



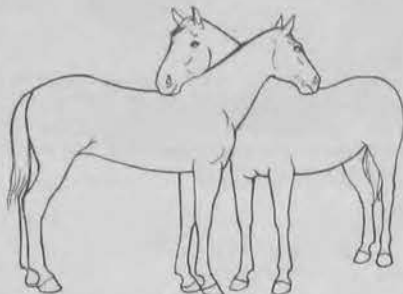
NORTH CENTRAL NEWS

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STARVING HORSES

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As I wrote in the last issue of the *North Central News*, the staff at the North Central Research and Outreach Center (NCROC) is engaged in a process of "Planning Our Future". This planning process has been on hold for the past few months pending a determination of how the states reduction in funding for the University of Minnesota would affect the College of Agricultural, Food, and Environmental Sciences, and the Research and Outreach Centers (ROC's). The extent of the budget reductions required to adjust to reduced state funding is now known. The average reduction in state appropriated funding for the ROC's is about 10 percent. For NCROC, the reduction is nearly \$200,000.

At NCROC, 100 percent of state funds are used to fund salaries, fringe benefits, and utilities. Since utility bills must be paid and utility costs are not decreasing, the \$200,000 state reduction in funding must be accommodated by a reduction in salary and fringe costs. Positions will be eliminated and staff appointment time will need to be reduced in order to fit our operating costs within this new budget reality.

This latest budget reduction is part of a series of ongoing budget cuts and increased internal university taxes that have reduced funding to ROC's over the past 12 years. This has created a situation that prompted the title for this article "Starving Horses". At NCROC, we have six research program areas that are primarily funded by state appropriations. These six program areas are: Agricultural Engineering, Agronomy, Animal Science, Horticulture, Forest Management, and Tourism/Economic Development. They are what I have at various times described as "six starving horses". Not all of the six are at the same stage of starvation, but collectively all are starving.

What is a starving horse? A starving horse is a research program that does not have adequate resources to reach the level of excellence its faculty research scientist is capable of and its customers require. It is a research program that, if it had adequate resources, could achieve a level

of productivity and efficiency that would provide the optimum level of service to our customers and would bring national and international recognition to our college and university.

The question we as a research staff have and you would have as a livestock producer, is how to deal with six starving animals? If you cannot find the resources to feed all six adequately, do you continue to feed at a near starvation level? The answer, I presume, is that you would not continue to starve all six. One solution is to get rid of two animals in order to feed the remaining four better. Another solution is to obtain more resources in order to feed all six well. We have been working hard at the latter solution and have had success in increasing grant and gift support for our research programs. The latest state funding reduction requires that we implement the first solution as well.

Over the next few years, NCROC will grow smaller and become more focused. We will have fewer faculty and fewer research programs. These changes will not be easy. We are asking our friends and customers to help us make this transition as smooth as possible with as small as possible direct effect on the services we provide to our customers. Your support in the legislature through contacts with your local senators and representatives and increased gift and grant funding will be most helpful at this time.

With increasing state budgets, you may be surprised by the fact that the University's financial condition is not better. In reality, state support for higher education has continued to decline as a percentage of state spending over the past 25 years. Funding higher education has become a significantly lower priority in Minnesota compared to other state needs. State funding now accounts for less than one-third of the University budget. Gifts, grants, tuition, and sales account for most of the remaining two-thirds of the budget. Tuition revenue has become one of the most significant sources of revenue growth in the University. Research units such as the ROC's are not able to generate revenue from tuition and thus suffer more from reduced state funding.

The reader of this article should not conclude that all is gloom and doom. It is our hope that out of this transition process will come fewer, but stronger research and outreach programs at the ROC's. NCROC is looking forward to working with our friends and customers to help make this happen.

In spite of pending faculty and program reductions at NCROC, some new faculty and programs have been located at NCROC over the past several years. These new positions and their primary funding source(s) are: Wildrice Breeding (USDA Grant); Shoreland Stabilization/Revegetation (Extension/Grants); Tourism/Economic Development (Extension/Grants); and Silviculture (Department of Forest Resources/Grants).

Working together, the faculty and staff at NCROC will continue to serve the needs of our customers and the University of Minnesota as we adapt to this new budget reality.

Please feel free to contact me if you have concerns about specific research and outreach needs, and how they may be addressed in this period of budget shortfalls.



SILVICULTURE
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There are approximately 65 acres of red pine plantations at NCROC ranging in size from a half acre to 12 acres and ranging in age from 15 to 103 years. The oldest red pine stand is the Chapman Plantation, planted under the direction of Dr. Herman Chapman, the first Head of the North Central Research & Outreach Center.



The University of Minnesota Forestry Club visited the Chapman Plantation in February 2003.

