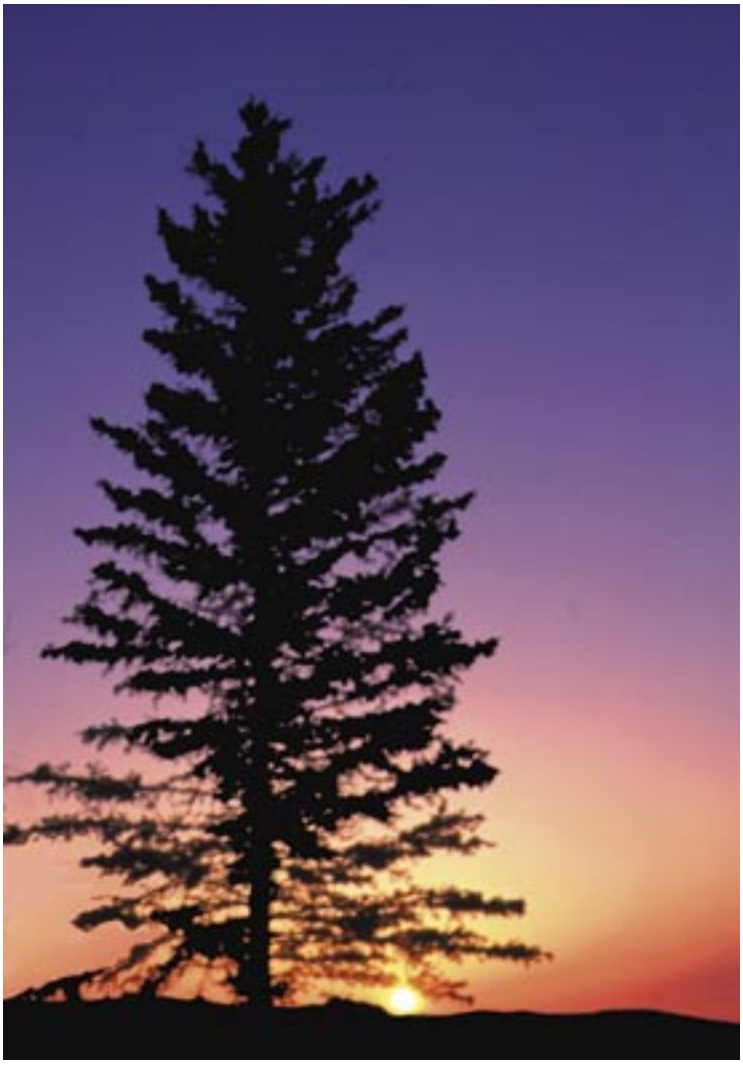
Working for Alaskans: a wealth of knowledge

School of Natural Resources and Agricultural Sciences
Agricultural and Forestry Experiment Station



school of natural resources and agricultural sciences

This publication highlights some of the research, instruction, and outreach programs of the School of Natural Resources and Agricultural Sciences (SNRAS). If you are acquainted with us, you will notice our name change and the recent addition of the geography department. Our research arm remains the Agricultural and Forestry Experiment Station to assure you of continued research and outreach programs that include traditional agricultural production and forest management.

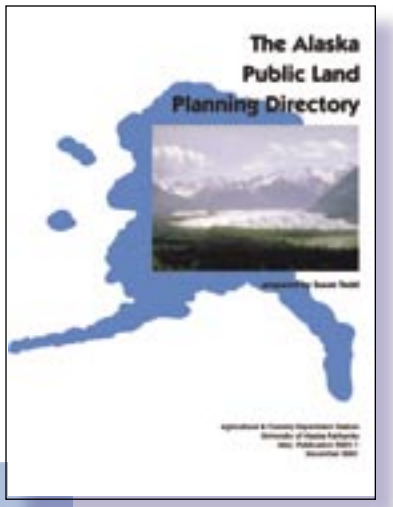
> The mission of the School of Natural Resources and Agricultural Sciences and the Agricultural and Forestry Experiment Station is to generate and provide knowledge that is important for the successful long-term management of natural resources in Alaska and the circumpolar world, and to discover, describe, and interpret the spatial characteristics of the northern regions of the Earth.

