

MINNESOTA *Science*

Agricultural Experiment Station
University of Minnesota
Spring, 1988

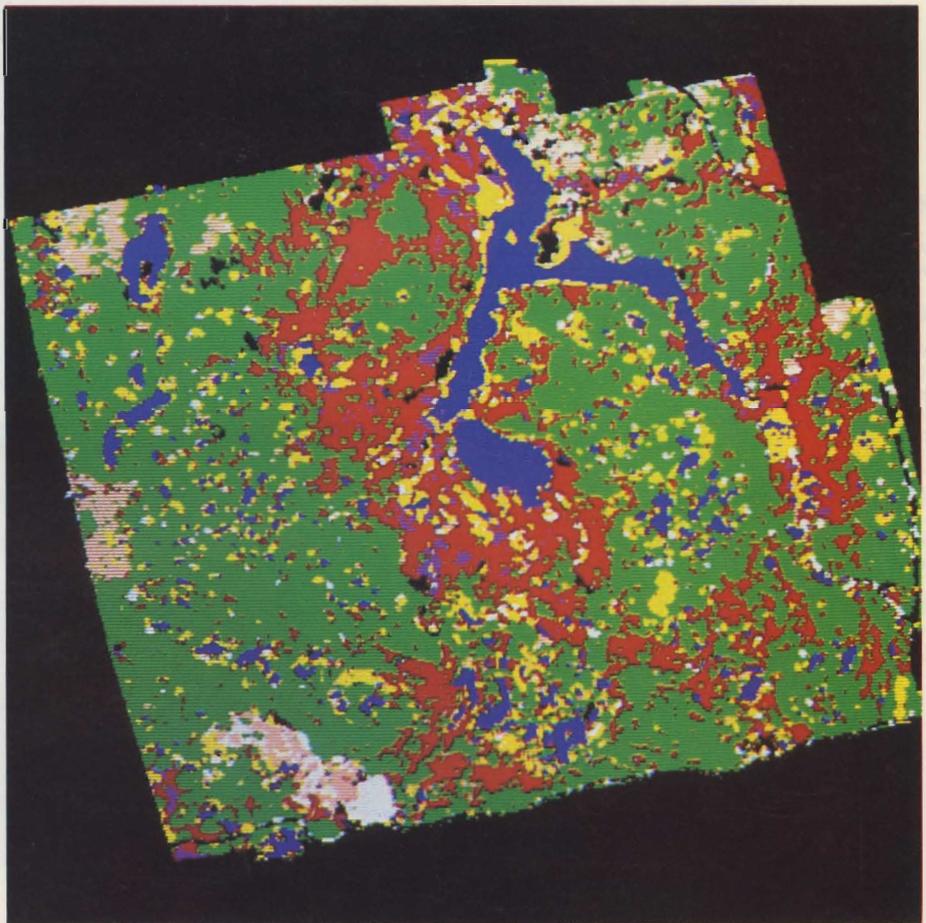
See the Forest for the Trees by Remote Sensing

If you take Minnesota forests as your field of research, you've got your work cut out for you, unless you're Paul Bunyan. Our forests are a large uncharted territory, hard to get around in, easy to get lost in, and impossible to see whole.

So how do you get a good look at them? One way is from 500 miles away, straight up. Satellite imagery of Minnesota forestland is providing some practical, specific detail about this resource. Looking from far away is proving to be a good way to see it up close.

The Agricultural Experiment Station's Remote Sensing Laboratory in the College of Forestry uses satellite images to analyze forest cover. The images come from two satellites. The United States' LANDSAT, and the French SPOT satellite. SPOT produces higher resolution images than LANDSAT, but in a narrower range of light reflectance bands. Researchers can analyze areas on the ground as small as one-quarter acre, while at the same time working over broad areas since each image covers more than 10,000 square miles.

Remote Sensing Laboratory director Marvin Bauer, isn't dazzled by this high technology. He focuses on practical use of the information it gathers.



A satellite image of Itasca State Park as interpreted through computer classification of forest types. Lakes are deep blue, tan shows logged areas, green areas are mixed hardwoods, lowland conifers such as cedar, black spruce and tamarack are violet, and the red areas are upland conifers.

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Bauer says remote sensing has improved dramatically since the first LANDSAT image arrived in 1972: "The images are better. The old technology produced images in which one picture element was 1.1 acre. This second generation sensor has one-quarter acre resolution and additional spectral bands."

