

FAIRBANKS EXPERIMENT FARM

*report on research &
operations 2009:*

- agronomy: barley, biomass, fertilizer, and sunflowers
- horticulture: Controlled Environment Agriculture Laboratory, Georgeson Botanical Garden
- animal husbandry: Reindeer Research Program
- student research
- partnerships

**agricultural & forestry
experiment station**



A ProCut sunflower (*Helianthus annuus*), growing in a high tunnel at the Fairbanks Experiment farm, 2009. Dr. Meriam Karlsson tested sunflowers for response to short day length. See story p. 14.

FARM REPORT 2009

Another growing season (the 103rd) has come and gone at the Fairbanks Experiment Farm, and now the 104th is fast approaching. Two words that describe the summer of 2009 best are: hot and dry.

Forty-five acres of cropland were used to produce Albright barley for reindeer feed. Bromegrass hay grown on the farm is also used as part of the reindeer ration. Fallowed land, forest, and research studies make up the remainder of the farm's 260 acres of cropland. The resulting crops will feed the farm's seventy-eight reindeer for a year. Each summer the farm grows enough grain for a two-year supply so there is uniformity in the reindeer diet. Seed is set aside for next year.

Because of the extreme temperatures, hay production was 70 percent down from the norm. Rather than the one to 1.5 tons usually harvested at each of two cuttings, only a half ton was produced. The yield was about two tons per acre.

Research at the farm includes work on grains and oilseeds, biofuel sources, controlled environment production techniques for various crops (apples, lettuces, peppers, raspberries, snap beans, strawberries, sunflowers), horticultural crop variety trials (flowers, herbs, vegetables), marketing and growth of niche crops such as berries and peonies, and alternative livestock (reindeer) reproduction, husbandry, and meat treatment. The farm is the site of regular tours and kindergarten through high school educational programs for children and teachers alike.

RESEARCH

AGRONOMY

Grain and oilseed variety trials

VARIETY TRIALS ON small grains have been a part of the research of the Alaska Agricultural & Experiment Station (AFES) since its beginning in 1898. Grains studied over the last century have included barley, buckwheat, camelina, canola, mustard, oats, rye, triticale, Sunwheat, and wheat, among others, at research sites across the state. This ongoing research provides information on new and better adapted agronomic crop varieties and their response to dryland farming conditions and harvest methods at Fairbanks, Delta Junction, and Palmer. It also provides a database for local producers to determine the economic viability for those crops. The USDA's Agricultural Research Service (ARS) has been a longstanding partner in this effort, developing and releasing many varieties of grain to the public, and creating useful varieties for further research at AFES.

Researchers at AFES released two new varieties this year and have received publicity statewide and beyond about Sunshine Barley and the Midnight Sun-flower.

The Fairbanks Experiment Farm was established in 1906 by the US Department of Agriculture as an Agricultural Experiment Station.

Ripe Sunshine barley growing in the fields of the Fairbanks Experiment Farm.



SUNSHINE HULLESS BARLEY

The “naked” barley is a hulless type featuring a tough inedible outer hull that loosely adheres to the kernel. Hulless barley is not truly without a hull, but it requires little or no processing to remove the hull, as it is attached so loosely to the seed that it easily falls off during harvesting. Research that eventually led to the creation of the variety Sunshine began in 1993—barley has been studied at AFES since practically the beginning of work at the station. Research Assistant **Bob VanVeldhuizen** has been working on the new barley variety for many years, with other researchers on the quest to create a hulless variety for Alaska conditions along the way. Rosco Taylor of ARS was the primary plant breeder for many years, and created the parent varieties that **Steve Dofing** used when he started the process fifteen years ago. Then **Charles Knight** took up the work. Using Thual as the parent seed, Dofing crossed the barley with a Finnish variety (JO1632) to improve straw strength, as Thual tended to produce weak stalks which fall over in the field, scattering the grain on the ground.

Dofing spent many days peering through microscopes to learn everything he could about all aspects of the grain. Once the trials passed the greenhouse research phase, fields were planted at the Fairbanks Experiment Farm, the Matanuska Experiment Farm in Palmer, and the Delta Field Research Site.

This early-maturing, non-waxy barley is specifically adapted to northern environments. Sunshine yields nearly 2,500 pounds per acre and good test weights of 57 pounds per bushel.