Our mission statement reflects our research and outreach traditions, our new name, and new geography partner. It applies to all of the natural resources, including agricultural land and forests. As people become increasingly aware of the need to manage these resources to ensure sustainable industries and resilient ecosystems, our school and experiment station are at the forefront. Along with the biological and physical sciences, our research, instruction, and outreach programs include the social sciences—an innovative combination that allows us to explore the many facets of natural resources management from both ecological and human perspectives. Our faculty reflect this focus with their expertise in the agricultural, forest, and soil sciences, horticulture, range management, revegetation, recreation management, and community development related to planning, policy, and economics. We are here to serve you, our clients and friends. If you have any comments or questions, please contact me or any of our faculty and staff

Carol E. Lewis
Dean of the School of Natural Resources and Agricultural Sciences
Director of the Agricultural and Forestry Experiment Station
University of Alaska Fairbanks

agricultural and forestry experiment station

who's planning Alaska?



Over ninety percent of Alaska's lands are in public ownership, and that means planning by multiple state and federal agencies. A directory to guide people through the resulting maze has been updated and published by the Alaska Agricultural and Forestry Experiment Station and the School of Natural Resources and Agricultural Sciences.

To guide and justify activities on public lands, agencies are required by law to prepare plans. The Alaska Public Land Planning Directory reviews the agencies, their planning goals and processes, their public involvement opportunities, and the plans they have or intend to produce.

Written for anyone with questions on public land management in Alaska, the directory describes the agencies, their mandates, areas of expertise, and contact information.

The directory is meant to help the public and agencies form more effective negotiating teams for planning. The goal is to maximize the effectiveness of plans developed through a fair and cost-effective process and based on the best scientific data available for the sustainable use of natural resources.

The directory was prepared by Dr. Susan Todd, Assistant Professor of Regional and Land Use Planning. It is available from AFES Publications, P.O. Box 757200, Fairbanks, AK 99775-7200, or on the Internet at http://www.uaf.edu/salrm/AFESpubs.html.

global change education

Accelerating environmental change—in weather patterns, air and water quality, permafrost, sea ice and sea level—has raised concern about how people will handle these changes in the future. At the School of Natural Resources and Agricultural Sciences, educators have responded with leadership in global change education, which aims to help children understand their environment and cope with change.

One such initiative is the GLOBE program (Global Learning and Observations to Benefit the Environment). In over seventy Alaska schools, GLOBE has involved teachers and children in watching planet Earth—mapping it, taking measurements, asking questions, and learning how science works by participating in research projects. The idea is that K-12 students can learn science in a meaningful way by participating in environmental research. At the same time, they can contribute extensive and meaningful data that could not be obtained otherwise.

Using age-appropriate methods and modest equipment, they locally take measurements related to atmosphere and climate, hydrology, soil, land cover and biology, and phenology (the study of periodic biological phenomena, such as bud burst, flowering, and migration, especially as related to climate).

Public school teachers learn how to lead their students during summer institutes created at the School of Natural Resources and Agricultural Sciences, where the Alaska GLOBE program director also coordinates several related grants.

Worldwide, one hundred countries and 16,000 teachers participate in GLOBE. The goal is enriched science education and a new generation of informed citizens, policy makers, and scientists.

For more information, visit
http:// www.cgc.uaf.edu/Globe/default.html
http://www.uaf.edu/olcg/ or contact Dr. Elena Sparrow, ffebs@uaf.edu.

regional resilience: the IGERT program

Can the desirable features of both the environment and human society be sustained? In Alaska, an innovative graduate program, "Regional Resilience and Adaptation," integrates several disciplines to address this problem. It is part of a national effort to produce new models for graduate learning (the Integrative Graduate Education and Research Traineeship (IGERT) Program).

Studies in regional resilience and adaptation are based on two ideas: major problems facing the world must be addressed at the regional scale; and, no solution will be tenable unless it is ecologically, economically, and culturally sustainable.

Regional understanding requires skills and resources from several disciplines. Ecology, economics, and anthropology are emphasized. Participation by faculty from the School of Natural Resources and Agricultural Sciences ensures a multidisciplinary approach to sustainable resource management.