In the Remote Sensing Laboratory, the satellite images are analyzed by computer. "The human analyst is an integral part of the classification and

analysis, but as we learn how to extract information from this data, we expect to make the process more automatic," he says. "This digital approach is more quantitative and objective than photo interpretation methods."

Satellite images sense a broad range of reflected light, including visible and near-infrared light invisible to the human eye. This is useful because the varying reflectance spectra of vegetation

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Saving the Prairie

Minnesota has some of the largest expanses of remaining northern tall grass. An important part of Minnesota's land heritage, our native prairie is continually threatened by development. Remote sensing techniques are locating the "savable" pieces of what remains.

University of Minnesota assistant professor Sean Ahearn, working with the DNR, is identifying and characterizing the prairie, seeking the best areas for purchase by the Nature Conservancy. According to Carmen Converse, with the DNR's County Biological Survey, "We also hope that we can identify specific wildlife habitat, such as that of the burrowing owl, so that it can be preserved." Part of a two year study, they've completed mapping Lac Qui Parle County, and will be looking at Big Stone next.

"We've generated a map of the whole county that shows where prairies occur with a relatively high degree of accuracy using LANDSAT imagery," Ahearn says. "We're also getting a handle on the quality of each of the prairies identified."

A high quality prairie has a mixture of native species. Lower quality prairies contain non-native exotic species, such as brome. And the better the prairie, the more diverse the native species are.

Ahearn says that to get all that information, they train a computer: "We find the prairies by first training the computer to identify prairies on the satellite images. This is done by taking a sample on the satellite image of what we know from the ground to be prairie, to generate statistics that relate a cover type (such as prairie) to how light is reflected in each of the spectral bands. This relationship gives us a spectral response that



An example of native tall grass prairie in Lac Qui Parle County. Researchers are identifying these parcels of land using satellite remote sensing techniques to save time and money.

can be used to classify those areas where we have no cover type information. A portion of the known samples are not used in the training process but later used in the accuracy analysis, which is a critical part of every satellite classification.

"The advantage of satellite image classification is that, with relatively few samples, very large areas can be classified." To do this same amount of mapping manually on the ground would take a very long time.

Ahearn has run into some unique

difficulties in classifying prairies from satellite images. "With forest remote sensing you deal with illumination problems due to vegetative height differences and shadows. But with prairie, it's litter. When the grass dies the litter builds up over time, and this complicates the analysis procedure," Ahearn says.

But the researchers are finding ways to surmount this difficulty, and they are pleased that their results so far, reviewed by a DNR ecologist, match data collected on the ground.

—Jennifer Obst

Satellite *continued from front page* can identify both types and amount of vegetation.

"With more vegetation the visible reflectance will decrease, and the near infrared will increase. With these measurements we can discriminate between high and low amounts of vegetation to identify cover types: crop species such as corn or soybeans and tree species such as red pine or aspen. The computer can then easily calculate the area occupied by each," Bauer says.

"The next important thing to determine is the occurrence and degree of stress that vegetation is undergoing. This is also an area of current research," he says.

Bauer believes it's important to keep a watchful eye on changes in Minnesota's forests. "Once a tree stand is established, it may be there 40 to 100 years. But forests do keep changing—they grow and they get cut down, and what grows in that place may be different from what was there before. The last comprehensive statewide inventory of Minnesota forests was done more than 10 years ago. Although it's the volume of timber ultimately that is important, information on forest type and area is critical. A typical question from

"Remote sensing has improved dramatically since the first LANDSAT image arrived in 1972."

the forest industry is, where should a new plant be built, and to answer that

How Good Are Home-Delivered Meals?

For the frail elderly, or those recently home from the hospital, a hot meal delivered to their door is more than a luxury. It's a lifeline allowing them to stay in their own homes and community.

Home-delivered meals programs offer a pretty good product, but could be improved, say two University of Minnesota nutritionists. Agricultural Experiment Station researcher Elaine Asp and extension home economist Mary Darling have completed a five-year study on the quality and nutrition of home-delivered meals.

The popularity of these meal services is growing. "In 1980 there were 31 million home-delivered meals, and five years later that figure had risen to 47 million," Asp says. "For those just released from the hospital, home-delivered meals give them temporary support until they get their stamina back. For the frail elderly, this is a way to keep them in their homes longer and independent," Darling says. And, with the elderly population growing, the demand is likely to grow.