Kitchen tests followed the field trials, with Cooperative Extension Service testing twelve barley varieties. Nutrition expert and Food Sciences Specialist Kristy Long determined that Sunshine was indeed a marketable product, easy to mill, with a nutty flavor, and containing an abundance of nutrients.

“We want to show growers the possibilities of uses for Sunshine barley,” VanVeldhuizen said. “In Alaska you almost



Bob VanVeldhuizen with grain grown at the Fairbanks Experiment Farm. Photo by Todd Paris, UAF Marketing.

have to create the product yourself as we don't have industries to do it.” He foresees some demand for the grain from health food enthusiasts. “I doubt there will be 100,000 acres of it in Alaska but I see a niche,” he said. “There will be small acres, small plots. And the demand might increase once people see it's great.”

Foundation seed is available through the Plant Materials Center, Alaska Department of Natural Resources in Palmer. Breeders' seed is maintained by AFES.

NEW SUNFLOWER

AFTER SIXTEEN YEARS of selection, a new oilseed sunflower variety adapted to interior Alaska growing conditions has been announced. Midnight Sun-flower is an open pollinated selection made from a sun-wheat variety (a dwarf hybrid sunflower) that was originally planted in 1993. This selection was unofficially released as 'Midnight Sun-flower' to local gardeners in spring 2008 as a potential agronomic and horticultural oilseed crop, primarily for the wild birdseed market.

Sunflowers (*Helianthus annuus* L.) are annual broadleaved plants that can grow five to twenty feet tall. They have stout, rough, and hairy stems one to three inches in diameter topped by a seed head that is three to twenty-four inches in diameter. The heads have many small, cross-pollinated flowers surrounded by pointed scales and forty to eighty yellow rays. Wild sunflowers or horticultural varieties may have multiple branched heads from a single stalk. There are two types of sunflowers that are grown as an agronomic crop. Those that have black or dark brown seed are grown for the oil content, and those with white stripes on the seed are grown for the confectionary market. Both the heads and the leaves of sunflowers track the sun during the day and tilt upward at midnight. This phenomenon is called nutation and continues every day until the end of the flowering stage.



Midnight Sun-flower at the Fairbanks Experiment Farm. In the photo at left, one can see that some heads have been covered with mesh bags to prevent birds from eating the seed.



About half of the dried weight of sunflower heads is seed. The whole seed contains about 24 to 45 percent oil. Only about 20 to 35 percent oil can actually be expressed from the whole seed. Sunflower oil is obtained by a combination of expressing and solvent extraction. The remaining oil cake meal contains about 35 percent protein, which is used as a livestock feed. Sunflower oil is mostly polyunsaturated and is used in the edible oil market. It also is a semi-drying oil that is used in the manufacture of soaps and paints. Whole oil seed is used as a feed for poultry and caged and wild birds. Confectionery seeds are either eaten raw or roasted. In Alaska, oilseed sunflowers have been grown on limited acreages off and on for many years, primarily as livestock forage and secondarily as oil and confectionary seed for the local birdseed market.

Starting in 1993, seeds were collected from the earliest maturing heads of a sun-wheat variety in the Fairbanks area. These



Dr. Stephen Sparrow smiling for the camera in the fields of the Fairbanks Experiment Farm. Photo by Todd Paris, UAF Marketing.

seeds were hand threshed, cleaned, and planted in test plots the following season. This process has been repeated every year since then. Since sunwheats are hybrid varieties and all sunflowers are open pollinated, there was considerable variation in the following year's crop. However, continued selection for early maturity has resulted in a more uniform, open pollinated sunflower that closely resembles the Canadian Sunola varieties. To date, the plants are quite dwarfish, 20–24 inches tall, and with head diameters of close to 6 inches. It matures 7 to 10 days earlier (an average of 83 days from planting) than the earliest sunwheat varieties and 14–20 days earlier than common sunflower varieties. This produces acceptable yields of around 350–400 lbs/acre, much better than that of the earliest sunwheat varieties. Because this is an open-pollinated selection there is still considerable variability among plants.

Biomass

PROFESSOR STEPHEN SPARROW is exploring the cultivation of shrubs and grasses as potential biomass crops for fuel in Alaska. Willows are among the first woody species to colonize new flood plains; they grow prolifically for four or five years, and are followed by alders (five to ten years) and then balsam poplars, which mix with the alders and dominate for around 100 years after a floodplain is created. White spruce will follow (provided no new flood washes out the previous growth) and remain as the dominant forest for 200 to 300 years, and then are followed by black spruce.

