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North Central Research and Outreach CenterNORTH CENTRAL NEWS
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FAREWELL**Dr. David L. Rabas, Center Head**
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All good things must end! On June 13, 2004, I will be leaving my position as Head of the North Central Research and Outreach Center. I have enjoyed my 13 years as Head, but feel it time to retire and move on to other adventures.

It is not my intention to use this article to list the successes and failures over the past 13 years. There have been many of both. Hopefully on balance, the pluses have outweighed the minuses. In the past 13 years, NCROC's research and outreach programs have grown in strength and quality. This is more a credit to the hard work and dedication of our staff rather than anything I have done. The Center has managed to remain reasonably fiscally strong through a long series of budget retrenchments required to help with continuing shortfalls in legislative funding for the University. Grants, gifts, and income have partially reduced the impact of some of these budget shortfalls. In other instances staff and expenditure reductions were required to maintain the fiscal integrity of the Center.

With the help of staff, I have put together a compact that outlines a series of strategies and initiatives to strengthen our research and education programs and provide the resources needed to allow our scientists to optimize their efforts to serve our customers. To achieve these initiatives requires that we focus the Center's resources on a few strong programs that both generate enough revenue grants or gifts to be sustainable and deliver the highest quality research and education programs to our customers.

Focusing services on a few strong programs requires that other programs be reduced or eliminated. The next few years will bring significant changes in how we serve our customers. Hopefully these changes can be

made in such a way that we retain those unique activities that historically have provided valuable services to our research collaborators and useful information to our customers.

NCROC is unique among the University of Minnesota Research and Outreach Centers. We are the only Center with beef cow-calf, wildrice, and Center based forestry research programs. We are the only Center with field based horticultural research programs that specialize in fruit and vegetable production. The climate, soil, and management challenges that characterize our location provide unique opportunities for evaluating cold hardiness and short season production technologies in many fruit and vegetable species. Similar opportunities exist for evaluating the management of annual and perennial forage species for pasture and stored forage.

The Center's travel/tourism faculty position provides a unique opportunity for a person located near the heart of Minnesota's nature based tourism industry to provide research and education programs and projects and explore economic development opportunities for many of Minnesota's rural communities.

As the Center has moved forward, our mission has continued to change. We have embraced a new partnership with the University of Minnesota Extension Service. This new relationship began with a co-location and partnership with the Itasca County Extension Service and now includes a newly developing role as a co-location with an Extension Regional Center.

Through faculty efforts and facility improvements, we have also expanded our capacity at the Center to include greater opportunities for graduate and undergraduate student training. Faculty have provided internships to undergraduates and serve as advisors to numerous graduate students. NCROC has developed on campus housing opportunities for graduate students and visiting research staff and faculty.

Saying goodbye is not easy. Since I am not "really" leaving right away, I will take this opportunity to wish all of our readers a good

growing and harvest season and an enjoyable summer.

I will not be leaving the University immediately. I have accepted a 25% time appointment for one year as a Professor of Agronomy. During this time I will complete some long overdue analysis and writing of research results and be available to conduct forage management outreach activities, support NCROC fund raising/grant writing, and provide forage management assistance to NCROC farm operations.

When I complete this assignment and permanently retire I will have completed 40 years of work at the University of Minnesota as a graduate research assistant, agronomist, and Center Head. Long enough!!

**AGRICULTURAL
ENGINEERING****Dr. James J. Boedicker**
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In the May 2001 issue of this publication, I briefly discussed a UV monitoring site located at the NCROC Beef and Forage Research Farm south of Grand Rapids, its purpose, and our roll in maintaining it. This article is intended to provide additional information about this monitoring site and the importance of the UV data gathered there and elsewhere.

Our monitoring site, established in 1996, is one of a network of 29 such sites located throughout the United States, including one each in Alaska and Hawaii, as well as two in Canada and one in New Zealand. These sites were set up under the USDA Ultraviolet-B (UV-B) Monitoring and Research Program (UVMRP) through a grant from funding authorized by Congress in 1992. The UVMRP is based at Colorado State University at Fort Collins. The program came about in response to increasing concern over potentially harmful effects on agriculture, humans, and other ecosystems of enhanced UV-B associated with declining stratospheric

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ozone levels due to man made chemicals such as chlorofluoro carbons. (UV-B is that portion of the UV band in the wavelength range of 280 to 320 nanometers). Most people are aware of the ozone hole over Antarctica, a phenomenon that reached record proportions in 2003. Although less dramatic, ozone levels have declined at mid-latitudes as well including over the United States. The data gathered is of value to researchers in quantifying the rate of UV-B increase over time. This information can then be combined in computer models with information on changes in other stress factors such as extremes in soil moisture and increases in temperature and CO₂ associated with the greenhouse effect. Complementary research is also in progress on the effects of UV-B on plant growth in numerous species and in identifying plant strains that are less susceptible to elevated UV-B levels.