Their study began when the Southeast Home-Delivered Meals program of Minneapolis asked them to evaluate their meals for nutrient content and food quality. "The board also was concerned about the temperature of both hot and cold food when it was delivered, because proper food temperatures are critical for food safety and food quality," Asp explains.

The researchers evaluated one week of meals each year. They also interviewed meal recipients about how they used the meals, what they liked and didn't like about them, and how well they understood nutrition concepts.

"We found considerable variability in the nutrient content of the meals," Asp says. "If the recipients took every



A volunteer with the Minneapolis Southeast Home-Delivered Meals program drops off a meal to a program participant. Researchers looked at nutrient levels and client satisfaction as part of a five-year study.

meal in the week, their average nutrition intake would be good, but if they only got a few of the meals, depending on which meals they received, they might fall short."

They learned that the meals were sometimes not eaten when delivered. They were also not eaten all at once. Recipients would sometimes save food to parcel out over the course of the day. "We found that without these meals their nutrient intakes were quite low. This meal was their major food for the day," according to Darling.

"The biggest nutrition problem we found in the particular program we were evaluating was the low calcium content of the meals because they didn't deliver milk," Asp says. "If the meal doesn't include milk, then they should have more milk-rich foods on the menu, like cream sauces, pudding, or cheese."

Asp and Darling also evaluated color, flavor, and texture of the meals, and asked for the recipients' evaluations too. The recipients related some quality problems such as meat that was not always as tender as they desired. "These people do recognize food quality," Asp says. "Their complaints were that the quality was not consistently high."

A home-delivered meal is a series of compromises based on the restrictions its delivery system imposes. Breading, for example, is used frequently because it keeps food temperature up. And sauce or a breading is used to keep it moist and soft and warm, Darling says.

A number of recommendations came out of the study. These included providing more fresh foods, increasing the fiber content of meals and, Darling says, "to handle the problems some elderly people find in chewing raw foods, these foods could be grated and put into food mixtures."

One clear conclusion was the realization of how important these meals are to the recipients. "Many of these people find food preparation difficult. They can get help to get to the grocery store, but food preparation comes every day, several times a day," Darling says.

The researchers say their conclusions should apply to rural areas as well as the urban Minneapolis program studied. Moreover, in rural areas where distances between homes are greater than in the city, the problems of delivering a hot meal are even larger. "The fact that the elderly population is tending to stay in rural Minnesota, adds to the costs to the volunteer in transportation," Darling points out. "Small towns are going to have greater needs for this service than cities and more volunteers will be needed to cover the delivery territory."

—Jennifer Obst

you need to know type, size and location of trees," Bauer says.

He believes remote sensing is beginning to find its stride as a tool. "It's beyond its infancy and at the point where it can be used as operational information," he says.

Bauer counters the impression among some that remote sensing is too expensive. "The satellite approach may be more affordable than other options," he says. "Just to acquire aerial photography for a statewide forest inventory probably would cost about \$250,000. But using LANDSAT would cost about \$75,000. Plus the data analysis would be cheaper. It would take probably 20 photo interpreters two years to interpret the photography for such an aerial survey. It would probably take two to three analysts only about six months to analyze the satellite data by computer.

"Also, remote sensing is useful for more than forestry applications. Other uses in agriculture include crop inventory, soil mapping, and land use classification. The data are also extensively used in geology and mineral exploration and water resource analysis." As Bauer sees it, the view from way up there can be very helpful down here.

—Jennifer Obst

Housing Study Update

Researchers are now analyzing data from interviews with 500 farm and rural nonfarm families regarding the consequences of their housing decisions. These decisions include additions, alterations, and changes in housing use. The findings will help rural elderly and farm residents to evaluate potential consequences—economic, psychological, and social—accompanying various housing decisions. The six-state regional survey was conducted in part by Minnesota Agricultural Experiment Station researchers.