The purpose of this research is to screen various trees/shrubs, perennial grasses, and perennial forbs as potential bio-energy crops for Alaska and to determine best management practices for efficiently producing bio-energy crops.

Replicated plots with three native Alaska woody species, feltleaf willow, Pacific willow, and balsam poplar, are being studied, along with ten woody species, including willows, birch, and alders, which were established in single rows. Fourteen herbaceous species, including indigenous and non-indigenous grasses and forbs, were planted in replicated plots. Bromegrass appears to have higher yield potential than the native species.

Darleen masiak, a research technician working with Dr. Stephen Sparrow, standing in a plot of willows being tested for woody biomass potential at the Fairbanks Experiment Farm.



Farmed biomass may be a viable option but research continues on:

- Which species of willow or other trees, shrubs, forbs, or grasses will grow the fastest and produce the largest amount of biomass?
- How long should the woody plants grow before coppicing?
- How much biomass will they produce in three, five, or eight years?
- What types and levels of fertilizers will they need?
- What is the best way to plant the chosen species?
- How much weed control is required? Which weed control systems will leave the biomass species unharmed?
- When is the best time to harvest the biomass? In the fourth year? During the fall or winter?
- How much is a power plant willing to pay per ton? Is it cost effective to grow woody biomass as a cultivated crop?
- When is the best time of year to harvest for biofuel use?

Biomass production potential and the costs of production, harvesting, transportation, and processing need to be examined before Alaskans can know whether this option is viable.

Fertilizer

ASSOCIATE PROFESSOR MINGCHU Zhang and Dr. Sparrow are testing a urea inhibitor to reduce ammonia fertilization loss as a gas. Their phosphorus fertilizer trial is determining the rate and application method to optimize phosphorus use efficiency. Zhang is also conducting studies with fish as a fertilizer. Fertilizer treatments have been tested on smooth brome grass at the farm since 2004. The objectives of the research are to determine 1) optimal hay yield and quality from high and low nitrogen application rates in combination with two different cutting times; and 2) the fate of applied nitrogen fertilizers. The results so far show that a low nitrogen fertilizer application rate and two cutting times can yield high-quality brome grass hay biomass. Dr. Zhang's research will help to develop fertilizer recommendations for reindeer pastures and to improve the efficiency of nitrogen fertilizer use.

*Dr. Mingchu Zhang has been examining fertilizer treatments at the Fairbanks Experiment Farm.
Photo by Todd Paris, UAF Marketing.*





HORTICULTURE

CONTROLLED ENVIRONMENT AGRICULTURE LABORATORY



A view of the interior of the Controlled Environment Agriculture Laboratory.

An exciting project at the farm is the **Controlled Environment Agriculture Laboratory (CEAL)**. Simple to highly advanced controlled environment systems—from temporary cold frames and high tunnels to facilities using technology developed for space exploration and missions to Mars—can be adapted to Alaska’s regional conditions to improve production of vegetables, berries, and floral crops. Ongoing research at CEAL investigates plant requirements, varieties, and treatments to maximize productivity for growers. Unlike a greenhouse, the closed laboratory allows for precise control of lighting, temperature, humidity, and nutrients, so that different varieties and various treatments can be tested. This facility has approximately 1,500 square feet of growing area using only artificial lighting. Various lamp types, combinations, and arrangements are being evaluated here as they apply to northern greenhouse and controlled environment conditions.

Apples

SNRAS PROFESSOR MERIAM Karlsson and the UAF Cooperative Extension Service are growing apples in high tunnels at the farm. This was the second harvest for the research project, that tests the effect of unheated high tunnels on the survival rate and yield of apples, berries, and other fruit trees in extreme cold conditions.

Professor Karlsson and **Kendra Calhoun**, an Extension research technician, are continuing the research begun by the late **Bob Wheeler**. They are testing thirty-nine apple varieties in the high tunnels, which measure 42 feet by 96 feet.

Calhoun helped erect the tunnels in May 2007 and she and two students with the Rural Alaska Honors Institute planted more than 200 trees two months later. The apple varieties tested are those known to grow in colder climates: Arctic Red, Carroll, Ukalskoje, and Golden Uralian. The varieties were grafted onto rootstock of the Ranetka crabapple, which is known for its ability to withstand cold winters.

