MINNESOTA
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SCIENCE

**MINNESOTA IS FOURTH IN SEED PRODUCTION**

# New Bluegrass Coming Up Soon

*by Anne Gillespie Lewis*

Some of the best Kentucky bluegrass doesn't come from Kentucky. In fact, the latest variety being developed at the University of Minnesota's Agricultural Experiment Station promises something for everyone. According to researcher Nancy Ehlke, all types of grass-growers will appreciate the traits of the bluegrass plants she is now breeding. The new grass will be a descendant of the once-mighty Park variety. Originally released in Minnesota in 1957, Park is found in lawns from Maine to Oregon.

Ehlke's field plots were initially generated from tissue cultures of many varieties, including Park, since traditional plant breeding methods do not work on Kentucky bluegrass, whose progeny reproduce maternal characteristics only. By using tissue culture to obtain individual plants that show somoclonal genetic variation, Ehlke thinks improved traits may have appeared in the bluegrass plants.

Turf breeders, Ehlke explains, consider the needs of commercial grass seed growers, homeowners and what will work well in different climates. "What we're looking for is the overall turf quality and disease resistance," she says. Park is very susceptible to leaf spot disease and patch diseases, which are influenced by variety and management.

Turf quality, she adds, is made of up many different factors. "We consider color. The deeper green, the more desirable the grass is. We also look at density, texture, reaction to summer heat and humidity, how quickly it greens up in the spring and how long the color lasts into the fall."

Until recently, Park was one of the

BLUEGRASS continued on back

## INSIDE



**Researchers uncover the first St. Paul campus plots of potential new bluegrass varieties.**

**HOW TO DESTROY E. COLI**

# Study Finds Safest Way to Zap Burger

*by Dave Hansen*

Can *E. coli* bacteria survive microwave cooking? Food microbiologist Ed Zottola should know. In an exhaustive food safety study of *E. coli* destruction by microwaves, Zottola and research assistant, Sophia Czechowicz cooked, observed and analyzed more than 1,000 laboratory hamburgers.

The researchers first determined how much microwave energy was needed to destroy *E. coli* bacteria, which can cause painful intestinal disorders. They inoculated ground beef patties with the pathogen, cooked them and looked for surviving organisms. To make the test even tougher, samples of each burger were incubated for four days and analyzed again for bacteria.

each patty. And, as anyone who has watched food being zapped in a microwave knows, the edges heat up first. The study showed that the center, top surface of the hamburger was last to cook. To speed up the cooking and eliminate the center cool spot, the researchers developed and tested a burger with a hole in the middle. "The doughnut-shaped burger reduced cooking times by 15 to 20 percent," Zottola notes.

"Cooking in the cold spot of your oven ensures that all parts of the food will be thoroughly cooked and safe to eat," Zottola summarizes. Besides being of interest to consumers, the methods can be adapted by the fast food industry to improve preparation of hamburgers.

**Microwave cooking of frozen burgers is a true challenge. Knowing where in the oven to cook affects food safety as well as appetite.**

They next compared brands of

Funding for this experiment sta-

**CHIPPEWA AND POLARIS**

# New Berries Promise Flavorful Return

*by Dave Hansen*

Two new blueberry cultivars are now available for Minnesota and other northern gardeners. *Polaris* and *Chippewa* cultivars were first selected in 1972 and have been tested in University of Minnesota plots at Grand Rapids, Staples and Becker since 1984. They add to the variety of choices for commercial fruit growers who seek optimum results.

*Polaris* is the earliest maturing of all Minnesota cultivars. It produces very firm berries of moderate size with a highly aromatic flavor on an upright plant about four feet in height and width. Fruit breeder Jim Luby notes that, because it is not self-fruitful, *Polaris* should be planted with other

*Chippewa* blueberry was developed for the soil and climate of central and northern Minnesota. The light blue berries are firm and large with a well-balanced flavor. Horticulturist Dave Wildung says the plants are more upright than *Northblue* and produce slightly better at the North Central Experiment Station at Grand Rapids. "It will be a useful addition in commercial plantings in cold regions, as well as in residential plantings and gardens," Wildung states.