IN PRINT

A number of new Minnesota Agricultural Experiment Station publications are now available:

Varietal Trials of Farm Crops—1988 Edition (AD-MR-1953) is the annual report on crop variety performance in Minnesota. It presents the results of experiment station testing of more than 500 varieties of 32 crops. Planting recommendations are included for many of them. This year's edition has a new cover, and a redesigned inside that makes it easier to use. (\$1.00—Distribution Center)

Three New Garden Mums for 1988 (AD-MR-3318) describes the newly released Burnt Copper, Grape Glow and Lemonsota chrysanthemum varieties. It includes full-color photos of their respective, striking orange-bronze, rosy-purple and lemon-yellow flowers. (\$.25—Distribution Center)

Nordic Raspberry (AD-MR-3393) describes a new release rated superior in many characteristics to the widely grown Boyne cultivar. Nordic has a less acidic and more pleasant taste, firmer fruits, and fewer thorns. (\$.30—Distribution Center)

Statewide Forest Resource Planning Programs: An Evaluation of Program Administration and Effectiveness (AD-SB-3365) is an in-depth examination of the benefits from and problems associated with this planning in the 48 states where it has been done. The authors surveyed and interviewed hundreds of government, industry and environmental leaders across the nation as they examined this question. (\$15.50—Distribution Center) A brief summary of

African Bee Unwelcome Here: Beekeepers Face Change

Killer bees are the stuff of horror shows, best served with popcorn and a willing suspension of disbelief. But an invasion of the Africanized bee, known for its aggressive behavior, is something Agricultural Experiment Station entomologist Basil Furgala takes very seriously. Their inevitable arrival into the southern United States could radically change beekeeping and honey production in Minnesota, possibly for the better.



A queen bee is surrounded by her retinue—a Minnesota resource facing change due to the threatened arrival of the African bee.

Bees are important to Minnesota. Last year honey production was a \$5 million business. Pollination of crops, is worth another \$25 to \$30 million. And there are benefits to backyard orchards and gardens, and to wildlife.

Furgala says the Africanized bee, which has been moving north at the rate of 300 to 400 miles a year, will probably not fly into Minnesota. It will be brought in. "The North American beekeeping business is highly mobile," he explains. "There's a lot of interstate movement of bees. In Minnesota, from 100,000 to 130,000 colonies of bees come up from Texas, Florida, and Mississippi every year. We depend on a southern line of states for queens and packages." Packages are screened cages with two or three pounds of bees in them, and a queen.

"This is the way the industry has developed over the past 60 to 70 years. Because of our winter, it's very difficult to produce queens when we need them in the numbers that we need them."

Since the early 1980s Furgala has been looking at alternative sources for queens, and at strategies for the Minnesota beekeeping industry to become more self-sufficient. He's been comparing different lines from Hawaii and British Columbia to Minnesota's common starline queen.

Both places can rear queens early enough for Minnesota use. Australia and New Zealand are other potential sources, but so far Furgala hasn't been able to obtain permission to import them for study. He's evaluating the queens for brood and honey production, wintering ability, foraging characteristics, and

look promising, the arrival of the Africanized bee could be an opportunity for Minnesota beekeepers. "If we have alternative sources of queens, and can certify that there's no Africanized genes in our stock, we could become the source of queens and packages," he says.

"What I see in the next decade or so is a whole new industry for states like Minnesota, where there will be a reverse flow of packages with queens, from here to the southern states.

Our bees will be needed to pollinate, for example, the \$400 to \$700 million almond crop, and the vegetable seed crops in southern Arizona and California." If the Africanized bee becomes established, they will need to periodically either re-queen, or depopulate their colonies.

"The African honey bee is, number one, unpredictable."

Furgala is also comparing traditional package systems with a wintering system he has developed. His "horizontal two-queen system" is a winterized unit that is divided in the spring. It's easier to manage than a vertical two-queen system used by some honey producers.

Management of the packaging system is easier, Furgala admits, than maintaining the colonies through the winter. With current options threatened by the Africanized bee, graduate student Steve Duff is studying the costs of production and return of the horizontal two-queen system compared to the package or the vertical two-queen systems.

their investigation, *Statewide Forest Resource Planning: The Effectiveness of First Generation Programs* (Miscellaneous Publication 20-1987) is also available. (No charge—contact the College of Forestry, 110 Green Hall, University of Minnesota, 1530 North Cleveland Avenue, St. Paul, MN 55108)

Single copies of some of these publications are available to Minnesotans from county extension offices or branch experiment stations. Those designating a price and "distribution center" can be requested from the Distribution Center, 3 Coffey Hall, University of Minnesota, St. Paul, MN 55108 (phone 612/625-8173). Orders should include publication title and item number, and should be accompanied by proper payment. Minnesotans should also include 6 percent sales tax.

