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Agricultural Experiment Station

University of Minnesota

SCIENCE

ONE MILLION COUPLES BENEFIT

Research Shows Preparation Before Marriage Is Key Ingredient In Lasting Relationship

by John Winzenburg

The marriage and family structure in the U.S. has changed drastically over the past three decades. Many Americans have come to accept change as an inevitable product of modern society. Others remain indignant over the sobering facts: more than half of the couples getting married today will eventually get divorced, and those marriages that end in divorce do so in an average of seven years. As well, more than half of today's children will have lived in a single-parent household by their eighteenth birthday.

Marriage researcher David Olson is not content to watch this phenomenon expand. Instead, he has spent an entire career searching for practical steps that couples can take to build healthy marriages and family lives. His programs, PREPARE and ENRICH, enjoy international success because they focus on a common factor in troubled relationships. "Based on our extensive research," says Olson, "we have observed that for couples

considering marriage, failing to prepare is like preparing to fail."

Olson's PREPARE (Premarital Personal and Relationship Evaluation) and ENRICH (Enriching and Nurturing Relationship Issues, Communication and Happiness) have been used and continually revised since 1980.

PREPARE is an inventory for couples who are seriously thinking about marrying, and ENRICH is used by those who are already married/cohabiting and seeking counseling. On a broader scale, the programs are intended to help reverse the trend towards social fragmentation by gaining an overall understanding of family systems. Their immediate goal, however, is to identify potential problems between a couple.

Olson's success is unparalleled, as more couples have been helped by his programs than any

other. Approximately one million couples have used PREPARE and ENRICH in the U.S. alone, and another 350,000 couples have used it in 10 other countries. About 35,000 licensed therapists, clergy, and other counselors use the programs in the U.S.



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"We have observed that for couples considering marriage, failing to prepare is like preparing to fail."

David Olson

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RESEARCH SITES LOCATED WHERE MOST NEEDED

Canola Production Centre Conducts Farm Scale Research

by Vince Becker

■ Most U of M canola research is located in NE Minnesota where it is easily observed by growers. The Centre shifts sites each year, and additional plots are also accessible, such as this one along US Hwy 2.



Growers are impressed with the farm-scale research that's being conducted at the Canola Production Centre in northern Minnesota. Established in 1998, the production centre is the first of its kind in the U.S., according to Beth Nelson, president of the Minnesota Canola Council. "We take the concepts that

Trials dealing with fertilizer rates, seeding rates, variety evaluation, planting dates, insecticide seed treatment, weed management and harvestability were conducted in 1998. Trials use commercial farm equipment and treatments are replicated. Data is then statistically analyzed at the centre.

The 1999 trials included herbicide-tolerant canola-LibertyLink Canola,

University for approval. Seven grower-member directors and three industry members serve on the board.

"Canola has been the cash crop up here because of favorable prices," says Dahl, who's been growing canola since 1990. "A lot of farmers are interested in raising it because of low prices we've been getting for small grains and also because of diseases like scab that have



RAPID RESPONSE FUND TARGETS MAJOR ISSUES

The Minnesota State Legislature provides special University of Minnesota funding to address urgent issues challenging Minnesota. The challenges all impact Minnesota's economy, with billions of dollars at stake. This page reports progress in one project. The funding is for one of five University-wide priority areas that attracted legislative attention. The others are molecular and cellular biology; design; digital technology and multimedia.

The following projects, and others, are currently underway at sites throughout Minnesota:

- Canola as an alternative crop. (this page)
- Alternative swine production systems (see inside)
- Potato virus epidemic. (previous issue)
- Turkey disease control and eradication
- Small grains improvement project
- Animal waste odor control systems
- Reducing root rot in kidney beans
- Family farms: decision making and problem solving
- Eradication of PRRS from a large swine system

researchers are coming up with in small plot research and apply them to the large research plots at the centre," explains Nelson. "The plots measure 30 ft. wide by 400 ft. long and are replicated four times, which is the equivalent of 1.1 acres." The centre, which is modeled after the Canola Council of Canada's production centres, encompasses 80 acres that is rented from a local canola grower.