The data being gathered by the UVMRP is proving valuable in other types of studies as well. Some examples are investigations by the United States Armed Forces on durability of materials and coatings and on sun burning of soldiers, refinement of airplane and satellite remote sensing technology to better monitor crops and grazing lands for various purposes including precision farming, and studies of urban air quality. The North Central Research and Outreach Center is pleased to be playing a roll in this important program. Anyone interested in learning more about the UVMRP is encouraged to check out their web site at <http://uvb.nrel.colostate.edu/UVB/>.



AGRONOMY

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Alfalfa is the most important perennial agronomic crop grown in Minnesota, grown on about 1.5 million acres annually and with a value of nearly \$400 million. Additionally, cultivation of alfalfa has numerous environmental benefits. It does not require nitrogen fertilizer because of its ability to "fix" atmospheric nitrogen. The deep root system of alfalfa increases water penetration into soil and increases microbial activity in soil leading to improved soil quality. Alfalfa begins growth early in the spring, preventing movement of nutrients from soil into surface water, and specialty varieties of alfalfa are being developed for bioenergy production.

Plant breeders have developed alfalfa varieties adapted to most areas of the United States, however in areas with colder climates varieties with high yield potential often lack adequate winter hardiness, resulting in winter injury. Winter hardiness is affected by stand management, environmental conditions, plant physiology, and disease resistance. Diseases that affect root and crown health are thought to have the greatest impact on winter hardiness. Recently, a fungal disease, brown root rot of alfalfa, has been shown to be associated with winter injury and stand decline. Brown root rot of alfalfa in Minnesota was found for the first time in the fall of 2003. University of Minnesota and USDA personnel are currently in the process of applying for funds from the Rapid Agricultural Response Fund to collect alfalfa plant samples from throughout the state to assess the distribution of the disease, providing growers with information on the likelihood that the disease may affect the productive life of local alfalfa stands.

The cause of winter injury in alfalfa has been a mystery to growers, researchers, and extension educators. It is likely that brown root rot has been present in Minnesota for some time, and has been playing a role in winter injury and stand decline. Because brown root rot was unknown in the US until recently, alfalfa breeding programs are only beginning to target brown root rot resistance. Also, crop management strategies to minimize damage from this disease need to be developed to improve crop productivity and farm profits.

Many forage producers grow annual forages, for a number of reasons. Nurse crops to control weeds and erosion in perennial forage establishment, emergency feed, and components in crop rotations are some of these reasons. There are numerous species available for use as annual forage, thereby making a good choice for a particular situation somewhat challenging. Two demonstration studies being conducted at the North Central Research and Outreach Center this growing season may provide some useful information to producers interested in annual forages. One study will focus on sorghum-sudangrass, a warm season species that regrows after defoliation, unlike small grain or foxtail millet that are basically one-cut species. Brown midrib sorghum-sudangrass, an improved type with high palatability, will be rotationally grazed with beef cow-calf pairs. Dry matter yield and animal acceptance data will be collected. The second demonstration will focus on Italian ryegrass, a species with exceptional seedling vigor, making it an excellent choice as a companion crop to control erosion and weed competition while at the same time providing seeding-year forage. Italian ryegrass has excellent nutritive value as livestock

feed. Italian ryegrass as a companion crop for the establishment of tall fescue will be compared to solo seeding tall fescue. Both of these demonstrations will be displayed at the annual Beef and Forage Day, August 26, 2004.



ANIMAL SCIENCE

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It seems like the years appear to be passing by faster and faster! Thus far, 2004 has been an extremely rewarding year. Our calving season has been the smoothest in years. This is due to several factors such as the weather, our excellent animal attendants and staff, but also because our estrous synchronization system worked to ensure that a majority of the cattle were due to calve at the beginning of the calving season. In addition, the calves are healthy and growing fast – it is great to see! The future North Central Research and Outreach (NCROC) cattle look good and are improving every year.