—Larry A. Etkin

Research May Help Create a Minnesota Dairy Sheep Industry

Each year, the United States imports over 22 million pounds of cheese made from sheep milk. Sold as a gourmet food, in some cases it retails for as much as \$10 to \$12 a pound. A United States dairy sheep industry could reduce the need for those imports, provide an alternative source of income for farmers and create new business opportunities and agribusiness-related jobs.

Minnesota Agricultural Experiment Station researchers are examining the milking potential and milk composition of several U.S. sheep breeds and crosses. They are finding differences in the amount of milk produced and milk composition. The top third of the experimental flock produces about 234 pounds of milk per ewe in a 120-day lactation. This is less than European

The Africanized bee has moved steadily northward since introduced to Brazil in 1957. Now in Mexico, "it's possible the first wave of swarms could reach either Texas, southern California, Arizona, or New Mexico in the next two or three years," Furgala says.

"The African honey bee is, number one, unpredictable, in where it goes, when it goes, and where it nests," Furgala explains. He says their defensive behavior far exceeds anything now known in Minnesota. "I can, during a nectar flow, walk into an apiary without a shirt and not worry. There is no way that you could do that with any sense of confidence with the Africanized bee."

Africanized bees swarm, follow, and sting much more aggressively than the European bee. They also appear to be less efficient pollinators and honey producers.

dairy sheep breeds produce, but to control disease present in European breeds, USDA restrictions prevent their being imported to the U.S.

The researchers are also improving management strategies. They've found, for example, that the milking period can be extended by 74 to 130 days and milk production more than doubled when lambs are weaned at 30 days, instead of 55 days of age as was tried the previous year. Weaning at 30 days is the earliest it's possible to go directly to solid foods.

Related research is developing processes for making sheep milk cheeses. These include Roquefort-type, Kasseri, Feta, Romano, and Manchego cheeses. They represent both variety for consumers and an alternative that can be eaten by people who are allergic to cow's milk cheeses. In a cooperative trial with a commercial company, Swiss-style yogurt has also been successfully produced from sheep milk.

—Sam Brungardt

ology, foraging characteristics and defensive behavior.

If Furgala can identify a good alternative queen, and some of these lines

Southern Experiment Station Branches Out

Minnesota's branch experiment stations often find research opportunities off-station. One example is the Waseca Southern Experiment Station's vegetable research in the Hollandale area, which is 15 miles northeast of Albert Lea and 90 miles south of the Twin Cities.

What makes this area so unique? It's the muck soil. The 15,000 acres once called Geneva Marsh grew a native



Southern Experiment Station horticultural researcher Vince Fritz shows raised bed onion production at the Hollandale Field Day.

vegetation of bulrushes, cattails, and flags. For thousands of years, this ground cover grew and then decayed, leaving behind a rich legacy of organic matter and creating some of the most fertile soil found anywhere.

In 1924, the Hollandale Marketing Association, composed only of farmers

of the Hollandale area.

"We need these options," Furgala says, "We're racing against time."

—Jennifer Obst

on the tract, was organized. Today, the HMA members produce 7,000 acres in vegetable crops, including potatoes, onions, carrots, sweet corn, cabbage and asparagus.

The most critical needs for research are with potatoes and onion. Horticulturist Vince Fritz of the Southern Experiment Station is conducting studies at Hollandale to assist producers in the evaluation, development and adaptation of crop cultural practices.

The research is a challenge. "Hollandale is the only concentrated area of vegetable production in southern Minnesota, and cultural management strategies are significantly different on its muck soil than on a mineral soil," says Fritz.

He has been studying black scurf disease, which has haunted the red potato production region at Hollandale for several years. Systemic fungicide treatments may offer some control in conjunction with other cultural practices.

Fritz has also been studying the use of raised beds in onion production. He wants to find out if they significantly affect seedling emergence, as well as crop maturity and yield.

The Southern Experiment Station is involved in off-station research in water quality as well as vegetable research. As Dick Anderson, superintendent of the station says, "We've moved off the station for research at least 50 times in the last 15 years when relevant questions could not be answered with a study at the station. One of our great satisfactions is that this work must always be done with a land owner, and we have never been refused the opportunity to use a farmer's field."