Red pine stands that are 30 to 50 years old are ideal candidates for thinning. Thinning a forest is equivalent to weeding a garden in that growth is concentrated on the most desirable trees. The silviculture and logging classes at Itasca Community College are marking and thinning a red pine stand this spring on the NCROC forest. Thinning will allow more room for the high-quality trees selected for final harvest to grow and allow light through the canopy to promote the growth of other plant species.

In the Thinned and unthinned portions of a 41-year-old red pine plantation at NCROC. Average stand diameter is 9.5 inches, site index is 70. The thinned portion of the stand has 75 square feet of basal area and 140 trees per acre. The unthinned portion of the stand has 190 square feet of basal area and 350 trees per acre.

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AGRICULTURAL ENGINEERING

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In this world nothing can be said to be certain, except death and taxes." (Ben Franklin, 1789) At this writing, our country is facing heightened uncertainty both internally and abroad. Closer to home, we at the University of Minnesota are facing the uncertainty of budget cuts and their effects on programs including those of this Center. Whatever the future holds, we know we must continue to serve the needs of our customers to the fullest extent possible.

As usual, this past winter/early spring period has been a busy time for this department on a variety of fronts. In the research area, in response to a recent request from the MN Wildrice Council, I have been reviewing past research on treatment of freshly harvested wildrice for ideas processors might consider for alleviating the problem of inadequate processing plant capacity during time of peak harvest. When harvested, wildrice is high in moisture content and cannot simply be kept in the pile for an extended period without deteriorating. The ultimate goal here would be the development of an effective, low-cost method for "holding" excess wildrice for processing later.

In the support area, one current project in cooperation with this Center's Horticulture department is the development of a system to "mist" randomly assigned rows within a field strawberry research plot to promote disease development as part of a disease screening study. The objective is to develop a low flow rate, low pressure, low-cost system that will provide automatic, intermittent application of water to "mist treatment" rows with minimum drift onto adjacent rows. After having considered various options and tested various types of sprayer and irrigation type nozzles, I am optimistic that we are homing in on a system that will meet the above objective. Other recent involvements with the horticulture department include replacement of obsolete environmental controls in the horticulture (and wildrice) greenhouse and construction and operation of "high tunnel" systems for use in extending the growing seasons.

As for Center maintenance and improvement, one major project over the winter was the demolition of a 40' x 60' structure used for the last several decades for loose housing of livestock. Built in 1920 into the sidehill east of the water tower, it was originally designed for solid manure storage. Over time, the old rock and mortar foundation/retaining walls had moved gradually inward and one wall was in danger of imminent collapse. With repair costs prohibitive, demolition was the only alternative. After lead paint and other concerns were successfully resolved, the building was demolished and hauled to approved landfills, and 660 cu yds of fill was hauled from our gravel pit to fill the hole. Landscaping will soon be completed. We continue to make progress on a long list of other projects.

In the midst of planned work, like so many of you this winter, we have had a number of frozen sewer and water lines as well as failures of the underground electrical service to the beef barn. Thanks in part to a knowledgeable and dedicated maintenance staff, these emergencies were all

resolved in a timely manner without harm to our research programs.



AGRONOMY

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The lack of snow cover during much of last winter, combined with many lengthy periods of sub-zero nighttime temperatures, likely has many forage producers wondering about survival of perennial forage species. Fortunately, there are many factors involved in winter survival in addition to snow cover and soil temperature. The age of the stand of forage plants is one such factor. Young plants are generally healthier than older ones. They tend to be less weakened by disease, cutting management and physical wear and tear from farm implements and grazing animals. Nutrient status is another important factor in winter survival. Nutrient ions in solution in cellular fluid help plants withstand cold soil temperatures, somewhat analogous to the amount of anti-freeze in a car's coolant system. Therefore, well fertilized plants have an advantage. Thirdly, soil moisture status affects respiratory activities of plant roots and crowns. Wet soils will be colder and excess soil water retards effective air exchange between plant cells and the soil water. Dry soil, although warmer, can have a desiccating effect on belowground plant parts, removing water needed for normal biological processes.