The Animal Science program continues to grow at rates that we could not have expected. In turn, this has resulted in an increase in our potential to obtain grants and funding that will allow us to perform cutting edge research. As many of you know, last fall we received support from the NCROC and the College of Agriculture Food and Environmental Sciences to initiate the NCROC Reproduction Biotech Center. It was hard to imagine that we would generate the interest that we have received during our first year. Producers have started to use our services such as artificial insemination, embryo transfer, and reproductive ultrasound technology. Please feel free to contact us if you have any questions regarding the Center.

I was invited back to speak at a reproductive conference in Brazil. Last year when I spoke at the conference, there were about 500 attendees. This year there were more than 1,100 attendees, most of whom were veterinarians and industry professionals focusing on cattle production. This was just another indication of the growth of animal agriculture in a developing country. It was another phenomenal trip and the knowledge of the veterinarians and industry representatives continues to amaze me. I look forward to returning next year to gather more information that may help us increase our productivity.

As a result of my travels to Brazil, I have established relationships with several faculty members in Brazil who have excellent students seeking opportunities to study in the United States. Through this relationship, I was able to encourage two veterinary students to participate in our summer internship program. Mauro and Ivan were students that impacted everyone at the NCROC with their knowledge and work ethic, plus their contributions enhanced our ideas and management practices. With the success of last year's program, we invited two more students to join us this year. Everton and Guilherme will be joining us in May. In addition, we are fortunate enough to have generated sufficient funding to hire two additional interns. After screening several resumes we have identified Roman Irturia and Amber Leaf as great prospects. Roman has graduated from veterinary school in Argentina, whereas Amber is a sophomore in college. Quite an eclectic group of students!! We're excited for a productive summer.



A group of Nelore Cows in central Brazil

From a research standpoint, the embryo transfer, twinning and estrous synchronization research continues to be valuable to producers in their production systems. It is hard to look through the semen company literature and not notice data or systems that we have participated in developing. Rud Wasson, a Ph.D. student of ours continues to spend much of his time working on a management system for twins, whereas Jamie Larsen spends a large portion of her time analyzing the data on the estrous synchronization protocols. The 2004 Minnesota Beef Cow/Calf Day report contains most of the data we have available for producers. The report can be purchased after contacting the NCROC.

Our beef extension program continues to be a strong part of our focus and ensures that

cattlemen receive as much support as possible. Along those lines, a new Regional Extension Educator position totally focused to beef will be hired in the Grand Rapids office sometime during early summer. The person in this position will work closely with the state specialists (Alfredo, Deb, and myself), plus coordinate extension programs throughout the state. We are excited to have this position in Grand Rapids.

As a reminder, we do have bulls, cows, and embryos for sale that may meet the needs of your operation. Currently, we have bulls that range in price from \$1,400 to \$2,000 that have passed breeding soundness exams to ensure they are sound enough to breed cows. All cattle are sold on a first-come-first-serve basis, so please feel free to contact us at your earliest convenience. 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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Teaching forest management planning in the Department of Forest Resources on the St Paul Campus has been interesting. Most students are sharp, hardworking, graduating seniors excited about getting that first job and making a difference. Yet most have not thought much about forest management from a broad forest-wide or management science perspective. Students are more familiar with stand-level concepts such as silvicultural guidelines and basic financial analysis. They came to the class hoping it would help tie together their forestry education. Most expected to learn some good simple guidelines that might help overcome the many complications and challenges facing forest managers today. There was a day when simple guides like "cut the oldest stands first" worked well for foresters. But with new intensive and multi-aged silvicultural systems and with both economic and ecological objectives, such harvest sequencing rules do not work very well. Spatial management objectives also add new complications. With objectives of sustaining large patches of mature forest, some have thought that guidelines like "cut in larger block sizes" might work well. A shortcoming with that simple strategy is its heavy focus on long-term impacts when spatial concerns tend to be more short term in nature.

So what topics are covered in a forest management class these days? It is much more computer and mathematical based than most might expect. Topics include:

Optimization Modeling: Forest management planning is much like a map coloring problem with polygon colors representing different stand conditions associated with possible silvicultural management options. With even a relatively small forest, the possible stand-level combinations are essentially limitless, especially when one considers conditions at various points in time. Optimization models like linear programming allow one to search efficiently through the many combinations, while also considering broad forest-wide objectives like sustaining a steady flow of wood and achieving desired stand age distributions within specific landscape ecosystems.