—Linda L. Oetke

Growing Wild Rice Can Be a Shattering Experience

(Editor's Note: The previous issue of Minnesota Science looked at experiment station wild rice research on disease control, particularly for brown spot. Research also focuses on seed shattering.)

For Minnesota wild rice growers, seed shattering ranks with fungal brown spot disease as a yield-limiting factor.

Shattering is nature's way of getting the seeds down to the water before they can be eaten by predators. Unimproved varieties drop their seeds as they mature. Growers want the exact opposite, for seeds to remain on the stalk until all are mature and ready to harvest.

Shattering doesn't only mean less grain to harvest. It also undesirably reseeds the paddies. And, since the plants that grow from those seeds are from plants prone to shattering, over the years a plant population becomes increasingly of the shattering type. Shattering also results in dense stands that growers must thin with airboats—an expensive operation—or else the crowded plants will be unthrifty and more susceptible to brown spot.

Although “nonshattering” varieties, including those the Minnesota Agricultural Experiment Station has released, hold their seeds more strongly than wild types, even the most shatter-resistant shatter in late-summer stormy weather.

Developing greater shatter resistance is Robert Stucker's top priority. Stucker has headed experiment station wild rice breeding since 1978. His constant goal has been to gain a sound knowledge base to guide breeding efforts, to learn how desirable traits can be concentrated most rapidly. These desirable traits in-



An agronomist checks burreed, an aquatic weed, in a wild rice plot at the North Central Experiment Station, Grand Rapids. Researchers are working on weed control, disease control and shattering to improve wild rice production.

this take? Using a force meter to measure the tension needed to pull the seed off is labor intensive and slow. Instead, we hope to rate plants rapidly by grasping the stalk and passing the hand on up, around the panicle.”

So, Stucker must plant all the genetic material he uses in his breeding program each year to perpetuate it—a breeder's nightmare. Freezing, used for long-term storage of many seeds, kills the embryos in the seed. Oelke is looking at low-temperature storage possibilities in moist peat and other mediums.

Oelke is also searching for a growth-regulating chemical that could reduce lodging and the resulting yield loss. Such growth regulators are used on some cereal crops to reduce plant heights and strengthen stems.

Meter was released partly because it doesn't grow as tall as other varieties and is less likely to lodge. However, when growers fertilize Meter heavily with nitrogen, it grows very tall and lodges easily. Oelke has tested many growth regulators, but so far has found none that work, particularly when growers apply more nitrogen in their push for higher yields.

Oelke's also looking at crop rotation and residue removal, practices which might result in better weed control, elimination of volunteer plants, and less brown spot inoculum.

“We're looking at these management alternatives in the hope that we'll find ways that growers can reduce their production costs and increase yields without applying chemicals,” he says. “We should know in about three years whether it's advantageous to remove the residue or leave a paddy fallow for a year.”

Stucker, Oelke, and the other station scientists who do wild rice research are very happy about the University's new paddies at Aitkin, which are on peat soils. About 85 percent of the state's

NEW

Experiment Station Releases “Nordic” Raspberry

Nordic, a red raspberry developed by scientists from the University of Minnesota's Department of Horticultural Science and Landscape Architecture, has been released by the Minnesota Agricultural Experiment Station.

Jim Luby, who heads the experiment station's hardy fruit development, says Nordic has fewer thorns, a less acidic and more pleasant-tasting fruit, and greater resistance to anthracnose than the commonly grown Boyne.

“Although we are not promoting Nordic as a fall-fruiting cultivar, it will produce a late, small crop on the primocanes in years or locations with long growing seasons,” Luby said.

The yield, berry weight, harvest period and winter hardiness of Nordic are similar to Boyne.

Nordic is being propagated from virus-indexed stock under a royalty agreement with the Minnesota Nurserymen's Research Corporation. To obtain a list of the nurseries that are propagating Nordic, call Jim Luby at (612) 624-3453 or write the Department of Horticultural Science and Landscape Architecture, 305 Alderman Hall, University of Minnesota, St. Paul, MN 55108.

—Sam Brungardt

clude increased grain yield, early flowering for early maturity, seed length, plant height, and shatter resistance.

The breeding program has yielded three early maturing varieties, a trait that reduces preharvest losses from high winds, storms, blackbirds, and killing frosts. Netum, the first, was released in 1978. Then came Voyager, which has good yield ability. The newest variety—Meter—is short statured, making it less likely to lodge (fall over) in bad weather. It also has fewer leaves, enabling growers to control brown spot better with sprays.