Minnesota blueberries are noted for their natural, intense, wild taste, a result of their native lowbush plant heritage. Original sources for Minnesota's breeding program range from the New England states to microwave ovens to see how different heating patterns destroyed the pathogen. In full size ovens with power ratings over 800 watts, quarter-pound burgers were free of the bacteria after 2.5 minutes on high. Longer cooking times were needed in lower powered ovens, and an industrial oven with two to three times the power took only one minute. But power isn't everything. "Our results clearly show that the power of the microwave oven *and* the configuration of the heating pattern markedly affect the thermal destruction properties," Zottola says. "To be safe, you should base cooking time on the time it takes to cook in the *coldest* spot in the oven," he continues. This is because most microwave ovens have a highly irregular heating pattern which most likely will leave part of the food undercooked. Its better to cook it safe and slow, than be sorry.

Czechowicz explains that the microwave heating process is much different from conventional heating. In a microwave there isn't a constant temperature because the power pulses on and off and the heat distribution is very uneven. To find the cold spot in each oven, researchers covered the entire bottom of the oven with thermal fax paper and cooked it on high power for five minutes. Since the paper is heat sensitive it records hot spots as dark while cold spots remain white. The result is a map of the oven's hot and cold areas. (Caution: if you try this in your own microwave, do not heat the paper for longer than five minutes or it may catch on fire.)

During the burger tests, the temperature was monitored by probes placed in the coolest locations within

tion study was provided by the Minnesota Beef Council. "Food safety is the responsibility of everyone in the food chain, from farm to fork," says council executive director Ron Eustice. "Our goal is to eliminate any food pathogen in the food supply, and this research is a major step." ■

blueberry cultivars for pollination.

National tests in Michigan, Ohio and Pennsylvania documented that *Polaris* was among the hardiest of 50 selections. It yields about the same and is more spreading than *Northblue*, released by the University's Agricultural Experiment Station in 1983.

Michigan and Canada including Minnesota. ■

**U OF M BLUEBERRIES**

- Chippewa
- Northblue
- North-country
- Northsky
- Polaris
- St. Cloud

**FAMILY FARMS BENEFIT**

# New Grazing Methods Improve Dairy Farm Life

*by Jack Sperbeck*

According to a study of 29 Minnesota grazing operations, Minnesota farmers who graze their dairy herds are optimistic about the state's dairy industry. This, despite the fact that numbers of Minnesota dairy herds have been declining for more than 25 years and that total milk volume produced in Minnesota has decreased since 1985. With fewer dairy farmers in rural communities and fewer jobs in dairy processing, dairy-related industries are expected to disappear.

"For some farmers who graze their herds, the future of the dairy industry is not as dismal as recent milk production and farm numbers might imply," says animal scientist Dennis Johnson of the West Central Experiment Station, Morris. Johnson and other researchers conducted a study of 29 Minnesota grazing operations to learn about the effects of management intensive grazing (MIG) techniques rapidly being adopted in parts of Minnesota.

**Animal scientist Dennis Johnson gathers a grass sample in a field managed for intensive grazing.**

The farms were typical Midwestern dairy farms. Most farms were single family operations averaging 58 cows and approximately 300 acres of land.

The families said their quality of life improved after adopting MIG since they shifted their efforts from repetitious tasks such as baling hay and repairing equipment to pasture and business management.