There has been extensive study of climatic conditions that can lead to winter injury of alfalfa. Stand age, fertility status and soil moisture conditions aside, alfalfa crowns can survive soil temperatures down to 5-15 F°. Soil temperatures in St. Paul under bare soil were below 10 F° at a depth of about two inches for several hours for three consecutive nights in late January, 2003. These soil temperature data have prompted a statewide effort to assess the potential for winter damage to alfalfa. County extension educators and research faculty at Research and Outreach Centers have been encouraged to dig alfalfa crowns and bring them indoors, plant them in pots, and observe for ability to initiate new growth. This effort may give a preliminary indication of the regionality and extent of alfalfa winter injury. Here at the North Central Research and Outreach center at Grand Rapids, 80% of crowns from a 2000 seeding had initiated vigorous growth after one week indoors. A possible contributing factor to the survival of these alfalfa plants is the phenomenon that soil temperatures under sod are substantially warmer than soil temperatures under bare soil. Soil temperature at a depth of about one-half inch, on the same three January nights as mentioned previously, only fell below 20° by the third night. An alfalfa stand is not precisely sod, however it is not precisely bare soil either. It is possible there was enough "sod effect" to help many of the alfalfa plants survive. It is quite likely that alfalfa plants in mixture with grass will be even less susceptible to winter injury than alfalfa in pure stands. Results of this preliminary survey, when available, will be posted on the

North Central Research and Outreach center
w e b s i t e a t
<http://mailman.coafes.umn.edu/mailman/listinfo/alfalfa>.

Winter injury to alfalfa is likely to be variable across our region, as local soil moisture, snow cover and soil temperatures can vary. While the preliminary assessment mentioned above may give some early useful indications of winter injury to alfalfa, an accurate assessment of winter survival should be made when alfalfa is growing vigorously and plants are two-four inches tall. Healthy plants will be vigorous with firm roots or crowns, whereas winterkilled plants will have soft crowns with little or no top growth and be easy to pull up. Injured plants will have only a few stems growing out of one side of the plant, and will likely not live through the season.

Counting growing stems per unit of area is a quick, accurate method to determine if an alfalfa stand is dense enough for good forage production. At a density of 55 or greater stems per square foot, forage yield will not be limited. At a density of 40 to 55 stems per square foot, some forage yield reduction can be expected. When stand density is less than 39 stems per square foot, consider replacing or improving the stand (a useful hint: a coat hanger bent to a circular shape is very close to 65% of the area of a square foot; so comparable stand densities using this method would be 36 or greater, 26 to 36, and less than 25, respectively). When assessing stand density, walk the entire field, as some areas will be better than others. Finally, when stands are marginal or thin only in spots, interseeding is a viable option. However, attempting to thicken thin stands of alfalfa by interseeding alfalfa is not an option for stands greater than one year old because of autotoxicity. Winterkilled fields of alfalfa can be re-seeded to alfalfa after waiting at least eight weeks.

There is less readily available information on winter survival of other perennial forage legumes and grasses. Red clover and birdsfoot trefoil are generally less persistent than alfalfa, so significant winter injury to stands of these two species is likely. Fortunately, healthy stands of perennial forage grasses will receive the full beneficial impact of the "sod effect" on soil temperature. Possible areas for concern are grass pastures, which often in fall are suffering from a season of over-grazing and low soil fertility.



ANIMAL SCIENCE

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Spring has arrived again after a long cold winter! At the NCROC, spring also brings along the anticipation of an excellent calving season and a great calf crop. For the Animal Science crew this can be the toughest and longest part of the year, but it also is the most rewarding. This year is no exception! We reached the tail end of the calving season and have had our most rewarding calving season thus far. Our calf health is as good as ever, which should translate to heavier weaning weights this coming fall.

We expect 188 cows to calve during this calving season and we maintain a small group of donor cows, which provide embryos for us that will be implanted into our recipients this spring, plus approximately 80 replacement heifers that will be inseminated this summer to calve next spring. In addition, we have 18 bulls for sale and several fall calving cows and open cows that remain potential additions to producer herds. If you are interested, please stop by or give us a call at your convenience.

A highlight for me this spring was a recent trip to Brazil to speak at a reproductive veterinary conference in the heart of their cattle industry. What an experience and an "eye-opener"! I found it overwhelming that greater than 500 veterinarians and industry professionals attended this conference based solely on reproductive management practices for beef and dairy operations. The scope and potential of the Brazilian beef industry is almost frightening and the level of technology used by veterinarians and cattle producers tends to be extremely progressive. In preparing for my speeches, I researched their artificial insemination industry. During the last 10 years, the Brazilian beef cattle producers have purchased 400% more semen for artificial insemination use than beef cattle producers in the United States.



Speakers and Organizers of the Brazilian Reproduction Conference

Beef cattle producers also tend to adopt new technologies and figure out uses for those technologies. Let me share with you some of the farm visits that impressed me. Our first stop was a privately owned bull test station that tested between 800 and 1,000 bulls annually. After the test, all bulls that meet certain requirements are offered for public auction either in person, over telephone or satellite! The sale spans three days, with the *Bos Taurus* bulls (Continental and British

breeds) selling on one day, *Bos Indicus* bulls (Brahman, Gir, Guzurat, etc) selling in the second day, and the Nelore breed (the most popular *Bos Indicus* beef breed in Brazil) comprising the third day of sales. What struck me as amazing was that this bull test station was not the largest bull test in Brazil!