The continuing project is evaluating trees grown inside and outside of the high tunnels. Two weather stations and ten micro-stations record environmental conditions hourly, including the soil and air temperatures inside and outside the tunnels, as well as soil moisture, wind speed, and solar radiation.

The end walls of the greenhouses are erected in mid-October to help preserve the heat inside the high tunnels. During winter, temperatures inside the greenhouse averaged 10 to 15 degrees higher than the outside temperatures, but soil temperatures were as much as 20 degrees colder inside, the result of the snow outside insulating the ground.



Meriam Karlsson and graduate student Yosuke Okada planting a demonstration garden at the Tanana Valley Fairgrounds.

Despite the colder soil temperatures, 80 percent of the trees grown inside the high tunnels survived both winters. Sixty-eight percent of the outside trees survived the first winter. After January 2009 temperatures dipped to nearly 50 below zero, and only 45 percent of the outside trees survived the second winter.

Apple trees that died the first year were replaced with new seedlings the following year, except for the Asian pear, plum, and cherry trees, none of which survived.

An assortment of berries was planted inside and outside the tunnels, including red and black currants, nagoonberry, and honey berry. The berries outside the tunnels had a higher survival overall than those planted within, which was not too surprising given the lack inside the tunnels of insulating snow, according to Calhoun.

The project is funded by a grant from the Western Sustainable Agriculture Research and Education Program.



Basil growing on the Fairbanks Experiment Farm in field experiments.

In the Controlled Environment Agriculture Lab, researchers have complete control over all light and temperature conditions.

Apples in a high tunnel at the Fairbanks Experiment Farm.



Sunflowers are grown in both field and controlled environment tests at the Fairbanks Experiment Farm by Professor Karlsson.

Growth experiments are done at the Controlled Environment Agriculture Lab on greenhouse-grown horticultural crops such as black-eyed Susans, using energy-efficient light-emitting diode (LED) lamps.

High tunnel research

IN FIELDS AND hoop houses at the farm Professor **Meriam Karlsson** does innovative research on vegetable and fruit varieties, testing everything from snap bean transplant success to the best techniques for growing strawberries.

She focuses much of her research on high tunnels that offer opportunities to increase yield, improve quality, and extend the field season for specialty crops. Under northern conditions with naturally long day lengths and short seasons, high tunnels covered with non-traditional plastic materials may more effectively support crop productivity, and Dr. Karlsson tests the plastics available to determine the best ones for Alaska. Various crops including leafy greens, various types of lettuce, snap beans, peppers, onions, potatoes, and culinary herbs have performed well. The high tunnel results suggest opportunities to produce cultivars not fully adapted to high latitude seasonal conditions.

Sunflowers were evaluated for flowering under field and high tunnel conditions. The results were that making artificially short days by limiting light exposure of seedlings prior to transplanting shortens the time to flowering for some cultivars of sunflower.



Research professional Jeffrey Werner holding a daikon radish grown at the farm.

A dozen potato varieties were tested in documented field trials to determine which cultivars are best suited for Fairbanks. Highest yielding plant was the French Fingerling (29.3 pounds per four-foot row). In the onion patch the highest yielder was the Ailsa Craig (35 ounces per square foot).

Photosynthesis was measured to determine when the process occurs in beans and corn crops. A portable photosynthesis system was used to measure net photosynthetic rates for a 24-hour period in July.

Studies on light emitting diodes are underway at the CEAL to evaluate LEDs as a source of supplemental lighting for greenhouse crops. The use of LEDs for greenhouse production is promising and may significantly increase the opportunities for producing greenhouse crops at high latitudes. Additional studies are necessary to specifically determine plant development and flowering in various greenhouse crops under LED lighting.

Alaska's wild and domestic berries are studied at the Georgeson Botanical Garden for cultivation and analysis of antioxidants.

GEORGESON BOTANICAL GARDEN

ONE OF THE most recognizable assets at the farm is the Georgeson Botanical Garden (GBG). This nationally recognized botanical garden



There are 350 varieties of flowers and 150 vegetable varieties grown at the Georgeson Botanical Garden each summer.