Profits on farms using MIG improved since they drastically reduced input purchases such as feed and fuel. MIG helps maintain profits on small to mid-size family dairies, preserves existing community jobs and encourages farm children to continue farming, according to Johnson. Many people support the idea that MIG can slow the demise of Minnesota dairy farms and reduce further rural decline. You'll find complete study results in the publication *Knee Deep in Grass*, available from county extension offices in Minnesota, or by credit card at (612) 624-4900 or (800) 876-8636. Ask for BU-6693-MS. ■

**HERE BUT NOT HERE**

# Ambiguous Loss Strains Family

*by Anne Gillespie Lewis*

A discerning ear can trace a symphony's recurrent theme, no matter how complex the variations. Similarly, family social scientist Pauline Boss can follow the sad strains of ambiguous loss and its consequences through areas of research that appear initially dissimilar.

Ambiguous loss is the uncertainty that occurs when people must deal with the unresolvable physical or mental absence of a family member. She has studied this phenomenon in military families, caregivers of Alzheimer's patients and in immigrant women.

Boss is known nationally for her work on issues of family stress. She recently completed a sabbatical year at Harvard University, where she wrote a book synthesizing her research and presenting the theory of ambiguous loss and its treatment.

"I've always been a family stress expert," says Boss, "and ambiguity is the common thread in all of my research." There are two kinds of ambiguity according to Boss. One kind is where the body is missing, as in a plane crash, and the other kind is where the mind is gone, as in Alzheimer's disease.

There are everyday life and catastrophic versions of ambiguity. In everyday life, family members may be mentally absent because they are pre-

that makes the loss so terrible. It is the stress of not knowing if a member is in or out of the family."

The treatment that Boss advocates for ambiguous loss departs from traditional therapy. "Ambiguity comes from the outside, not from the person's personality. If we treat the person, we would be blaming the victim," Boss notes. "The only way to fix ambiguous loss is to label it and reframe the situation so the person can move from being frozen to being functional. Then we need to make meaning of it. It's best to do this in group therapy. What we hope is that there will be some congruence about the meaning among family members."

Boss continues her work for the Agricultural Experiment Station in the area of ambiguous loss, which she predicts will escalate due to technological changes and increasing family disruptions.

Currently, Boss is revising *Family Stress Management*, a standard text for family therapists. She is also writing a book on ambiguous loss among immigrant women, based on Swiss immigrants in her hometown of New Glarus, Wisconsin. ■

**AMERICAN INDIANS LESS STRESSED**

Different cultures deal with ambiguous loss in different ways, according to Pauline Boss. North American Indians, she adds, describe their feelings about the disease in an accepting, spiritual way that contrasts with the fix-it views of many European Americans.

Boss's research looked at how a small group of Ojibwa women caregivers in Duluth view Alzheimer's disease of their family members. She found American Indians did not view Alzheimer's as devastating or tragic and had difficulty thinking of their close relatives in those terms.

She conducted additional studies at McGill University's Department of Trans-Cultural Psychiatry in Montreal. "North American Indian tribes believe in harmony in nature, in the cycle of life, but they also mastery may take a more spiritual form than the Western approach, she adds, including such kinds of active healing as dream interpretations or consulting a herbalist.

"These are old ways of solving the ambiguities of their lives, of dealing constantly with ambiguous losses such as children being sent to residential schools away from their families," she states.

Could European Americans cope better with ambiguous loss by following Indian approaches? Boss thinks it may be possible even though the idea is controversial in social science circles.

"It's exciting to merge Western and Eastern thought," says Boss. This is not New Age spirituality, but traditional, non-Western coping skills.

**Stress often takes over European American families when a member has Alzheimer's. American Indians do not view the disease as tragic and their families are not overwhelmed.**

occupied by watching TV or working on a computer. Boss states, "In the catastrophic version, it is the uncertainty

believe in mastery," says Boss. The

- *Anne Gillespie Lewis*

**Alfalfa is a perennial crop that protects soil and water, benefits wildlife and diversifies rural economies.**

**FOR FEED AND FUEL**

# Alfalfa Power!

*by Jack Sperbeck*

By 2001, an electric power plant at Granite Falls will likely be producing electricity from alfalfa stems. The proposed plant, Minnesota Agri-Power or MAP, will be the first in the U.S. to use alfalfa, a renewable plant resource and cash crop.