My second day of visits included two beef operations, a purebred operation and a commercial operation. If you have ever visited a thoroughbred racehorse operation in Kentucky, you may appreciate the appearance of the purebred Nelore, Brahman, and Guzurat operation that we visited. The huge green pastures and show-barns were more impressive than any beef operation that I have visited in the United States. At their last production sale, they sold 60 Nelore females for an average price of 130,000 Brazilian Reals. Converted into US \$ is approximately \$42,000.00! The future of the beef industry in Brazil is indeed very strong!



The visit to a commercial operation astounded me with the level of technology used. This operation had 4,000 F1 cross females that served as recipients for in vitro produced embryos. During 2002, this operation sold 3,000 pregnant recipients that were pregnant with embryos that were produced from eggs and sperm in a laboratory (in vitro). These recipients were sold for an average of US \$400.00. Certainly the price received per female by the commercial producer was significantly less than that received by the genetics sold from the purebred producer, but the commercial producer was also selling pregnant recipients for 350% less than what similar animals would sell for in the United States. These producers have managed to incorporate cutting edge technology into their operations to improve genetics at a cost effective rate.

Although my farm visits focused on outstanding operations, several operations that we drove past were considered substandard. However, my hosts indicated that through the use of reproductive technologies and genetic selection the genetic base of the Brazilian beef herd is improving exponentially. My hosts suggested that if the substandard operations fail to utilize careful selection and technology they might not survive as beef producers in the future. This was an exciting trip and an excellent learning experience, which I would gladly share with any of you if you stop by my office.

As you all well know, our Beef Research Fund Campaign is well underway. For the future success of the NCROC beef research program, your contributions are essential to our sustainability. To learn more about the campaign please contact our office and remember that any donations to the University are tax deductible.

From everyone on the Animal Science crew at NCROC we wish you a productive summer and hope to see you at one of our field days or on a personal visit at your leisure. Visitors are always welcome.



FOREST MANAGEMENT
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Draft Forest Plans for the Chippewa National Forest and the Superior National Forest are scheduled for release in late April. Forest Plans will help guide the US Forest Service in managing these forests for the next 10-15 years. NCROC faculty and graduate students have played a substantial role in helping analyze seven forest-wide alternatives for each forest. The draft plan for each forest compares the seven forest-wide alternatives and has selected one alternative as a preferred alternative for each forest.

Now it is time for the public to get involved in the planning process by voicing their opinion on the strengths and weaknesses of each alternative. The plans at this point are just draft plans. Public input will help guide further analysis, which will help the Forest Service move from a preferred alternative to a selected alternative. The selected alternative will not be limited to one of the seven alternatives from the draft plan. It most likely will end up as a hybrid alternative that integrates strengths of the different alternatives. A hybrid alternative may help overcome some of the potential conflicts because of differences in public opinion. In each draft plan, only one of the seven forest-wide alternatives is identified as a preferred alternative. Each of the other six alternatives has a stakeholder group associated with it. Many of these groups were quite active in developing "their alternative." If the Forest Service limited its choice to just one alternative from the seven in the draft plan then stakeholders behind the other six alternatives would likely feel like they lost. It is important not to view the process as a competition with a winner and six losers. Much of our work this summer will be tied to helping with analyses related to building a selected alternative

The forest plans will emphasize strategic direction rather than site-specific management. Emphasis is on balancing timber harvesting and forest use while moving the forest towards a set of desired future conditions. Desired future conditions are defined in terms of the age distribution of stands, the mix of tree species, and the size and spatial arrangement of stands on the landscape. As in

the past, even-aged management is still a major part of most alternatives because of the ecology of the natural systems of northern Minnesota. In general, harvesting substitutes for the natural disturbance of stand replacement fires. Most alternatives also include a substantial amount of uneven-aged management to help provide more areas with some older trees and greater within-stand diversity. For each alternative, emphasis is on designing plans to better match management activities with the characteristics of specific ecological areas. Overall, it is too simplified to assume that the ecological integrity of an alternative is inversely related to the total volume or area harvested. Various interest groups may have more in common than they realize when they consider the potential to invest in management options, especially those related to reforestation. For northern Minnesota in general, important public policy decisions relate to the level at which society is willing to invest in the management of public forest lands.



HORTICULTURE

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This spring offers some unique challenges for the horticulture

program at NCROC. With the departure of Pat Johnson in January, the current University hiring freeze, looming budget cuts, the horticulture program, which is highly labor intensive, is in for an interesting season. Nevertheless, Keith Mann, our hourly workers, and myself are looking forward to an exiting growing season. As mentioned, Pat Johnson left our program in January. She added much to the program in the two years she was here, and will be greatly missed not only in our program but also for what she brought to NCROC. Thanks Pat and good luck.