Trade-off Analysis: Forest management must balance timber production with environmental objectives that move the forest towards a desired set of forest conditions. Decision-makers generally want to know how timber production potentials would change as one changes the desired set of future conditions and the speed at which these conditions are achieved. Much of forest management planning involves "what if" analyses to help managers learn more about the potential of the forest.

Heuristic Techniques: Many large forest management problems have unique problem structures for which specialized solution techniques can be developed. Typically, forest-wide problems involve many stands tied together by a few key forest-wide constraints. Concepts from economics allow one to "price out" these forest wide constraints so stands can be analyzed individually in great detail while still taking into account key forest-wide constraints like sustaining timber flows over time. This can be especially valuable for practicing foresters focusing on stand-level decisions. Heuristic-based models are also valuable for addressing spatial arrangement of the forest emphasizing how patches of mature forest might rotate across the landscape while still producing timber.

Case Studies: The US Forest Service has invested heavily in computer technologies for forest planning. NCROC faculty along with grad students from the Department of Forest Resources have been actively involved in Forest Service planning for the Chippewa and Superior National Forests. This ongoing work involves some of the most detailed forestry

models applied anywhere. These examples make great classroom teaching examples to show how models can be used as effective learning tools. There is considerable controversy surrounding these forest plans. Students find this controversy interesting. It points to both the importance of the resource to Minnesota and the need for good professional foresters with forest management planning and problem solving skills.



HORTICULTURE
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A year ago, we were very concerned about winter injury to our small fruit and herbaceous perennial plots because of no snow cover and unusually cold soil temperatures. This spring the prospects for these crops is much better. We had a wonderful winter with good snow cover and normal temperatures. Our soil temperatures did not get below 23° so plant survival should be good overall. Early views at plant tissue indicates some damage, but not the severe winter injury we had last year. It hopefully will be a good season for evaluating differences in winter survival that makes NCROC so valuable as a hardiness testing site. I'm certainly excited about the prospects of evaluating strawberry and blueberry breeding lines in our search for new cultivars for northern small fruit growers.

Budget cuts and lack of funds continue to take their toll on the NCROC horticulture program. Last fall and this spring, we removed most of the blueberry feasibility planting. Originally planted in 1984, this planting was the first commercial blueberry planting in Minnesota. This study was invaluable for developing economic cost analysis, winter protection techniques and as a teaching and cultural block for numerous prospective growers. The 2004 season will also be the last year that we will evaluate first year strawberry seedlings. Since 1980, NCROC has evaluated over 30,000 seedlings. There are still several hundred advanced breeding lines to evaluate. Finally, I was informed last week that we will not plant the potato verticillium wilt plot this year. We expect to plant this plot in 2005, but for 2004, it may be the first year since NCROC began that there will not be any potato plots.

Despite these changes, the 2004 growing season will be a busy one. The high tunnel vegetable project will be progressing with

cultivar, spacing, pruning, planting date, and irrigation studies. At the February Minnesota Fruit and Vegetable Conference over 90 potential vegetable producers attended the High Tunnel Workshop. There is great interest in this research. We hope to put out a High Tunnel Manual for Minnesota producers at the end of this growing season. We planted several cool season vegetables April 13 and hope to have our warm season vegetable transplants in by May 5. Earliness, yield, and quality increases are all positive aspects of using high tunnels in Northern Minnesota.

The second half of our new orchard will be planted in 2004. Several of the newer apple breeding selections will be in this planting. All are grafted to Bud 9, a hardy European dwarfing rootstock. The future of this orchard is exciting as we evaluate the winter hardiness of these breeding lines. The first half of this orchard, planted in 2001, suffered moderate root damage last winter, but survived this winter with no sunscald injury and very little winter injury to new top growth. Some of those trees might fruit this year.

The woody ornamental trials went through their first winter and while there appears to be some winter injury to the rose selections, some look better than others. Those better selections and the ones that can show the best regrowth potential will be the ones that eventually will be released for use in your yards. We also hope to find a hardier smokebush selection among the 20 selections evaluated.

The new cultivars currently growing in our greenhouse will provide a colorful and educational flower trial again this year. Many new cultivars and types will be evaluated under our growing conditions. You can visit these plots and evaluate for yourself which ground bed, hanging basket, container, or shade plant you want for your garden. The current All America flower winners from 2000 to 2004 are featured along many other new cultivars entered in the trials by participating companies. I hope you can visit these plots to see what you can expect to find on the market next year.