The project provides many benefits. For one thing, the increased production of alfalfa will reduce soil erosion and use less fertilizer and pesticides than the predominant corn and soybean crops of western Minnesota. In addition, there will be significant environmental benefits to soil, water and wildlife.

"This may be Minnesota's best example of sustainable development," says University agronomist, Ervin Oelke. "In terms of rural economic development," Oelke says, "it means long-term viability in an economic region of the state that's lost business and population in recent decades."

The project will create 1,000 construction jobs and 200 permanent jobs once the plant is operating. MAP is a public-private partnership to construct and operate a 75-megawatt power plant that will use efficient gasification technology to produce electricity from alfalfa.

The project began in 1993 when Northern States Power (NSP) began working with the University of Minnesota's Center for Alternative Plant and Animal Products to develop a way to produce electrical power from biomass. University scientists proposed alfalfa as the renewable biomass energy crop. The alfalfa stems would be used for electricity and the leaves processed for livestock feed. The University and NSP suggested a feasibility study and got additional funding from the U.S. Department of Energy , the Electric Power Research Institute and the National Renewable Energy Laboratory.

The Minnesota Valley Alfalfa Producers (MNVAP) was formed after completion of the study. This farmer-owned cooperative now leads the effort to develop the $200 million integrated alfalfa processing and biomass energy system at Granite Falls. It has 500 members and expects to have about 2,000 when the alfalfa processing and electric generation facilities are operating. At the beginning of this year financing was completed so MNVAP will build the power station and NSP will purchase the electricity generated from alfalfa. The research investment so far totals about two million dollars. Half is from alfalfa growers and half from public sources including the University's Agricultural Experiment Station and the Legislative Commission on Minnesota Resources.

Experiment station researchers are working on many aspects of this unique project, including breeding programs, processing and storage (see sidebar). How to efficiently separate the alfalfa leaves from the stems is a major problem.

"This project represents the potential of public-private partnerships," says Oelke. The alfalfa processing and biomass energy system will be self-sustaining without continuing public subsidies. "It's a good example of how we can work to help people out in the state develop the rural economy," Oelke states. ■

**"This may be Minnesota's best example of sustainable development," says agronomist Ervin Oelke.**

**RENOVATE? DEMOLISH? REOCCUPY?**

# Home Renovation Programs Make the Best Use of Public Dollars

*by Dave Hansen*

Fixing up abandoned houses is a much better idea than tearing them down. According to a study by housing researcher Edward Goetz, public subsidies to fix up abandoned houses in low-income neighborhoods of St. Paul not only provide much needed housing, but many related benefits.

In the first detailed economic analysis of a U.S. home renovation program, Goetz's research team analyzed St. Paul's *Houses to Homes* effort. They found that the resulting increase in nearby property values and taxes was enough to pay back the maximum $42,000 renovation subsidy.

The city program began in 1991 in an effort to reduce the some 600 boarded-up houses in blighted areas. In the five years Goetz reviewed, 266 houses were renovated and 320 demolished. In addition, 1,169 were reoccupied without any public investment or major repairs.

The researchers compared the costs to rehab, reoccupy or demolish houses with the many economic impacts on the city.

**Costs included:**

- up to $42,000 subsidies
- demolition expenses
- reduced tax revenue
- declining property values

in their own homes." Razing a house or continuing to occupy it in marginal condition does nothing to stop the downhill slide of property values. "The sales tax revenue generated from building materials expenditures, by itself, is enough to cover the average *Houses to Homes* subsidy," Goetz says. The study estimates a total pay-back of about $59,000 in tax revenue and cost

savings over 20 years.

The bottom line is that fix-up pays, but not necessarily to the entity that makes the investment. While St. Paul provides the subsidy, the increase in property taxes is divided between the

that, "A significant portion of the benefits are captured by other levels of government, which is a good argument for state and county investment in housing programs." Since St. Paul cut its subsidy in half in 1996, only two homes have been renovated under the program.