"The production centre provides a focus for agronomic research that demonstrates practical and profitable canola production techniques and technologies on a field-scale basis," according to Erv Oelke, director of the Center for Alternative Plant and Animal Products, University of Minnesota.

Roundup Ready Canola and imi-tolerant canola. Comparisons of these systems will help growers select the best genetically modified varieties for their cropping systems.

White mold (sclerotinia) control also is a top priority for this year, says Steve Dahl, a member of the Canola Production Centre committee. Dahl's operation near Roseau grows 1,650 acres of small grains, canola and certified grass seed.

The committee is composed of growers, industry representatives, University Extension and research individuals. It recommends research topics to pursue. The Canola Production Centre board then reviews the projects and submits a prioritized list to the

severely affected small grain production in the area."

He believes the production centre offers growers a tremendous amount of practical knowledge about successfully growing canola. During the summer the centre invites growers to attend a field day to view firsthand the results of the different research trials.

"Growers can get answers to all their production questions at the centre. It helps take the guesswork out of raising canola," says Dahl.

This year, the production centre will move to the Thief River Falls area, according to Nelson. "The same location cannot be used every year because of rotational restrictions. We also move it around to make sure the data we're

Details of these projects will appear in *Minnesota Science*, or may be checked at: www.rapidresponse.umn.edu

collecting is relevant to all canola production areas of the state."

Special Rapid Response funding approved by the Minnesota State Legislature helped launch the Canola Production Centre near Roseau, Minnesota. The centre is a joint project of the Minnesota Canola Council, the University of Minnesota, and the Canola Council of Canada and shares an agronomist with Canada's Manitoba centre. ■

CANOLA ACREAGE BOOMS, BLOOMS ACROSS NORTHEAST MINNESOTA

Back in 1990, only about 8,000 acres of canola was grown in Minnesota. In 1998, the bright yellow fields covered over 200,000 acres and year 2000 plantings may cover 300,000 acres. The disastrously wet spring and summer of 1999 prevented planting in much of northwestern Minnesota so only 85,000 acres of canola were grown.

This emerging alternative crop is ideally suited to the small grain production area of northwestern Minnesota. "Acreage is increasing rapidly because of the devastating wheat and barley scab problem in the northern part of the state," says Erv Oelke, director of the Center for Alternative Plant and Animal Products, University of Minnesota.

In an effort to reduce the incidence of scab, growers generally rotated with other crops, such as sunflowers and soybeans, according to Oelke. But in recent years, more and more growers have been finding that canola is an even better broadleaf rotational crop because they can use the same equipment as they do with small grains including drills, seeders, swathers and combines.

Steve Dahl, a farmer from Roseau, Minn., has been using canola in his rotational system since 1990. After three years of wheat, he switches to canola for a year. He also rotates certified grass seed throughout his acreage. This year he had planned on planting 1,000 acres of wheat, 500 acres of canola and about 150 acres of certified grass seed. Unfortunately, because of the very wet

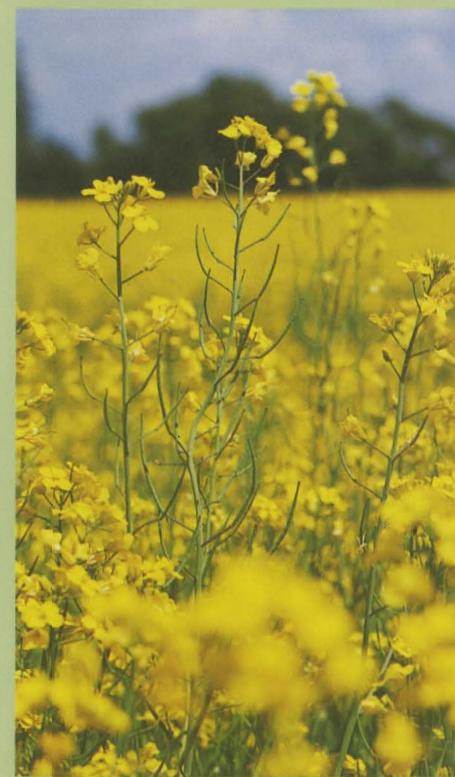
spring and summer, Dahl could only plant about 30 percent of his acreage.

"Canola has been an excellent cash crop," says Dahl. "That's why its popularity is growing every year in this area."