The effects of the lack of snow and cold soil temperatures should prove to be a challenge to the survival of many plants. Soil temperatures at four inches were as low as 5 to 10 F. These temperatures are low enough to kill and/or seriously damage roots. Certainly unmulched plants will be winterkilled. I would be surprised if any of our carryover chrysanthemums or unmulched strawberry plants survive. On the other hand, air temperatures while cold, were not extremely cold so normally exposed woody tissue should come through the winter well. Our young orchard looked great on February 20 when I evaluated stem tissue for winter injury. In my over 30 years in northern Minnesota I have never seen soil temperatures as cold as they were this winter. It may be a first where apple rootstocks are winter damaged while the tops survive. It would truly be a test winter if that occurs.

Several new plantings are planned this year including three new strawberry plantings to evaluate new breeding lines, new cultivars, and strawberry angular leaf spot. New blueberry selections, planted in 2002 had their first hardiness test and the newest yield trial planted in 2001 should fruit for the first time this summer.

New hardiness evaluation tests of hardy roses from the University breeding program will be planted this spring in cooperation with woody ornamental breeder, Dr. Stan Hokanson. NCROC being the coldest research center in the lower 48 states offers this unique opportunity.

We expect to be planting tomatoes, cucumbers, and peppers in our high tunnel houses around May 1. This season extending project is exciting and hopefully will provide northern Minnesota market growers an opportunity to grow and market warm season crops over a longer period of time. One of the two houses will be used to evaluate cultivars, the other to evaluate planting dates and other cultural systems to improve production.

Flower trials should be excellent again this season with the many new cultivars we are now planting in the greenhouse. We plan to have over 100 hanging baskets on trial as well as containers, shade plants, and ground beds that will show you how to use these annual flowers in your gardens.

The All America trial winners and many other new cultivars entered by the participating seed companies offer you and other northern Minnesota gardeners a unique opportunity to preview what you can expect to see on the market in 2004.

I hope you will plan at least one visit to our horticulture plots this season. You are always welcome! Wednesday, August 27 is our annual Horticulture visitor's day. If you would like to volunteer your time or provide a financial contribution to our horticulture program, we would like to hear from you. We hope to see you in the plots this season!



SHORELAND VEGETATION AND LANDSCAPE

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"Shoreland Education" now has a new look and focus within Extension! Our Shoreland Volunteer, Shoreland Revegetation, and Shoreland Plant Identification workshops are now coordinated statewide through Extension's Shoreland Education Program. Special logos and brochures were created to promote this spotlight program (available near the front desk). This season we'll be offering the same informative, train-the-trainer shoreland workshops, with the addition of a project maintenance workshop that will tour existing shoreland projects within a region. Locally, in cooperation with Itasca County Extension, Itasca and Aitkin SWCDs, and Itasca Coalition of Lake Associations, we are fortunate to host a Shoreland Volunteer Workshop at Camp Bluewater, north of Grand Rapids.

A shoreland intern will be assisting Extension, the DNR, and local SWCDs with shoreland projects in northeastern Minnesota this summer. As a cooperative effort between the DNR and Extension, this university student will be trained and gain experience in shoreland restoration. At the same time, our northern lakes and rivers will benefit from his/her efforts.

The native plant supply may be low in northern Minnesota this summer. We lost one of our best local native plant producers to cancer last fall, and another producer will be operating under limited capacity this summer due to a recent fire at the nursery. Fortunately, two new native plant nurseries are becoming established, one in the Cloquet area and another near Longville, to complement the existing nurseries and local SWCDs' spring plant sale.

A new plant product on the market is pre-vegetated mats of native aquatic plant species. Planted in coconut fiber blankets in a greenhouse in mid-winter, these vegetated mats are ready to be established outdoors by spring and are easily transported to restoration sites. When anchored to a lake bottom the plants in these mats rapidly become established and spread to create a solid stand of emergent aquatic plant species that will protect the shoreline from erosion, as well as provide habitat necessary to fish and wildlife. This summer these mats will be piloted on Spirit Lake in Menahga and other shoreland sites in need of aquatic vegetation.



TOURISM AND ECONOMIC DEVELOPMENT

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The Minnesota Department of Transportation will be funding (\$131,000) a new project entitled "Economic Benefits of Airports for Communities An Economic Impact Tool for Small Airports." The principle investigator is Bill Gartner (COAFES Applied Economics) and co-PI is Dan Erkkila (North Central ROC).