Horticulture Day Visitors

Our visitors day this year is Wednesday, August 18th from 2:00pm—5:00pm. Please accept this invitation to attend. You are also welcome to visit the plots whenever you are in the Grand Rapids area. If you would like to volunteer your time or provide tax deductible financial support for the horticulture program, I would like to hear from you. I hope to see you in the plots this season!



SILVICULTURE
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Tree species found in forests of the Minnesota "live on the edge." Species of both the Laurentian Mixed Forest and Eastern Broadleaf Forest are at the edge of their natural geographic range. For example eastern white pine grows along the Atlantic coast but is found growing naturally no further west in the United States than Minnesota. Another example is white spruce. White spruce is a boreal species found growing from coast to coast across Canada and Alaska. The natural range of white spruce extends south of the Canadian border in New England and the Lake States and in Minnesota it is found growing naturally within 100 miles of the prairie. One important feature of "living on the edge" for tree species in Minnesota is the paucity of rainfall relative more eastern and northern regions. Minnesota receives approximately half of the average rainfall of the Northeast – 16 as opposed to 30 inches of rain per year. Thus, drought years in Minnesota have a more severe impact on trees than they would in more eastern states.



Species that "live on the edge" of their geographic range have a greater susceptibility to insect and disease outbreaks. In 2003, we witnessed the tale end of a cyclic epidemic of forest tent caterpillar (FTC). This insect

defoliated thousands of acres of aspen in northern Minnesota between 1999 and 2003. Defoliation of aspen by FTC did reduce tree growth, but overall mortality was low. FTC, however, set the stage for the two-lined chestnut borer (TLCB) to cause severe oak mortality. TLCB is native to North America and as its name implies its preferred host was the now extinct American chestnut. Like FTC, TLCB has cyclic fluctuations in its population levels. Unlike FTC, however, high populations of TLCB are lethal to red oak. Thousands of ornamental and forest-grown red oak were killed throughout north central Minnesota this past year. "Living on the edge" is difficult for red oak during drought years because drought increases the likelihood of TLCB induced mortality.

Important Tree Species in Minnesota

Conifers

The Pines

Red, Jack, and White Pine

The Spruces

White and Black Spruce

Tamarack

Northern White Cedar

Hardwoods

The Aspens

Quaking and Bigtooth Aspen

Balsam Poplar

The Maples

Red and Sugar Maple

The Birches

White and Yellow Birch

The Oaks

Red and Burr Oak

American Basswood

Unfortunately, it appears this beetle was accidentally introduced into the Grand Rapids area over the past two to three years. Traps baited with chemicals attractive to Douglas-fir beetle have captured the beetle in several areas surrounding Grand Rapids. If Douglas-fir beetle has become established in Minnesota, it could cause changes in local forests. While Douglas-fir does not grow naturally in Minnesota, there is concern that Douglas-fir beetle will survive in another tree species, specifically tamarack. Minnesota is currently suffering large scale losses of tamarack to another bark beetle, the eastern larch beetle. If Douglas-fir beetle is established and successfully attacks and reproduces in tamarack, there could be even more mortality to this tree species expected in the future. Bark beetles typically carry associated fungi and microorganisms that are detrimental to trees. If Douglas-fir beetle and eastern larch beetle inhabited the same tree, these associated organisms may be transferred between species and spread further into the native tree population. Therefore, there is a risk that new types of fungi may be introduced into Minnesota forests and cause further tree mortality.



**NCROC Research Associate
Dr. Kevin J. Dodds**

In addition to our work on Douglas-fir beetle, we are developing ecological risk assessments for western forest insects that may be released into northern Minnesota. We are reviewing the biology of these species, host distributions, potential economic and ecological impacts if these species become established, and pathways for introductions. This document will also contain recommendations to help private businesses and government agencies reduce the likelihood of further introductions of insects not native to northern Minnesota. Where possible, management options are also detailed.



TREE IMPROVEMENT

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Have you ever begun a project expecting it to take an enormous amount of time and then been pleasantly surprised to discover that someone else, who is no longer around, has done much of the legwork for you? In tree improvement we rely constantly on genetic trials that were established decades ago, through the foresight of previous geneticists, to address current research questions. Today, I would like to tell you about one such trial that we are using in our white pine blister rust research.