Sarah Bernhardt peony bud. Research into commercial production of peonies, variety suitability, and marketing of Alaska-grown peonies is conducted at the Georgeson Botanical Garden on the Fairbanks Experiment Farm.

is part of the Fairbanks Experiment Farm, and is a member of a national network of educational and research institutions dedicated to plant culture and conservation. The GBG is one of five botanical gardens in the nation to be a satellite test garden for the International Hardy Fern Foundation. Garden staff test more than 1,000 trees, shrubs, and herbaceous perennials for hardiness each year, including Alaska native plants and those collected from China, Russia, and Iceland. The garden serves as a location for variety trials of annual flowers, vegetables, herbs, and fruits, where researchers conduct experiments on new horticultural crops for Alaska's conditions, such as peonies.

The overall vision of the garden is to demonstrate the depth and breadth of responsible natural resources management in Alaska. At one end of the spectrum, there is the intensive land management of agriculture as demonstrated in the annual flower trials, family food garden, and agronomy plots. Native plants are grown along with introduced species to show the diversity of what is possible in Alaska along with best methods of cultivation to conserve soils and water, promote optimum plant growth, and minimize the adverse effects of chemicals and invasive weeds and other pests on Alaska's environment. In the future, Director **Pat Holloway** and her staff will follow guidelines of the national Sustainable Sites Initiative to demonstrate best practices in soils and soil management, water management, appropriate plant selection, and wildlife habitat management to provide a framework for sustainable development in Alaska.

NATIVE SPECIES

In the northern section of the garden, the plants are mostly native species and demonstrate the types of plant materials in Alaska that are suitable for home and commercial landscapes and revegetation. Researchers also explore traditional ethnobotanical plants used by the local Athabaskan communities for traditional food, medicine, dyes, and other creative uses, with an eye toward preserving knowledge, promoting traditions common in Far North communities. Research is also aimed at using energy efficient and sustainable new technologies.

The garden is connected to the North Campus area including the Viereck nature trail that shows management and interpretation of "natural" environments. This area is also a demonstration of management for outdoor recreation and land planning as it has been used extensively for natural resources management classes. This trail will connect with other trails in the North Campus area to show major ecological units of the boreal forest and illustrate the preservation end of the NRM spectrum in the arboretum and Smith Lake Preserve.

Dr. Holloway's goal is for the garden to be the center for horticultural knowledge in subarctic Alaska and provide information to anyone in the circumpolar north interested in growing plants, sustainably managing lands for garden culture, producing plants commercially or for home use, exploring new crops and new markets, preserving traditional plant knowledge, expanding uses of native plants, conserving and

rehabilitating plants on wild lands, and promoting good stewardship of horticultural resources. “We conduct applied plant research that adds to this body of knowledge, and we share results of our efforts through formal and informal education for all ages, published works for the local and scientific community, and internet networking,” Professor Holloway said.

ANIMAL HUSBANDRY

Reindeer

ABOUT EIGHTY REINDEER live at the farm, where they are the focus of intense study. Animal scientists Drs. **Milan Shipka** and **Jan Rowell** focus on reproductive biology and management for alternative livestock such as reindeer and muskoxen. The **Reindeer Research Program (RRP)**, managed by Dr. **Greg Finstad**, concentrates on reindeer herd management, nutrition and meat science. Passersby who slow their cars to gaze upon the creatures most likely do not know that this is the only program of its kind in the nation.

The emphasis of the reindeer research at the farm and elsewhere is applied research for reindeer production. Our animal scientists at SNRAS and AFES also work in cooperation with groups such as the Kawerak Reindeer Herders Association in Nome. Kawerak provides assistance to its twenty-one members in the development of a viable reindeer industry, by enhancing the economic base for rural Alaska and improving the management of the herds. The program offers administrative, logistical, advocacy, and field support toward the development of a self-sustaining reindeer industry.

All the varieties of research must be applicable and useful to the state’s reindeer industry which spreads from the Seward Peninsula (20,000 reindeer) to about 5,000 more living in on the Pribilofs, Adak, and St. George Island.