Improving Alaska's economy, its human and environmental health, and capacity for institutional research and development is the focus of work now underway as a result of Alaska State Senate Joint Resolution 44, which asked UAF and SNRAS to lead this planning effort through IGERT. The graduate students will contribute to this work, and to the Millennium Assessment (Polar Regions Chapter), which focuses on high-latitude sustainable development. In the course of their studies, students also complete individual research projects and contribute to other planning efforts. Faculty participants include professors Joshua Greenberg, Glenn Juday, Scott Rupp, and David Valentine.

Student Thesis Projects

- Human effects on Alaska's fire regime
- Development and avian ecology of North Slope ravens
- A sustainable development plan for the Fairbanks North Star Borough
- Indicators for sustainability in the Tanana Valley region: an ecological economic approach
- Large-scale forest dynamics; fire cycles, carbon dynamics & climate change
- Moose population dynamics, genetics, and hunting patterns
- Modeling land-use patterns
- Marine policy and decision making
- Fishery economics; economic & fishing anthropology in western Alaska
- Local resources and sustainability in rural Alaskan communities
- Effects of moose on plant browse species in the Rosie Creek burn
- Yupik oral histories and landscape ecology
- Subsistence practices and incentives for change among reindeer herders
- Complementary ways of knowing & holistic understanding; traditional ecological knowledge and science of whitefish
- Can co-management be implemented within ANILCA?
- Myco-scopic perspective on Beringian history

For more information visit http://www.regional-resilience.uaf.edu.

soil carbon in northern soils

New research on northern soils is providing important information about quality and quantity of organic matter in the soil and soil respiration, which occurs as roots and micro-organisms take in oxygen and release carbon dioxide. Soil respiration is the second-largest factor in the carbon cycle, a fundamental process that distributes carbon throughout land, atmosphere, and oceans.

About one-third of Earth's soil organic carbon is locked in tundra and boreal soils because of cold temperatures. Discovering the sensitivity of these soils to temperature is vital to understanding their role in the carbon cycle and global climate change.

To study winter soil respiration, scientists at the Palmer Research and Extension Center sampled a wide range of arctic soils from 88 sites spanning hundreds of miles. They determined organic matter properties of each sample, then incubated them at low temperatures and measured carbon dioxide respiration.

Respiration rates varied considerably, depending on the sample's organic content and whether the temperature was a few degrees above or below zero degrees centigrade (4°C and −2°C). These soil respiration rates suggest that small changes in temperature will alter soil respiration throughout the soil active layer.

The research, "Soil organic carbon and CO_2 respiration at subzero temperature in soils of arctic Alaska," was published in the *Journal of Geophysical Research*, January, 2003 by authors Gary Michaelson, research associate, and professor of soil science Chien-Lu Ping.

For more information contact Dr. Ping at pfclp@uaa.alaska.edu.

forest growth & yield

Active management of Alaska's forests requires information about growth, yield, and productivity. Creating this knowledge base is the target of ongoing research at the School of Natural Resources and Agricultural Sciences, through the Growth and Yield program of the forest sciences department.

A data base is necessary to provide information that will lead to cost-effective prescriptions for active forest management. This information can be used to assess potential fiber production, prepare habitat prescriptions, and estimate biomass and carbon uptake by trees—in short, multiple use of Alaska's forest lands.

Permanent sample plots provide a long-term continuous inventory of forest stand conditions. With the goal of a network throughout Alaska's northern forest, 471 plots representing 134 sites have been established.

Forest productivity is assessed using site index curves, which are not available for all Alaska forest species, and some existing curves are old and suspect. New curves for balsam poplar have been published and those for birch and aspen are in progress.

Information from the permanent sample plots is needed to predict stand volume (total and commercial), biomass, standing fuel, and carbon sequestration. This information will improve timber sale cruise efforts, flexibility in marketing trees, management forecasts of growth and yield, and the potential for multiple use of the forested lands in Alaska.

For more information, contact Dr. Ed Packee, ffecp@uaf.edu.

new crops & markets

Because over half of farm receipts in Alaska are from the horticultural industry (greenhouse, field, and landscape businesses), research is directed toward developing new crops and new markets for this segment of the agricultural industry.