Canola came to the U.S. from Canada, where 13 million acres of the crop are grown. It was developed by Canadian plant breeders in 1974 from rapeseed, an old oilseed crop. The new canola produces oil low in saturated fat and high in Omega-3 fatty acid. Canola oil is considered one of the highest quality edible oils available.

With increased consumer demand for more healthful food products, the outlook is bright for canola and regions that support canola processing.

-Vince Becker and Dave Hansen



TAKING A WATERSHED VIEW

St. Croix Studies Shed Light On Major Issues

by Dave Hansen

Jim Perry, University of Minnesota water quality researcher, has led watershed management projects in over 45 countries, advising governments on how to care for limited water and land resources. Closer to home he works with what he describes as a "very, very, high quality water resource," the St. Croix River and its environs.

The St. Croix watershed includes almost eight million square miles, from Mille Lacs Lake to Hayward, Wisconsin, and from 30 miles south of Duluth to south of Stillwater. The river's development is managed collaboratively by agencies from Minnesota, Wisconsin, and the federal government, a cooperative model Perry showcases with international environmental projects.

As resource managers predicted, the Lower St. Croix area has been affected by housing and industrial development; transportation and utility corridors; and intense recreation. Now, the new bridge proposed at Stillwater has attracted hundreds of people interested in development, conservation, water quality and other issues. Often polarized, these groups use Perry's methods to improve interaction, understand issues, and make decisions.

"Traditional management practices follow a geo-political perspective with arbitrary boundaries that often ignore the interaction of water, ecology, plant and



Water quality researcher Pam Davis samples submerged insect life from under a snag near Marine On St. Croix.

that make up life within the watershed. The research resulted in a water resources master plan used by the National Park Service. Included in the down-to-earth (and water) work was a survey of snag habitat, accumulations of debris that are home to algae, insects and fish.

Researchers have also compared past and recent river conditions, looked at the growth and chemical composition of mussel shells, and analyzed sediment from the river bottom for sedimentation rates, chemical composition and insect life. Current research is looking at insects

waders and wetsuits, Perry's team and the Park Service superimpose a 'map' of the St. Croix watershed. The map is actually layers of information inside a computer and makes up the Park Service's Geographic Information System (GIS) of the watershed. Included on the

terrestrial side is information about farmland, forests, industrial sites, housing developments, roads and other uses of land. This is the stage where microscopic findings — perhaps of lawn fertilizer runoff — merge with the overall view of the watershed.

The GIS analysis shows some very specific effects of urbanization:

- abundance and variety of species shifted over the last 40-50 years
- in urban areas, mussel shells grew slower and showed more contaminants
- over the 20-year study period, the number of small patches of forest almost doubled, from 328 to 610.
- urban land in the watershed doubled, from 3 percent to 6 percent
- forest distribution in the watershed changed, but the amount of forest remained constant

Perry's goal, with the St. Croix or the Zambezi, is to provide detailed — even microscopic — information in a form that is relevant when viewed from a neighboring county or country. "We're not trying to say that any particular changes are good or bad," Perry explains. "We're trying to increase the quality of decision making by helping decision makers understand the impacts of their decisions." ■

COOPERATIVE EFFORT BRINGS RIVER RESEARCH TO ALL

Details of the St. Croix River ecosystem are available without getting one's feet wet or searching scientific journals, thanks to a close relationship between the University of Minnesota, National Park Service, National Science Foundation (NSF),

NSF involvement is helping the Science Museum build an educational mission at the station, and complements Perry's goal to promote informed decision making.

This spring, university students in Perry's advanced water quality

interaction of water, geology, plant and animal life, soil, and other environmental realities," Perry says. Taking a watershed — or ecosystem — perspective makes sense, he explains, "because all the resources are tied together."

Perry formed his perspective while researching specific plants and animals

in tributaries, to understand how habitat and biology interact. By monitoring life changes in each part of the river, including even the small rivulets that feed it, scientists better understand change to the overall watershed.