In 1972, Cliff Ahlgren of the Wilderness Foundation, Dr. Scott Pauley of the University of Minnesota, and the USDA Forest Service cooperated in a joint venture to establish a white pine genetics trial near Tofte, Minnesota. This trial was designed to identify individuals with increased resistance to white pine blister rust by intentionally raising seedlings in a high blister rust risk area. Open pollinated seed was collected from approximately 500 individuals throughout northeastern Minnesota and the resulting 40,000 seedlings were planted at a single site near Tofte. Interspersed among the seedlings were *Ribes* plants, the alternate host of white pine blister rust, making this an excellent long-term trial to evaluate rust resistance in the field. As conceived, the survivors in this trial are expected to provide seed with an 8-14% increase in blister rust resistance over seed collected from native stands. Moreover, since the original seedlings in the trial are all native to northeastern Minnesota, seed from the survivors is expected to be well adapted to the climate of northern Minnesota.

Eleven years ago when the trial was 22 years old, each of the 2,150 surviving seedlings were scored for vigor and rated for incidence of white pine blister rust. The best trees, *i.e.* those that scored highest for both vigor and resistance, were tagged permanently and some were grafted into a white pine breeding arboretum. Currently, we are in the final stages of rescoring the surviving trees for vigor and resistance. This rescoring will identify two important populations among the survivors. First, we will be able to identify trees that have been continually free of blister rust infection for 33 years. Second, and perhaps more importantly, we will be able to identify trees that have had some level of infection in the past but were able

SILVICULTURE

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I recently joined NCROC as a research associate working with Dan Gilmore on the introduction of a bark beetle from the western US into northern Minnesota. This bark beetle, named the Douglas-fir beetle, often causes widespread tree mortality in its native range (western North America) where it attacks Douglas-fir and dead western larch. During outbreak years, Douglas-fir beetle can cause large economic losses to timber resources, diminished aesthetic values of forests, and losses in valuable wildlife habitat.

to survive. Both of these populations will be important in future breeding programs.

Our research plans for this trial include collecting open pollinated seed from promising individuals and screening the seedlings in a greenhouse setting by exposing them to *Cronartium ribicola*, the causal agent of white pine blister rust. Our cooperator in this project Dr. Robert Blanchette, a plant pathologist on the University of Minnesota's St. Paul campus, will be performing the screening and also doing histology work to identify mechanisms of resistance at the tissue level of the seedlings (See NCROC North Central News April 2003 for a report on initial research in this area). In addition, we will be grafting superior selections into our breeding arboretum where we will make controlled crosses to better understand the inheritance of these resistance mechanisms and identify which parents should be crossed to maximize resistance in the seedlings.

The legacy of the Tofte trial is an important one for those of us who are working to decrease the impact of white pine blister rust in Minnesota. I think the original investigators would be pleased to know that the research is progressing right on schedule.



**WILDRICE BREEDING
AND GERMLASM
IMPROVEMENT**
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Gearing up for Marker-Assisted Selection. Alex Kahler, grad student in Ron Phillips' lab on the St. Paul campus, is screening SSRs (a type of molecular marker that is easier to work with than RFLPs) for usable polymorphisms. These markers were first identified in rice (*Oryza sativa*), which is genetically very similar to wildrice (*Zizania palustris*). He will continue screening SSRs until he reaches the goal of adding 120 SSRs to the wildrice RFLP map, as the major part of his M.S. research. Plans are for him to continue for a Ph.D. focusing on developing the PCR markers for marker-assisted selection and as a tool for identifying varieties and wild populations. Meanwhile we plan to use some of these markers—ones linked to three major shattering genes—for screening an early maturity population (K2EF-C3). We plan to rogue out plants in which the markers indicate shattering. As part of this effort, wildrice project personnel Dan Braaten,

Laura Carey, and I participated in hands-on lab training by Alex on DNA extraction and PCR technique. This will enable us to prepare samples for marker-assisted selection and eventually screen them at NCROC, saving time and expense.

Harvest Timing. Dr. Dan Marcum (California Cooperative Extension) and I collaborated on a research project in 2003, with seven separate experiments (three in CA and four in MN) to ascertain the optimum grain moisture at which to harvest wildrice to maximize yield. Experiments at both sites revealed usable information. Franklin in California reached a maximum yield at 32% and 26% moisture in experiments at two locations. After that point, there was a rapid decline in yield at a threshold moisture of 20-25%. That threshold was higher for the older, less shattering-resistant variety Johnson. Seed length decreased slightly over time in CA. In Minnesota, the seed moisture in highly shattering stands of Franklin did not fall below 40%—seeds shattered off before they could dry out. However, a new planting of Franklin experienced a drop in yield after the 35% threshold moisture level. Petrowske Purple, more shattering-resistant than Franklin, maintained a stable yield and moisture level at 33% moisture, without the steep decline seen in Franklin or Johnson. This may be attributed to its superior shattering resistance; loss of shattered seed over time apparently was not much greater than additional seeds maturing in the tillers.