Small airports are not often viewed as economic engines for rural areas. Yet, there is some research that indicates business location and economic development decisions are directly tied to the presence of these airports. Although this study may not be viewed as addressing a significant transportation problem, it is a significant community development issue directly tied to air transportation.

There is no currently available tool to measure the economic importance of small airports to the communities in which they are located. Instead, a separate study for each airport is often undertaken to accomplish that objective. The idea behind this research is that standards can be derived which would allow managers of small airports to conduct an inventory of the type of

businesses in the area and enter them into a web-based program that would use the algorithms established during the research to provide an estimate of economic impact to the region.

The development of an economic impact measurement tool requires that standards be developed based on the norms and types of economic activities most likely to be encountered for small airports. The development of standards will involve intensive sampling of small and medium size airport activities.

Many airport managers would gain significant benefit from the availability of a user-friendly tool to estimate local economic impact. The tool will be web-based and it is envisioned that users will only need to know basic, baseline data, like the types and number of businesses associated with their airport. Project objectives include: Understanding the inter-industry linkages and connections to local communities of the varied economic activities of small and medium size commercial and general aviation (public use) airports in Minnesota; Development of a web-based tool that will allow local airport managers to estimate the economic impact of their airport on their community, and; Estimation of public (e.g. federal safety) and private activity contribution to airport economic impact.

The research will begin in Summer 2003.



TOURISM AND ECONOMIC DEVELOPMENT

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This year I am involved in some very interesting projects. One of them is my work as a board member on the UM Northeast Sustainable Development Partnership. This innovative partnership is setting an example internationally of how principles of sustainability can be properly implemented. It is mostly citizen-led and "active citizenship" is one of the requirements of projects that are funded by the board. It is a successful effort to link the University to grassroots initiatives around a critical topic. As the chair of the Recreation and Tourism Committee, I have been guiding the development of a work plan for the group that will be providing funding for assisting communities with sustainable recreation and tourism development. More information about the partnership is at www.regionalpartnerships.umn.edu.

Another project is with the Minnesota American Indian Association (MAITA). MAITA has received funding from the Minnesota Office of Tourism and the UM Tourism Center to do a visitor profile study of visitors to tribal areas. The group is securing the remaining funding and we plan to begin collecting data in the upcoming months. This study will provide information that will help with tourism development and facilities management. Tourism has great potential to bring more economic development to these areas and good

information will make development efforts more effective.

The last project I will describe is an event based on the Special Forest Products industry in Northern Minnesota. A group of various agencies, organizations, and businesses has come together to plan a new event with the overall objectives of strengthening this emerging industry and enhancing tourism. There will be education and training on entrepreneurial business management and sustainable practices as well as a marketplace where food and goods will be sold, demonstrations will be held, and entertainment will be provided. I am particularly interested in this event as a method to "brand" the Grand Rapids area as a place where there is diverse use of forests and as a good place to come learn about and purchase special forest products. Information about this event will be on www.specialforestproducts.com.

In addition to the above-mentioned projects, I have been coordinating a series of ICTV (Itasca Community Television) television programs about the work being done by NCROC faculty.

As I always have, I continue to meet with groups in various communities to discuss tourism development. An example of this is some recent presentations at Chambers of Commerce. My presentations are most often designed to stimulate interest and to educate the general public about tourism as an industry and as a form of community development.



TREE IMPROVEMENT

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The white pine is Minnesota's state tree, tall and stately with five soft needles per fascicle. Many Minnesotans can tell you about a particular white pine that has special meaning for them. Conversely, the history of white pine in Minnesota is less emotionally uplifting. Overharvested during the late 19th and early 20th century the remaining trees were then subjected to an introduced disease called white pine blister rust beginning around 1916. This fungal disease was brought into this country on white pine seedlings that had been grown in European nurseries for reforestation efforts in the United States. It has a life cycle that requires both white pine and gooseberry as hosts but is lethal only to white pine. Although it can attack white pine of any age white pine blister rust has been especially devastating to young white pine because once the fungus enters a needle it has a shorter distance to the main stem where it forms a canker, girdles the tree and causes its death. Recently we have had success identifying resistance to white pine blister rust in some seedlings from specially selected white pine trees.

In conjunction with the U.S. Forest Service Oconto River Seed Orchard (ORSO) in Langlade, WI and Dr. Bob Blanchette in the Plant Pathology Department at the University of Minnesota, we

have been screening seedlings from mature white pines that were selected throughout the Lake States for putative resistance to blister rust. These mature trees were identified from wild populations as being disease free and then grafted into a seed orchard at ORSO. Until recently, they had not been rigorously tested to determine if the seedlings they produced actually possessed resistance to white pine blister rust.