Goetz's research for the Agricultural Experiment Station focuses on the overall impact of local housing policies, including urban and suburban subsidized housing, high-rise public housing, and programs such as *Houses to Homes*. This study was funded by the Coalition for Community Development, a consortium of nonprofits involved in housing issues. ■

**Housing researcher Edward Goetz found that rehabilitation also spurs nearby property owners to invest in their own homes.**

**SAVES TREES**

# Utility Pole Not a Hollow Promise

*by Martin Moen*

The lines bringing electricity to your home are probably strung from wooden poles. Add all those utility poles together and you would have quite a stack of wood. That's why forest products researcher Robert Erickson has spent the last six years designing a unique hollow pole that uses only half the wood.

Erickson's design takes its cue from nature. "This pole resembles a tree in the forest, but without the nonessential wood," Erickson says. It weighs only half as much as a solid wood pole, yet retains 90 percent of the conventional pole's bending strength.

The hollow pole is built by gluing and finger-jointing narrow strips of wood, then wrapping them with layers of veneer. Solid wood poles usually rot from the inside out because preservatives only penetrate the outer surface. The hollow design allows preservative to be applied to the outside and inside surface, greatly extending the life of the pole.

According to Erickson, "Waste lumber from the manufactured housing industry could be used to construct most of the pole." He is also considering inserting a layer of synthetic fiber strong enough to resist damage caused

- declining property values
- police services
- code violation inspections

**Economic payoffs over the same 20-year period were:**

- increased home values
- increased property taxes
- sales taxes, including adjacent properties

For the analysis, researchers used 75 city blocks. On 25 of the blocks a house had been renovated, razed or left alone. The sale prices of nearby homes were tracked over a five-year period as were neighbors' fix-up projects, which averaged $13,500. In the case of demolition or use without fixing up, the value of other houses on the block fell by $1,200.

Goetz says, "Rehabilitation also spurs nearby property owners to invest

property taxes is divided between the city, county and state. Goetz notes

by woodpeckers.

Erickson retired in 1994 after 28 years in wood physics and wood moisture relations yet continues to do research. ■

**BIOLOGICAL CONTROLS EXPLORED**

# Insects May Temper Milfoil Monopoly

*by Dave Hansen*

Eurasian watermilfoil is an aggressive exotic plant that's choking many Minnesota waters. Fisheries researcher Ray Newman is trying to control the plant using natural insect enemies rather than by intensive mechanical and chemical treatments currently used.

Newman and a research team of entomologists and plant biologists use SCUBA gear to monitor the effects of three insect species on milfoil samples collected from several area lakes. The enemy insects Newman is using are weevils, midge larvae and moth larvae. The study, which began in 1992, is funded by the Legislative Commission on Minnesota Resources and the

MILFOIL *continued on back*

**REMEMBER WINTER OF '96-'97**

While most Minnesotans suffered through record snowfalls that preceded the 1997 floods, alfalfa researchers never had it so good. With more alfalfa being used as a supplement in animal rations, the research has gained importance. Agronomists at the University's West Central Experiment Station in Morris are examining protein losses under various storage conditions.

Alfalfa leaf meal as a protein supplement is produced at the Minnesota Valley Alfalfa Producers' plant between Willmar and Granite Falls. A proposed electrical generating plant will use alfalfa stems as fuel for a gasifier. Both uses require a year-round supply of alfalfa, which actively grows in Minnesota for only five months. Since alfalfa deteriorates with storage, researchers are investigating economical ways to minimize storage loss.

Agronomist Greg Cuomo monitored large round and square bales from the time of harvest through winter. Bales were located in a protected pole barn, an ideal location, as well as typical outside storage areas. According to Cuomo there are ways to reduce hay losses even though storing bales outdoors during a Minnesota winter is not an ideal situation.