Although a welcome winter sight, flowers and berries imported to Alaska often have a short shelf life or are of poor quality. Improving local production through research on such factors as day length, light quality, and temperatures will enable growers to market small fruits and flowers to restaurants, stores, and directly to consumers.

Economic production in a controlled environment requires efficient use of space and utilities, and knowledge of light requirements for bloom and fruit set. Spectral energy distribution studies suggest that current technology and commercially available light sources are suitable for producing high-yield crops.

Simple technical modifications of traditional systems can yield significant crop improvements. For example, research has shown that adding incandescent lamps to improve the spectral distribution improves growth. Knowing and using lighting recommendations (optimal amount, daily duration, and quality) increases opportunity for year-round production of perishable, high-quality produce and ornamentals.

For more information, contact professor Meriam Karlsson at ffmgk@uaf.edu.

rural industry support

Reindeer now are at home on the ranch as well as the range. Supporting both herders and ranchers is the Reindeer Research Program at the School of Natural Resources and Agricultural Sciences, which aims to help them sustain profitable meat and antler production.

Alaska Feed for Captive Reindeer: A participating rancher cut feed cost in half using a diet developed by the program and tested on the campus herd. Alaska-grown barley and fish by-products are a cost-effective and nutritious feed.

Reindeer-Caribou Interactions: The migration of large numbers of caribou back into Northwestern Alaska, and resulting reindeer runaways has prompted research on several fronts. Herders on the Seward Peninsula can now keep track of their animals using a system of satellite telemetry integrated with the Internet, a development one herder praised as the best thing to happen to the industry since the advent of the snowmachine. Under study are how caribou grazing affects the reindeer range and how to best help herders respond to large-scale changes. One result has been recognition of the need for more intensive herd management.

Herd Management: Better animal management techniques benefit ranchers and herders alike. Reproduction research recently published by professor Milan Shipka includes calving management and estrous cycling and bull management to increase calf survival.

Economics: Long-term strategies for the reindeer industry will benefit from economic analysis conducted by professor Joshua Greenberg. Data collected through interviews and surveys recently was used to create an IMPLAN-based regional economic impact model for evaluating the effects of various alternative policies and economic scenarios on the reindeer industry, region, and state.

Visit the Reindeer Research Program at http://reindeer.salrm.uaf.edu. Greg Finstad is the program director.

remote sensing training

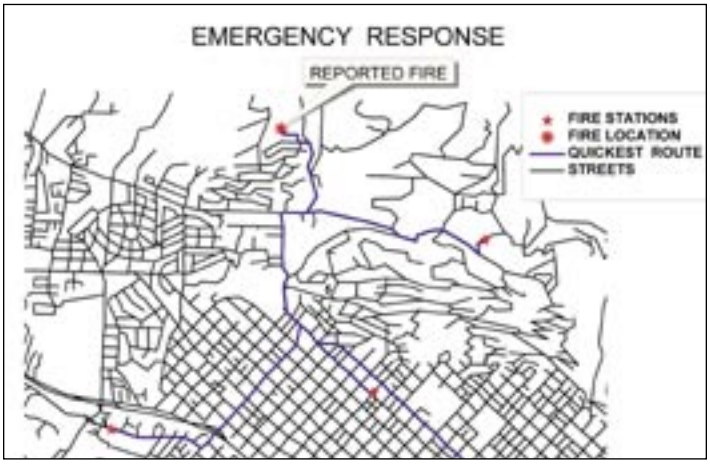
Real problems are solved by Alaskans and thousands of people worldwide using Geographic Information Systems (GIS) technology. GIS is software for computer mapping systems that link geographic information (where things are) with descriptive information. Users create information products to improve decision-making, productivity, and efficiency.