But shattering remains a big problem. "Research has shown that there's genetic variability for the nonshattering trait, and we should be able to increase the strength of seed retention," Stucker says. "The question is, how long will

Agronomist Ervin Oelke is tackling a problem that faces Stucker and growers alike: the dormancy of wild rice seed. The seed must be stored in a cool, wet environment for three to five months to destroy substances that inhibit germi-

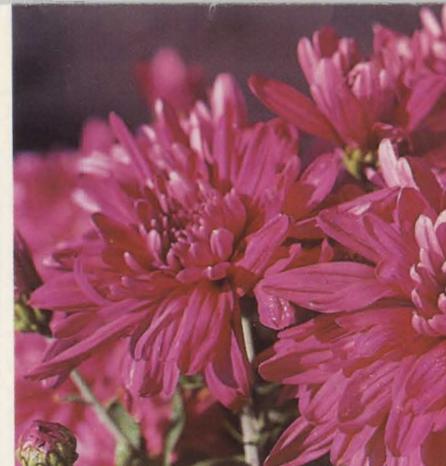
"Even the most shatter-resistant shatter in late-summer stormy weather."

nation. Then, it *must* be planted. There's no known way to keep it viable in storage for extended periods as we do with other field crops.

wild rice is grown on peat, so the new paddies better duplicate commercial growing. The paddies will help the researchers learn more about how growers can get top yields without degrading Minnesota's valuable surface water resource.

The station's wild rice research is funded by the state legislature, individual grower cooperation, and a checkoff levy on every pound of paddy wild rice produced in the state. "The research is valuable to a part of the state where farming is often a risky proposition," Oelke says. "The wild rice industry provides considerable income in Aitkin, Clearwater, Itasca, and Beltrami Counties, and this is one segment of Minnesota agriculture that we don't want to lose."

—Sam Brungardt



Grape Glow, one of the three new chrysanthemum varieties.

Three New Mums Available for 1988

The Minnesota Agricultural Experiment Station has released three striking chrysanthemum cultivars that are well adapted for use as greenhouse-grown spring-flowering pot plants.

The new Burnt Copper, Grape Glow and Lemonsota cultivars are the 67th, 68th and 69th garden chrysanthemums released by the station.

Burnt Copper has showy, orange-bronze, fully double, 3-inch flowers that fade gradually to an orange tone. The stiffly upright plants are 20 inches high, 16 inches wide, and have clean, dark green foliage.

Grape Glow has 3½- to 3¾-inch bright rosy-purple flowers whose flat petals have silvery undersides. Grape Glow has clean, medium green foliage.

Lemonsota forms a mound of 1-inch, lemon yellow flowers with darker centers and delicately fringed petals.

Commercial firms wishing to obtain stock of the new cultivars should call University of Minnesota horticultural scientist Richard Widmer (612/624-6701) for the names of wholesale suppliers.

—Sam Brungardt

Rental of Land Expands Station's Research Capability

Minnesota Agricultural Experiment Station scientists are putting increased emphasis on "sustainable agriculture" research. Sustainable agriculture employs production techniques aiming for a profitable enterprise with minimal use of purchased inputs made from nonrenewable resources (such as petroleum-based fertilizers and pesticides) and with minimal risk to the environment.

The recent rental of a 160-acre farm next to the Southwest Experiment Station at Lamberton will provide a site ideally suited to sustainable agriculture research and extension work.

Wally Nelson, superintendent of the Lamberton station, says, "It's important that we have land where there is little or no accumulation of fertilizers and pesticides. The farm we've rented has been cropped in a corn-soybean rotation

for at least 30 years with minimal use of fertilizers and pesticides. It has never been tilled and has been worked with relatively small equipment. In many ways, it is unadulterated. And since the new farm has soil types that are very similar to those on the Lamberton station, we will have a basis for comparisons.

"During this first year, we'll concentrate on determining the exact state of the land—its fertility, chemical residue, and microbial status, for example—so we will have benchmark data for future studies."

A renewable, \$100,000 federal grant is making possible the rental of other farmland near the Lamberton station and near Windom. On it, soil scientist Pierre Robert will conduct research that seeks to develop and improve the technologies of farming by soil landscape conditions and to study and model fertilizer nutrient flows in order to optimize productivity and minimize water pollution.