We collected open-pollinated seed from these individual trees and grew the seedlings for about four months in the greenhouse. In an inoculation chamber designed to provide optimal conditions for infection the seedlings were subjected to an intense barrage of blister rust spores grown on gooseberry leaves. After two days of exposure, the seedlings were returned to the greenhouse where seedling mortality was recorded every two weeks for a year and then averaged over families (a family consists of all the seedlings that came from one particular tree - they all share a common mother). Our results indicate that some trees in the seed orchard at ORSO do produce seedlings that are resistant to white pine blister rust. However, not all the trees we tested produced resistant seedlings and even in the best families, the survival rate was only around 50%.

Microscopic evaluation of infected needles from susceptible (Figure 1) or resistant (Figure 2) seedlings indicated cellular differences in response to the presence of white pine blister rust fungus. The fungus in the susceptible seedling moves unimpeded through the needle along and through the vascular bundle. In Figure 1, this is evidenced by a large area of densely packed fungal mycelium located around the vascular bundle in the middle of the picture. In the resistant seedling the mesophyll cells in the needle ahead of the fungus collapse and die which arrests the advance of the fungus because it requires living cells to survive. This reaction within the white pine needle creates a physical barrier and reduces the food source available for the blister rust fungus.



Figure 1. Infected needle from a susceptible seedling.



Figure 2. Infected needle from a resistant seedling.

What does this mean for the future of white pine in Minnesota? Clearly, the identification of trees that can produce seedlings resistant to white pine blister rust is good news for our breeding program but we are not out of the woods yet.

Three pieces of information will be key to returning white pine to Minnesota's landscape a) continued screening to find additional trees that produce large percentages of resistant seedlings, b) field trials to validate the seedling screening results and c) an understanding of the mechanisms of resistance so that individuals with similar mechanisms can be bred to enhance resistance.

An individual white pine that produces seedlings completely immune to white pine blister rust may never be found, but through screening programs such as this one, we can include materials with greater resistance in our breeding program to produce seedlings with more rust resistance than currently available.



WILDRICE BREEDING AND GERMPLASM IMPROVEMENT

Dr. Raymie Porter
Wildrice Geneticist
raporter@umn.edu

We have been investigating the genetics of seed size the past two years. We are still analyzing data from 2001 and 2002, going beyond broad-sense heritability total genetic variation reported last year. Broad-sense heritability is the percentage of total variation that is attributable to any genetic variation (nature, not nurture). Narrow-sense heritability, on the other hand, is an estimate of only that part of the genetic variation that is due to the additive type of genetic variation, the kind that breeders can actually select for and make progress. This year we obtained estimates of narrow-sense heritability of 59% and 67% for seed length. The latter estimate may be higher due to the unavoidable inclusion of additive by additive epistatic variance.

Heritability can be used to calculate gain from selection, which in this case was estimated at about 1.0/64 inch per cycle, using simple phenotypic recurrent selection (individual plant selection). Expected gain from selecting both among and within half-sib families was slightly higher: 1.3/64 inch per cycle. Additional gains through replicated family selection do not appear to be sufficient to offset the cost of planting, maintaining, and measuring replicated family rows, especially if an additional season is needed for recombining selected families.

How would this play out in the "real world"? Since the mean for this population was 23.8/64 in., we might expect to significantly exceed the longest entries in the 2002 variety trials (23.9/64ths for 96F-111C, K2PiP-C4, and PBM-C9) after only one cycle of individual plant selection. This was borne out by the fact that PBM-C9 was 1.5/64ths longer than PBM-C6 in the 2002 variety trials. PBM-C9 was the result of three additional cycles of selection using the same criteria as PBM-C6 (yield, disease resistance, lodging resistance, etc.), but cycle 8 and cycle 9 were *also* selected

for increased seed length using individual plant selection. Once again, wildrice proves to have enough genetic variability to make changes through basic plant breeding selection techniques.

Short to medium-term seed storage experiments are being conducted by graduate student Joanna Cregan, using several storage temperatures, the addition of sphagnum as a storage medium, and several pre-storage drying regimes. Maximum germination after 1 year of storage was observed when freshly harvested seeds were not dried, but stored without sphagnum or water at 6°C (21°F)

On the disease resistance front, a number of leaf lesions were collected in 2002 from growers' paddies in the Aitkin, Clearbrook, and Waskish areas. From these lesions, 52 isolates of *Bipolaris oryzae* (cause of Fungal Brown Spot) have been cultured, as well as 81 isolates of *B. sorokiniana* (cause of Spot Blotch). These new isolates will be used to grow a multiculture inoculum to spray on breeding populations for continued selection for resistance to both foliar diseases, and for estimating the disease resistance of variety trial entries.