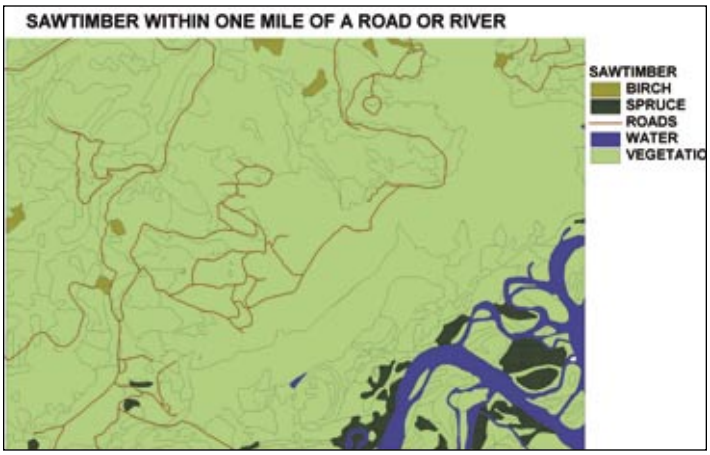
Alaska students and professionals are trained to use GIS at the School of Natural Resources and Agricultural Sciences, where the technology is applied to research concerning the sustainable use of the state's resources.

For any geographical area, a GIS can present many layers of information: one layer could represent all the lakes, another all the roads, a third all the towns. What information layers are combined depend on the user's purpose—finding the best location for a new resort, monitoring regional vegetation, improving a transportation system. The user can combine all the layers of available information, then turn them off and on, depending on what combination is desired.

GIS handles three types of digital information. Basic to every GIS product is spatial data (points, lines, and areas) that form the locations and shapes of map features. Tabular data is used to add information that describes a map feature (customers' locations linked to information about them, for example). Image data from satellites, aerial photographs, or anything scanned and converted from paper to digital format also can be used to build maps.

For more information contact Dr. David Verbyla, ffdlv1@uaf.edu.





Putting GIS to Work

- Foresters use maps with such data as property boundaries, vegetation, soil analysis, roads, contours, watershed, and sensitive areas.
- The pipeline industry uses GIS products for route planning and construction, operations, market analysis, and reporting.
- GIS supports oil company exploration, operation and maintenance, production, and management of land leases, the environment, and data.
- Governments use GIS to plan land use, transportation, public facilities and services such as law enforcement, fire protection, and health care.
- Natural resource managers monitor biological resources, plan and manage such problems as insect infestations, coastal erosion, and wildfire danger.
- Research on the effects of global warming, such as sea level rise, glacial melt, and changes in vegetation is supported by GIS.
- Utility systems use GIS for customer service, emergency response, distribution, maintenance, network tracing, flow analysis, and other aspects of engineering, operations, administration, and finance.

contacts

For more information contact:

School of Natural Resources and Agricultural Sciences
Agricultural and Forestry Experiment Station
P.O. Box 757200
University of Alaska Fairbanks
Fairbanks, Alaska 99775-7200

Web site: www.uaf.edu/salrm
E-mail: fysalrm@uaf.edu

Dr. Carol E. Lewis, Dean and AFES Director: (907) 474-7083

Departments
Forest Sciences: (907) 474-7188
Geography: (907) 474-7494
Plant, Animal, and Soil Sciences: (907) 474-7188
Resources Management: (907) 474-7188

Publications Office: (907) 474-6923
fynrpub@uaf.edu
Information for Students: (907) 474-5276
fnbjp@uaf.edu

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school of natural resources and agricultural sciences agricultural and forestry experiment station

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Forest Sciences
Geography
Plant, Animal, and Soil Sciences
Resources Management

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Natural Resources Management, B.S.
Options:
Forestry; Plant, Animal, and Soil Sciences; Resources
Geography, B.A.
Geography, B.S. (Environmental Studies)

Graduate Degrees:
Natural Resources Management, M.S.
Doctoral studies (interdisciplinary)

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FAIRBANKS

Students may develop individualized programs that complement their interests and draw upon the faculty's expertise. Programs emphasize preparation for careers in high-latitude environments. Courses and curriculum were developed in cooperation with groups and agencies that work professionally with resource management in Alaska. Students have opportunities to gain hands-on experience: state and federal agencies such as the Alaska Department of Natural Resources and the U.S. Fish and Wildlife Service contribute significantly to the instructional program by providing guest lecturers, internships, and field work opportunities for students. Internships and field work for credit can also be arranged through nongovernmental organizations.