Researchers found that covered bales either in a barn or outside under tarps maintained acceptable quality. Uncovered bales lost about ten percent of their dry matter when stored on a well-drained surface or left in a low area subject to higher moisture levels. "With the small profit margin, that loss is unacceptable," Cuomo says. He also found that uncovered square bales absorb a lot of moisture and as a result get very moldy.

Cuomo measured initial and final bale weights. In addition, he is looking at leaf and stem losses of alfalfa hay with storage. Crude protein, fiber and digestibility of the leaves and BTUs of the stems are also being analyzed.

*- Dave Hansen*

**Storage methods and shape of bales affects quality of alfalfa.**

**MILFOIL** *from page 4*
Minnesota Department of Natural Resources.

The weevil and midge larva eat only exotic milfoil and native northern water milfoil. The moth larva eats a broader array of plants. "Our observations suggest that all three insect species are widespread, even though they have not been reported previously in Minnesota," Newman says. "It is likely they occurred here before 1987, when Eurasian watermilfoil was first observed."

In controlled experiments, weevils can reduce root and shoot biomass of Eurasian watermilfoil. Declines of Eurasian watermilfoil have been associated with weevil activity in several Minnesota lakes. In other lakes, however, weevil populations are limited or have not controlled the milfoil. Current research is focusing on factors that limit weevil populations and their effectiveness at control. ■

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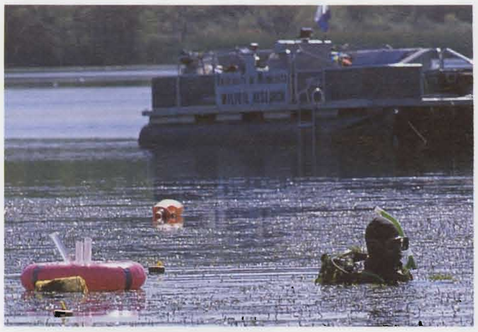

**Milfoil samples are collected from top to bottom of Schultz Lake in Carver County.**

**BLUEGRASS** *from cover*
premium Kentucky bluegrasses and had great success nationally and internationally. Since then other varieties grown in the West have supplanted Park. Ehlke is hoping to produce a bluegrass that will restore Minnesota growers to the top rank. "We'd like to have something good enough to give a marketing edge to the growers in northern Minnesota," says Ehlke. Minnesota's grass seed production area is in Roseau and Lake of the Woods counties. She is hoping the new variety will be an early emergent such as Park.

Ehlke cautions those eager for lusher lawns, however, that any new variety is still several years from release. Turf breeding cannot be hurried. From an initial 120 plants painstakingly bred by tissue culture and raised in field plots, Ehlke has eliminated roughly 25 percent that didn't meet her standards. "I hope to get it down to 20 plants," she adds, noting that examination of plants for turf quality and disease resistance is ongoing throughout the trials.

Minnesota's grass seed industry ranks fourth in the U.S. and Ehlke's project is supported by the Northern Minnesota Bluegrass Growers Association and the Minnesota Crop Improvement Association. While many people enjoy the results of such research efforts right in their own back yards, they may not realize that the roots go back to the University of Minnesota. ■

## RESEARCH CONNECTIONS

Research of the Minnesota Agricultural Experiment Station is conducted throughout Minnesota by investigators in five colleges of the University of Minnesota. For more information explore the following Internet sites.

- *College of Agricultural, Food and Environmental Sciences,* www.coafes.umn.edu/
- *College of Biological Sciences,* molbio.umn.edu/
- *College of Human Ecology,* www.che.umn.edu/
- *College of Natural Resources,* www.cnr.umn.edu/
- *College of Veterinary Medicine,* www.cvm.umn.edu/
- *Minnesota Agricultural Experiment Station,* www.mes.umn.edu/~maes/
- *University of Minnesota Extension Service,* www.extension.umn.edu/

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