- An ongoing nutrition project compares nugget bluegrass and smooth bromegrass to determine how each affects milk composition. Nugget bluegrass was chosen as the best pasture grass due to its higher protein content and easy digestibility.
- Another nutrition study works hand in hand with the Matanuska Experiment Farm. The other experiment station in the state, located at Palmer, produces haylage for the reindeer. The smooth bromegrass haylage is mixed with balanced milled rations such as barley, brome, oats, fishmeal, corn, and molasses for testing on two-year-old steers. The experiment, which is proving successful, promises huge potential cost-savings for producers.
- The diets of twenty one-year-old bulls are being supplemented with fish bone meal to see how it changes antler growth.



- Researchers are testing sodium bicarbonate to reduce milkfat depression.
- Fence studies compare free-range systems to controlled environments.
- Precise record-keeping charts the program’s calving, nutrition, meat yield, herd dynamics, breeding protocols, product testing, vaccinations, parasite controls, immunology.
- One graduate student research study is focused on the shelf life of reindeer meat: freezing, storing, and shipping meat to world markets. Others involve non-meat byproducts, antler studies and range management.

RRP is actively involved in K-12 and community outreach efforts, offering tours to schools and groups and taking reindeer for on-site visits. In 2009 for the first time reindeer were included in a 4-H livestock auction (at the Tanana Valley Fair). Reindeer from the farm were allocated to 4-H students and guidance and instruction were offered by the RRP staff.

RRP collaborates with Oregon Health and Science University in an immunology study to help establish normal and abnormal nematological and immunological reference ranges for Alaska reindeer. This allows for future herd health diagnostics and testing of hypotheses concerning pathogens and conditions outside of reference ranges.



Reindeer cows and calves at the Fairbanks Experiment Farm. Photo by Todd Paris, UAF Marketing.

Schoolchildren across the nation help name the reindeer born at the farm.

A very special reindeer calf was born at the Fairbanks Experiment Farm, thanks to Drs. Jan Rowell and Milan Shipka, who are researching reproduction in alternative livestock. The calf is the first reindeer documented to have been produced through artificial insemination using frozen semen.

STUDENT RESEARCH

IN ADDITION TO several summer jobs for UAF students, the farm is an excellent site for student research.

High school summer research

A rural high school student got to try being a budding scientist at the farm, thanks to the High School Summer Research Internship Program funded by the National Science Foundation's Long Term Ecological Research program and co-sponsored by SNRAS, EPSCoR, and IARC.

Kelsie Maslen, a high school senior from Kotzebue, worked with Professor **Stephen Sparrow** in June and July. Maslen tackled a project to determine if treatment with a root substance would improve the rooting of poplar and willow cuttings. She selected the topic because it complemented the work being done by Dr. Sparrow and research associate darleen masiak, who are evaluating the storage effects of cuttings. Sparrow is also studying the potential of willows as a biofuel crop.

The cuttings in Maslen's study were collected while the trees were dormant in the winter, and were stored at 5 degrees Celsius until they



were moved to a greenhouse. Maslen wanted to compare three treatments: no treatment, dry hormodin (rooting inducing substance), and soaking in water for forty-eight hours. Her methods included a 1:1 mixture of perlite and vermiculite, placement in a misting bed in a greenhouse, evaluating weekly for presence of leaves, checking for root growth after four weeks.

Maslen concluded that for the balsam poplar, no treatments affected the leafing and that treating with dry hormodin improved the rooting. For the willow, dry hormodin reduced leafing by the first sample date and also reduced rooting.

Maslen aims for a career in marine science, but said working with plants was a lot of fun. Dr. Sparrow said the internship is a good opportunity for bright rural high school students to learn about science by working with scientists and doing hands-on work. “Kelsie is a good worker and good to be around,” he said.



Kelsie Maslen, a high school senior from Kotzebue, conducted research into root growth promotion of willow and poplar cuttings at the Fairbanks Experiment Farm.

The farm hosts one of the state’s oldest National Weather Service data collection sites, providing accurate weather information for over 100 years.

WSU STUDENT

A parallel study of nitrate levels was simultaneously conducted in Fairbanks and Pullman, Washington, this summer. Washington State University graduate student **Haly Ingle** is at UAF for seven weeks closely examining the effects of the midnight sun and other factors on lettuce and spinach.

Ingle worked with Professor **Meriam Karlsson**, studying how light intensity and duration affect nitrate levels in leaf tissue of different lettuce varieties. The high-latitude Fairbanks site complements a sister site in Pullman where the same varieties are being grown. During several twenty-four hour periods, Ingle will measure nitrate every two hours.