Using all the details gathered in

BETTER THAN A PIG PEN

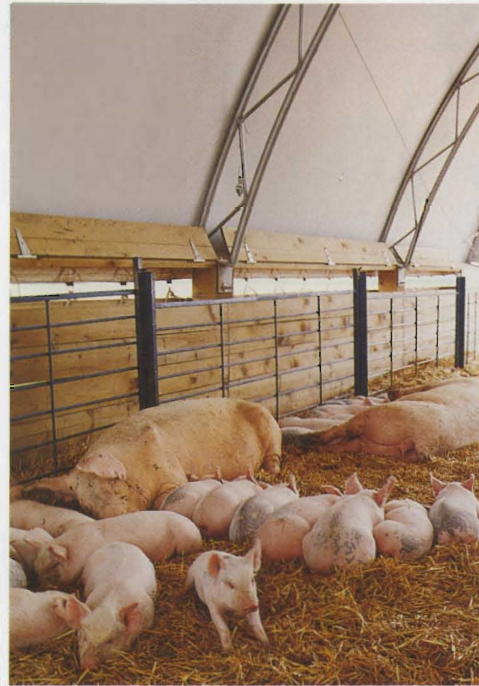
New Swine Systems Look Promising

By Vince Becker

There's more than one way to produce a pound of pork in Minnesota. While conventional confinement systems still work well for many operations, producers involved in an Experiment Station research and promotion program are finding that low-emission, low-input alternative systems can also be profitable. The legislative-funded initiative is studying alternative swine production systems.

"This program was created with the clear intention of doing research and promotion on the ideas of using hoop structures, pasture farrowing and the Swedish deep-bedded system," says Wayne Martin, coordinator of the Alternative Swine Production Systems Program. The primary objective of the program is to increase awareness and understanding of alternative pork production systems that are profitable, protect the environment, and enhance the economies of rural communities.

"We're trying to make information available to more and more people,"



says Jim VanDerPol, Chippewa County pork producer. To that end, he has produced a series of television programs about low-input swine production and alternatives in processing and marketing.

and the Science Museum of Minnesota.

U of M water quality researcher Jim Perry's work is funded by the Park Service and NSF, and the Museum's St. Croix Watershed Research Station is the repository for information developed by Perry's research team. The collaboration provides easy access to the Geographic Information System (GIS) map of the watershed.

The research station opened in 1989 and for the last two years Perry's team conducted workshops for local educators. The NSF sponsored the specialized classes for science teachers as part of a new initiative at just a half-dozen U.S. locations.

class will live at the station for at least two weeks. "They will work in the field to identify and resolve water quality problems," Perry explains. They will also use his international textbook, *Water Quality: Management of a Natural Resource*. It is the first to discuss aquatic ecosystems in the context of human valuation and decision making, and how those attributes vary among cultures.

Research of the St. Croix provides many benefits; to kids who get their feet wet on an island beach or commuters admiring it from a bluff, all the way around the globe to areas facing food shortages, environmental disaster or other conflicts over limited natural resources.

- Dave Hansen

Low cost hoop barn at Morris.

VanDerPol raises 1,500 hogs a year using alternative production systems. "We started switching over to pasture production and deep straw bedding about nine years ago when we began farrowing sows out on grass and abandoned the farrowing houses," he explains. "Since then we've built a couple of hoop houses, which are vinyl-covered hoop structures— basically, a tent over a pile of straw." About 360 head per year are produced in each hoop barn; the rest are pasture-raised.

VanDerPol serves on the task force directing the program and works at the West Central Research and Outreach Center in Morris. This is where research on different types of production systems is being done.

"Last summer, some sows were farrowed in a hoop barn and pigs were being finished in an abandoned concrete silage bunker," says swine researcher Lee Johnston. "In addition, a cold-slat barn was remodeled for three-season swine production."

Four more hoop barns are being constructed at Morris. Some existing structures are being remodeled into Swedish deep-bedded systems that have farrowing pens instead of crates and use a straw-based bedding process, according to Johnston.

Production and marketing is not the only focus of the program. Recently hired rural sociologist, Wynne Wright, is studying how changes in the livestock industry affect farm families and rural communities. Her work takes on increasing importance as economic issues continue to play out. ■

U OF M RESEARCHER LEADS NATIONAL EFFORT

Plant Gene Mapping Goes Big-Time

by Mary Hoff

What do efforts to reduce world hunger, curb the production of greenhouse gases, clean up environmental contamination, and develop alternatives to fossil fuels have in common?