NCROC Junior Scientist
Daniel M. Braaten

Inoculum Production. Laura Carey, Senior Lab Technician working in the Plant Pathology lab in Grand Rapids, has been conducting experiments this winter to refine the methodology for producing viable spores of *Bipolaris oryzae* and *B. sorokiniana*. These are the causal organisms of the two main foliar diseases of wildrice, Fungal Brown Spot and Spot Blotch. Producing large quantities of viable spores allows us to inoculate breeding lines and populations to select for resistance, and variety trial plots to compare resistance of varieties and breeding lines selected for resistance. Last summer, inoculum that was

grown and prepared in the lab from cultures of these organisms showed a lack of viability when plated out. In experiments carried out this winter, a perlite + ground wildrice + 1% PDA was found to be a more suitable medium for growing the higher concentrations of spores than the sterilized whole oats we have been using. Also, cultures peaked in spore production and viability at four weeks after initiation on the medium. Finally, aeration of inoculum culture pans using breathable stoppers or PVC film may extend the viability of the spores, but only by one to three weeks. We are conducting follow-up experiments aimed at finding a method that will produce more spores of *B. oryzae*, which typically produces significantly fewer spores than *B. sorokiniana*.



NCROC Senior Laboratory Technician
Laura L. Carey

NEWS FROM NORTH CENTRAL



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Spring is here and with it comes new and renewed activity, especially for those of us who work in the plant world. Snowfall this past winter was near normal, although it got off to a jump start in November. Winter temperatures, except for January, were above normal. While April has been cool, spring growth and field work is ahead of schedule. Spring calving in our beef herd is well along with 130 of an expected 160 calves already born.

As I stated in my article on the front page, I will be leaving my position as NCROC Head on June 13, 2004 and returning to a 25% time position for one year as a Professor of Agronomy. I want to thank all of our readers and the many friends I have met in my 34 years at NCROC for the many ways you have continued to support our Center's research and

outreach programs. NCROC was 108 years old in April 2004. With your help we will look forward to another century of service to the people of our area and state.

We have some hope that this legislative session will bring us funding to replace our farm shop. Those of our readers who have been on our campus know that the existing shop, much of which was constructed in 1915, no longer serves the needs of modern farm and research equipment. We have been working on replacement of this building for several years and need to thank Representative Solberg and other area legislators for their efforts to help us obtain capital funding for this very much needed building.

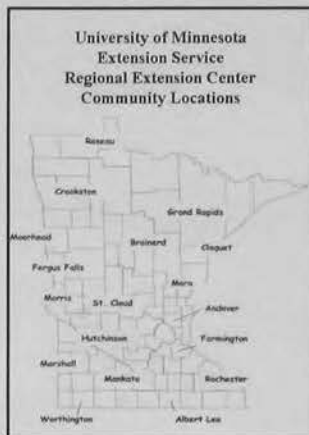
You will note from other articles in this newsletter that the partnership with the University of Minnesota Extension Service Regional Center is well and growing. The faculty and staff at NCROC look forward to working with our extension friends in the Regional Centers and County offices to provide valuable educational programming to our customers.

Thanks again to all of you for support for our Center's research and outreach programs. May you all have an enjoyable and productive summer season.

NEWS FROM THE EXTENSION REGIONAL CENTER AT GRAND RAPIDS

REGIONAL CENTER OPENS ITS DOORS

On January 5, 2004, the Extension Regional Center at Grand Rapids opened its doors at the North Central Research and Outreach Center. There are a total of 18 Extension Regional Centers located throughout Minnesota where regional Extension staff are located and provide focused, educational programming in 4-H/Youth Development, Family Development, Natural Resources, Agriculture, Nutrition, and Community Development. The purpose of the Extension Regional Centers is to provide educational program outreach that is "making a difference by connecting community needs and University resources to address critical issues in Minnesota."