Haly Ingle transplanting lettuce starts at the Fairbanks Experiment Farm.

Ingle grew up in Waitsburg, Washington, and earned bachelor of science degrees in agricultural communications and organic agriculture from WSU in 2008. She is studying toward a master's degree in soil science, and will use the research from Alaska for her thesis.

Ingle is particularly interested in the comparisons between Fairbanks' twenty-four hour daylight growing days and Pullman's diurnal rhythms. "The nitrate content of the plants should fluctuate more in Pullman," she predicted. In Fairbanks, there should be no fluctuations. Most prior research in this arena has been conducted in greenhouses, and Ingle is intrigued by the "unique growing conditions in Alaska."

During the times that she took measurements every two hours she will transported

samples to the lab for grinding, then sent them to Pullman to be processed. Nitrate research is important because nitrogen is the more critical element for plant growth. And nitrate can play either good or bad roles in human health. The European Commission has limited nitrate content for growers, just as the EPA has limits on the amount of nitrates in drinking water. "It's not like it's going to kill you but it's something to keep an eye on," Ingle said.

She prepared the soil in her plots at the Fairbanks Experiment Farm by adding fish meal. Dr. Karlsson was pleased to have Ingle here and looks forward to a SNRAS student doing research in Washington. This project is made possible by the Franklin Distinguished Graduate Fellow, an endowment established by Glen Franklin. Franklin grew up in Washington and worked for the Alaska Division of Agriculture. He donates funds to WSU for agronomic research that solves problems common to Washington and Alaska.

Ingle's advisor, Rich Koenig, WSU Department of Crop and Soil Sciences chair and SNRAS graduate, visited Fairbanks in July. His research and extension program have focused on applied soil fertility issues in cereal-based cropping systems in eastern Washington. Koenig

started the nitrate research with a previous graduate student who wrote four peer-reviewed research articles before completing her degree. Dr. Koenig said he is looking forward to a continued collaboration with Dr. Karlsson, examining agricultural issues common to both states.

PARTNERSHIPS

THE US DEPARTMENT of Agriculture **Agricultural Research Service's Subarctic Research Unit** conducts research at the farm on grasshoppers, beetles, bumblebees, potatoes, agronomic crops, and weeds.

Other researchers are studying swallow migration (Julie Hagelin, in partnership with **Swarthmore College**), high tunnel apple orchards (**Cooperative Extension Service**), poplar genetics and survival (**Institute of Arctic Biology**), measurements of air currents, air flow, and pollution; soil temperatures (**Geophysical Institute**), weather data (**National Weather Service**). **UAF Facilities Services** maintains a tree nursery at the farm for campus-wide landscaping projects and the **UAF Art Department** has three kilns at the farm where ceramics students can fire their pottery.



Agricultural Research Service staff and grasshopper traps at the Fairbanks Experiment Farm. Linda DeFoliart, center, is baiting her trap.



agricultural & forestry experiment station



ABOUT THE AGRICULTURAL AND FORESTRY EXPERIMENT STATION

THE FEDERAL HATCH ACT OF 1887 AUTHORIZED establishment of agricultural experiment stations in the U.S. and its territories to provide science-based research information to farmers. The Morrill Act established the land-grant colleges in 1862. The Alaska Agricultural Experiment Station was not originally part of the Alaska land-grant college system. In 1898, the station was established in Sitka, also the site of Alaska's first experiment farm. Subsequent branches were opened at Kodiak, Kenai, Rampart, Copper Center, Fairbanks, and Matanuska. The latter two remain as the Fairbanks Experiment Farm and the Matanuska Experiment Farm. The USDA established the Fairbanks experiment station in 1906 on a site that in 1915 provided land for the Alaska Agricultural College and School of Mines. In 1931, the experiment station was transferred from federal ownership to the college, and in 1935 the college was renamed the University of Alaska. Early experiment station researchers developed adapted cultivars of grains, grasses, potatoes, and berries, and introduced many vegetable cultivars appropriate to Alaska. Animal and poultry management were also important. This work continues, as does research in soils and revegetation, forest ecology and management, and rural and economic development. The station is administered through the UAF School of Natural Resources and Agricultural Sciences. As the state faces new challenges in agriculture and resource management, the Agricultural and Forestry Experiment Station continues to bring state-of-the-art research information to the people of Alaska.