All stand to gain from the National Plant Genome Initiative. Ultimately, the initiative hopes to boost plants' ability to meet human needs by learning more about the genes that control their function. This comprehensive plan will focus and coordinate federally funded plant genome research in the United States for the first time.

To that end, a White House working group, headed up by U of M plant genetics researcher Ronald Phillips, made recommendations for plant genome research which have been approved for \$40 million in federal funding. Six key areas of focus are:

1. *Finish sequencing Arabidopsis.* An otherwise nondescript member of the mustard family, Arabidopsis is, in Phillips' words, "the white rat of the plant world" because it has a relatively simple set of genes. Its genes are also represented in crop plants. When they finish sequencing (determining the structure of) the DNA of the Arabidopsis genome, scientists will have a valuable reference point for exploring the genomes of more complex, economically important plants.

3. *Develop biological tools for studying plant genes.* Tools are needed to understand the genetic material of economically important species such as corn, wheat, soybean, and cotton. This work includes identifying landmark chunks of chromosomes, generating DNA sequences relating to genes that are expressing their products (known as expressed sequence tags, or ESTs), and developing maps of specific points of interest along the chromosomes.

4. *Improve knowledge of gene structure and plant processes.* A map showing how plant genes are strung together is of little use without knowing how those genes are related to actual traits. The research recommended would link genetic structure and plant function and find genes that code for economically important traits such as seed production, growth rate, and disease resistance.

5. *Improve data handling and analysis.* Genome research produces vast

quantities of raw data. The group recommends the development of data management tools and databases that will help transform such data into clear pictures of gene structure and function.

6. *Disseminate information and provide training.* The group wants to disseminate knowledge about both the tools and the results of plant genome research and is encouraging the federal government to fund additional training for young scientists in the field.

As part of the undertaking, Phillips and U. S. Department of Agriculture (USDA) Agricultural Research Service colleague, Howard Rines, received a \$1.8 million grant to advance a new technique for mapping genes in the corn genome (see sidebar).

Phillips is enthusiastic about the momentum the committee's work has created. According to Phillips, "It won't be long until we'll be able to look at our plants like corn — corn grown under drought conditions and corn grown under normal conditions — and see which genes are on, which genes are off and which ones don't change under drought conditions. We can hone in on specific regions, specific genes." ■



Left to right: oats, corn, oats with one corn chromosome.

SCIENTIFIC SERENDIPITY YIELDS NEW APPROACH TO MAPPING CORN GENES

Oat geneticists Howard Rines and Ronald Phillips just wanted a bunch of better oats. Instead they got a \$1.8 million grant to develop a new technique for mapping the corn genome. Such mapping will expedite improvements in traits such as yield and disease resistance.

Initially Rines, with the USDA Agricultural Research Service at the U of M, set out to create a haploid oat plant to use for genetics research. The plant

2. Help sequence the rice genome. As a staple for much of the world's population and the cereal grain with the least amount of genetic material, rice has been the subject of extensive gene-sequencing efforts around the globe.



■ **Plant genetics researcher Ron Phillips and a DNA sequence from corn, indicated on film by the black bands.**

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FAMILY RELATIONSHIPS *continued from page 1*

The process relies heavily on trained counselors and clergy and begins with couples taking a 165-item inventory designed to help them examine their relationship. Counselors assist couples to identify areas of satisfaction and dissatisfaction and help them communicate more effectively about important topics. "We work directly with the counselors and clergy on how to interpret inventory results to help them facilitate counseling sessions," says Olson.

Ultimately, Olson is able to boast considerable success based on follow-up work conducted with participating couples over the past two decades. Results show that PREPARE is able to predict before marriage, with 80 to 85 percent accuracy, who will be happily married and who will be divorced within three years of completing the inventory. More importantly, says Olson, "PREPARE and ENRICH have helped those who participate in six to eight program sessions experience lower divorce rates and higher satisfaction in their relationships."