The Extension Regional Center staff located at Grand Rapids include: Mardi Harder – Regional Director; Lori Hendrickson – Regional Educator in Family Development; Clark Montgomery – Area Program Leader in Agriculture, Food and Environment; Jill May – Regional Educator in Health and Nutrition; Mary Blickenderfer – Regional Educator in Natural Resources; Jan Derdowski – Regional Educator in 4-H, and support staff Cheryl Britton and Diana Goemann, Executive Administrative Specialists General and 4-H.



*Back row left to right: Mardi Harder, Clark Montgomery, and Diana Goemann
Front row left to right: Mary Blickenderfer, Cheryl Britton, and Lori Hendrickson
Not Pictured: Jill May and Jan Derdowski*

Mardi Harder serves as Regional Director and oversees operations of the Center. In addition, she works with local Extension staff in Aitkin, Beltrami, Hubbard, Itasca, and Koochiching Counties to identify program priorities to serve local citizens.

Jan Derdowski is the Regional Extension Educator for 4-H and serves the geographic region including the counties of Beltrami, Itasca, Koochiching, and North St. Louis. She works with five 4-H program coordinators in these counties.

Lori Hendrickson is a Regional Extension Educator and Associate Professor in family resource management. Lori has an M. Ed. with emphasis in special education and currently works

on the leadership team for the High School Financial Planning Program, as well as being involved in the DollarWorks, RentWise and Financial Security in Later Life worksite programs.

Clark Montgomery is an Area Program Leader supervising local positions in the Agriculture, Food and Environment (AFE) capacity area. His responsibilities are for 17 AFE Extension staff directly serving 21 northern Minnesota counties.

Mary Blickenderfer is a Regional Extension Educator specializing in Shoreland Revegetation and Landscaping. She offers shoreland training and workshops to property owners, local units of government, and natural resource professionals throughout the state.

Jill Kokkonen May is the Regional Extension Educator for Nutrition & Health. She supervises the Nutrition Education Program in a nine county region and does educational programming in the Nutrition & Health area. Counties she currently serves are Aitkin, Beltrami, Cass, Crow Wing, Itasca, Koochiching, Morrison, Todd, and Wadena.

Diana Goemann supports 4-H programming in the role of Executive Administrative Specialist. Situated full-time in the Grand Rapids office, she manages the membership database for the four-county region of 4-H.

Cheryl Britton supports the regional center director and regional Extension educators in her role of Executive Administrative Specialist.

4-H IMPACTS YOUTH IN NORTHERN MINNESOTA

4-H today – whether 4-H clubs or 4-H Adventure – offers safe and fun opportunities for young people to lead and serve. With the support of caring adults, the 4-H program offers a wide range of project areas and activities for youth in kindergarten through one year past high school graduation. Last year, 170,000 Minnesota youth benefited from 4-H relationships and experiences.

4-H is available throughout all of Minnesota, and youth in the northern portion of the state are served by the Extension Regional Center at Grand Rapids. While the state's budget shortfall has impacted all of Extension, the University of Minnesota Extension Service remains committed to high-quality 4-H programs in all counties.

Upcoming Events

Wildrice Research Field Day

July 22, 2004
9:00am—Noon

Location: North Central Research and Outreach Center

Horticulture Field Day

August 18, 2004
2:00pm—5:00pm

Location: North Central Research and Outreach Center

Beef/Forage Field Day

August 26, 2004
9:30am—2:00pm

Location: 4 miles south from Grand Rapids on Hwy 169, then 1/4 mile East on Harris Town Road

RESPONSE REQUESTED

If you wish to discontinue receiving North Central News, please respond by either sending an e-mail to johns986@umn.edu or calling NCROC at 218-327-4490.

Research shows that 4-H clubs are good for kids! Children in 4-H clubs say they:

- Feel a greater sense of belonging,
- build quality relationships with adults,
- contribute back to community, and
- feel good about their parents' involvement.

Dedicated to serving 4-H youth and families in north St. Louis, Koochiching, Beltrami, and Itasca counties are the Extension staff Jan Derdowski, Regional Extension Educator, and Diana Goemann, Executive Administrative Specialist. They work closely with local county Extension staff housed in county offices. In addition to these teams, the Center for 4-H Youth Development provides oversight and direction to 4-H programming. The partnership's mission is to ensure quality 4-H programs for northern Minnesota youth.



**4-H Regional Extension Educator
Ms. Jan Derdowski**

UNIVERSITY OF MINNESOTA

NORTH CENTRAL NEWS

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