Also this year, we will conduct field experiments to estimate the optimum harvest maturity for maximizing yield and minimizing shattering for several recent varieties. Since newer varieties like Franklin, Petrowske Purple, and Itasca are considerably more shattering resistant than older varieties, growers should be able to delay harvest in order to allow more seeds to mature. However, the best time to harvest these varieties (in terms of seed moisture) has not yet been determined. Different types of moisture testers can quickly estimate seed moisture in other small grains. One or more of these could be calibrated for wildrice seeds, either whole or ground, giving growers a tool with which to make harvest decisions.



NEWS FROM NORTH CENTRAL

Dr. David L. Rabas
Center Head
drabas@umn.edu

Spring has arrived after a snowless, long, and cold winter. For a while, it seemed that even spring also might be long and cold. Late March and early April did not provide the kind of temperatures that make one think of tilling and planting for the new growing season. As usual, if we are patient, spring does eventually even arrive in northern Minnesota.

The lack of snow cover this past winter coupled with very cold temperatures in late January through early March, caused problems for septic and water systems as well as perennial plants. Frozen septic systems and broken water pipes have recovered by now, but many perennial plants will have been severely injured. Hopefully, some will recover. Growth will be delayed on injured plants, yield will be reduced, and some stands may be greatly thinned. As Russ Mathison writes in his article in this issue, some perennial plants such as alfalfa may have survived fairly well depending on age and

management factors.

As I wrote in my article on "starving horses", the University has been greatly affected by current and past reductions in state financial support for higher education. Continued declining support from the state may endanger our land grant mission to serve all the people of the state. Higher tuition rates required to augment decreased state revenues may price the University out of reach for an increasing number of our states young people. Increasing dependence on grant support for research may allow granting agencies and corporations to determine increased share of the University's research agenda. The real needs of all our customers, especially in the areas of applied research, may receive decreased attention. Hopefully, this trend of decreasing state support will be reversed and the land grant mission will continue to thrive at the University of Minnesota.

This spring has brought an abundant and healthy calf crop to NCROC. We look forward to seeing them grow. As the days warm, we also look forward to another challenging and rewarding research and outreach season. I hope many readers will find time to visit their research and outreach center this summer. We have special visitor and field days, but visitors are always welcome at NCROC.

Best wishes for a good growing season and an enjoyable Minnesota summer.



EMPLOYEE NEWS **LAMB PROMOTED TO ASSOCIATE PROFESSOR**

I am pleased to announce that Dr. Cliff Lamb, NCROC Animal Scientist has been promoted to Associate

Professor with tenure in the Department of Animal Science. Thanks to Department Head, Abel Ponce de Leon and the faculty in the Department of Animal Science for their support in recognizing Dr. Lamb's contribution to the University's beef cow/calf research and outreach program

ALUMNI NEWS

UNIVERSITY OF MINNESOTA
North Central School of Agriculture – All Class Reunion
1861 E Hwy 169 – Grand Rapids, MN 55744
July 26, 2003

A belated Happy Easter to everyone!!

The reunion committee has organized another all class reunion at our old campus on July 26, 2003. We will have access to the cafeteria from noon until 8:00pm for socializing with a buffet dinner at 5:30pm.

The campus has changed so much since we left that it will be nice to see all the progress. We have set up tours of the college including the new Engineering Building, and wagon tours of the North Central Research and Outreach Center (experiment station). Here's hoping we have a nice day!

All alumni, employees, and their guests are invited to attend. We look forward to seeing all of you for an enjoyable get together on July 26, 2003.

If you are attending, please return the registration form and check to:

Tom Carpenter
34331 S. Shoal Lake Rd
Grand Rapids, MN 55744

-----Detach and Return Bottom Portion-----

REGISTRATION FOR NORTH CENTRAL SCHOOL OF AGRICULTURE
ALUMNI REUNION – JULY 26, 2003

Name:	Class Year:	
Address:		
No. of persons attending:	(\$12.00 per person) =	\$
Alumni Dues:		\$ 2.00
Total amount enclosed:		\$

Upcoming Events

Wildrice Research Field Day

July 24, 2003 (Tentative)

Location: North Central Research and Outreach Center

Horticulture Day

Wednesday - August 27, 2003

2:00pm 6:00pm

Location: North Central Research and Outreach Center

Beef Forage Day

Thursday - August 28, 2003

10:00am Noon

Location: Four miles south from Grand Rapids on Hwy 169, then ¼ mile east on the Harris Town Road.

Grand Rapids Garden Club Tour

Sept. 2, 2003

6:15 -

Location: North Central Research and Outreach Center Warehouse.



UNIVERSITY OF MINNESOTA **North Central News**

North Central Research & Outreach Center
1861 East Hwy • Grand Rapids, MN 55744-3396

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