Robert will use a sophisticated applicator to apply fertilizer nutrients and

herbicides to the farmland, which will be planted to corn. A computer on board the applicator will read a detailed soil map of each field and a laser guidance system will "tell" the machine where it is so it can apply chemicals at rates considered optimal to that location's soil type and fertility level. Robert says it may be possible to reduce input costs \$5 to \$10 an acre using this technology. Robert will also monitor the leaching and runoff that occurs to determine the extent to which such precise chemical application reduces water pollution.

C. Eugene Allen, dean of the College of Agriculture and associate director of the experiment station, says, "Sustainable agriculture offers possibilities in helping farmers to avoid indebtedness while still maintaining a profitable farming enterprise. As we conduct more sustainable agriculture research, we expect to find ways to farm with less input of chemicals and less risk to Minnesota's soil and water resources."

—Sam Brungardt

Mother's Day Cards Show Complexity of Mother-Daughter Communication

When women select a card for dear old mom on Mother's Day, do they take pains to make it a hearts and flowers love message? Do they choose humor, depicting themselves as less-than-perfect offspring? Or do they extend tribute to "mom, the woman of the '80s," juggling home, family and career?

Whatever the message, chances are the card was selected carefully and sent with feelings of obligation mixed with love, good humor and, possibly, a gentle reminder of personal independence. This was the finding of a University of Minnesota study of 23 women who evaluated 52 best-selling Mother's Day cards.

Family social science professor Paul Rosenblatt and graduate student Cynthia Meyer asked the women about their reactions to greeting card messages and the things they sought or avoided when selecting cards for their own mothers. Their study revealed that sending a Mother's Day card was not a task the women took lightly. All but two of the

women had sent Mother's Day cards every year for the past five years.

Each woman had a definite idea about what message would be appropriate. Rosenblatt and Meyer said many of the women rejected such themes as "you are perfect" or "I want to be exactly like you" because they said they would feel dishonest sending them.

There was little agreement about card messages. "A card that was seen as mushy and flowery in the context of one relationship was viewed as simple and honest in another," according to Rosenblatt and Meyer.

Some participants purposely avoided cards depicting mothers as having no identity beyond cook, cleaner and family nurse. "Many women said they prefer cards which depict women as multi-dimensional and able to satisfy personal needs outside of the mother role," the researchers said.

For many of the women, selecting a card involved walking a fine line, looking for cards that portrayed them as independent but which still made clear their love and appreciation. "Women who were mothers themselves often expressed an understanding of what their mothers had gone through," Rosenblatt and Meyer noted. Still, the research subjects said it was often difficult to find a card that expressed both connection and separateness from their mothers without questioning the value or meaning of their mother's life and child-

rearing wisdom.

Rosenblatt and Meyer conclude that women who subscribe to contemporary values of equality and flexibility in household duties and childrearing may not find contemporary cards that mirror those sentiments. "One of the original purposes of Mother's Day was the glorification of motherhood in order to make this role appealing and something women strive for. Women today may find that values of gender equality conflict with some of the myths which have come to be associated with motherhood and the celebration of Mother's Day."

This research is part of ongoing family social science research which helps define and understand family relationships and family strengths.

—Deedee Nagy

MINNESOTA Science

Volume 43, Number 1

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Front page, Remote Sensing Lab, College of Forestry; page 2 top, Minnesota Department of Natural Resources; page 2 bottom, Dave Hansen; page 3 bottom, Southern Experiment Station; page 4 top, Dave Hansen; page 4 bottom, Dick Widmer.

Minnesota Science is published quarterly by the University of Minnesota Agricultural Experiment Station; Institute of Agriculture, Forestry, and Home Economics, St. Paul, Minnesota.

Address all correspondence and requests to Editor: *Minnesota Science*, 433 Coffey Hall, University of Minnesota, St. Paul, MN 55108.

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Publication

Penalty for private use, \$300

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Sugarbeet Disease Control

Cercospora leafspot is a fungal disease that can devastate sugarbeets. Until several years ago, the only defense was spraying fungicides several times a season. Now, growers can reduce unnecessary spraying, saving \$5 per acre for every application of fungicides avoided. "Thanks" is due a computerized model that accurately predicts when weather conditions that favor the disease are present. The model, developed by Minnesota Agricultural Experiment Station plant pathologists, is available to all sugarbeet growers in the Red River valley and southern Minnesota.

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