This fact is especially satisfying to Olson because of his desire to help couples build stronger marriages to carry on through succeeding generations. His book, *Building Relationships: Developing Skills for Life* (Life Innovations, 1999) is designed to build on his success by targeting teenagers early in their relationships. It presents an engaging approach to cultivating assertiveness, active listening, and conflict resolution. The book is being targeted for use in public schools, religious education programs, community groups such as YMCA and 4-H, and homes. Thus far, according to Olson, at least two states are considering the book in their mandatory high school curriculums.

As a natural outgrowth of his work on marital and family relationships, Olson has increasingly focused on how work-related stress affects relationships, particularly when families are in business together. Family operations account for more than 85 percent of all businesses in the United States. "Over the past decade," says Olson, "we have

found that greater communication and lower stress can almost always positively impact relationships both in and out of work."

Most recently, he developed a Coping and Stress Profile (CSP) to help family members assess stress, coping resources, and satisfaction in four areas of life: personal, work, couple, and family.

He trained 500 counselors who use the Profile with companies to help reduce employee stress and increase their work satisfaction. In family businesses, this has a significant impact on healthy relationships both in and out of work.

After he retires from the University this year, Olson will remain actively involved in distribution, training, follow-up counseling, and ongoing research for the programs he started. His most recent book, *Empowering Couples: Building on Your Strengths* (Life Innovations, 2000) is based on survey results from 21,500 marriages. It is designed to help couples identify stumbling blocks and ways to overcome them. ■

was to have a single set of chromosomes, rather than the two sets plants normally have.

To create the oat plant, Rines crossed oats with corn, based on a technique used successfully by British scientists to create haploid wheat. In the British wheat-corn cross experiment, the wheat shed the corn chromosomes, leaving the desired haploid all-wheat offspring. To Rines' and Phillips' surprise, however, the oat-corn cross retained a remnant corn chromosome, too.

This discovery led them to the idea of mapping corn genes. Because the cross separates a single corn chromosome from the other nine, it creates a manageable bit of information for analysis. That bit of information can be further fragmented with a jolt of radiation.

Rines and Phillips will create a complete set of corn-chromosome tidbits, each covering one-tenth or less of a chromosome.

In addition to developing a corn genome map, Rines lists other research applications including cloning bits of corn chromosomes for further research; developing markers that indicate the presence of genes coding for important traits; and developing modified oat plants with valuable corn traits such as disease resistance or heat stress tolerance.

-Mary Hoff

EXPERIMENT STATION BOOK TEACHES NEW TRICKS

Cleaning The Canine Gene Pool

by Larry Etkin

Dogs have been humanity's faithful companions for tens of thousands of years; longer than any other animal. This is because dogs are versatile and fill many roles for people. This relationship led people to create sub-breeds with concentrated subsets of characteristics that unfortunately resulted in concentrations of genetic diseases.

FutureDog: Breeding for Genetic Soundness, a new publication of the Experiment Station, discusses this accumulating genetic problem, and its potential solution using new tools of genetically based diagnostics.

"Every breeder is a keeper of the



■ **The Corgi is one of several breeds with a genetic blood-clotting anomaly. The *FutureDog* book covers all aspects of genetics in canines.**

'genetic flame' for his or her breed," says author Patricia Wilkie, and "every breeding decision an individual breeder makes has the potential to affect the future of the breed. For conscientious breeders, each attempt to produce quality purebred dogs includes a strong commitment to reduce inherited disease."

FutureDog, is a basic reference on the tools and techniques modern biotechnology makes available to breeders trying to eliminate genetic diseases and accelerate breeding to the

standard. The 100-page book presents a technical subject with language suitable for a nonexpert reader and includes over 60 color photos. *FutureDog* explains how genetics affect inheritance of traits and diseases and why genetic testing will improve purebreds.

FutureDog is available for \$13.95 plus shipping. To order call 1-800-876-8636 and ask for item 7046.

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MANAGING EDITOR

David L. Hansen

PRODUCTION AND COPY EDITOR

Phyllis W. Unger

DESIGNER

Nancy H. Teufert

PHOTO CREDITS

David L. Hansen except p. 4, USDA-ARS

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Minnesota Agricultural Experiment Station
University of Minnesota
190 Coffey Hall
1420 Eckles Avenue
St. Paul, Minnesota 55108-6056

ADDRESS SERVICE REQUESTED

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:

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- *College of Biological Sciences*,
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