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Lakewood Berry Farm owners (left to right) Mike, Dr. Johannes and Marcia Aas are expanding their raspberry and strawberry operation with assistance from NRRI.

NRRI assists Lakewood Berry Farm with expansion to wholesale market

What does it take to turn a small, pick-your-own berry farm into a large, commercial fruit producer?

At Lakewood Berry Farm, 329 Riley Road in Duluth, technical and business help from the Natural Resources Research Institute has assisted owners Mike, Marcia and Dr. Johannes Aas in their plans to turn Lakewood into one of the largest commercial fruit producers in northern Minnesota.

Business experts from the NRRI Business Group discussed business development plans with Lakewood's owners and assisted with arrangements to lease 18 acres of the University of Minnesota Research and Field Studies Center at 3755 Jean Duluth Road. Lakewood will use the leased land to take the scientific approach to berry growing by experimenting with different species to discover what grows best in this climate.

"They are applying technology in terms of berry growing and it is appropriate for us at the University to encourage that effort," said Kjell Knudsen, director of the NRRI/SBE Center for Economic Development.

NRRI Scientist Tom Levar stepped in with technical assistance for the expansion by

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From the director

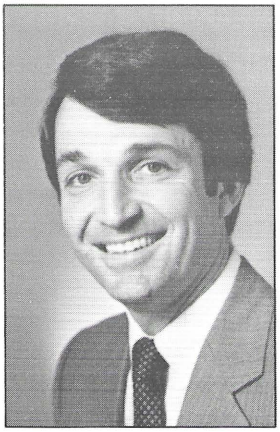
Minnesota's timber and taconite resources deserve attention

By Michael J. Lalich
NRRI Director

Minnesota is blessed with abundant natural resources, and NRRI's efforts to promote environmentally sound economic development of these resources are, to a large extent, based on this premise.

Diversification to new industries of any type, however, is at best a difficult and slow process. Thus, it is vital that Minnesota not lose sight of its taconite industry and its timber-based paper and wood product industries, all of which constitute an economic backbone for Northeastern Minnesota.

Unfortunately, there is nervousness in each of these industries relating to future raw material supplies. The disruption caused by the economic downturn of the taconite industry in the early 1980s can hardly be forgotten. And, while a cooperative effort by the taconite industry, its suppliers, labor, and the State of Minnesota resulted in a markedly trimmed down but competitive industry that has been able to take advantage of the recent resurgence of the United States steel industry, questions regarding future ore supplies exist. These concerns relate to the fact that during the period of economic downturn, taconite companies substantially reduced stripping of ore deposits required to expose the ores needed to make taconite pellets.



Lalich

Today these same companies are faced with planning their strategies for the future in a very competitive international environment. Should they develop their ore bodies in such a manner as to maximize relatively short term profits by mining only the high grade ores at the cost of greatly reducing the overall mine lives? Or should they mine a broader range of ores, thereby extending mine lives? Decisions on which of these scenarios to follow will be based on economics. If these companies perceive that they can remain competitive they will opt for strategies that will extend the useful lives of their mines. Otherwise they will be forced to try to maximize profits in the short term by mining high grade deposits.

Perhaps a concern that has been more frequently expressed in the media is the question of whether or not aspen is in sufficient supply. This concern was underscored recently at an aspen symposium in Duluth that was organized by NRRI and attended by some 270 industry, government and University representatives. This shortfall, which could occur in a time frame of 10 to 15 years, is caused by a current abundance of over-mature trees that, unless harvested, will not regenerate as aspen. Fortunately, aspen is a renewable resource. However, there is an urgent need to consider strategies to make aspen, or alternatives to aspen, available on an economical basis to sustain the forest product industries dependent on aspen. To do this, Minnesota needs to make sound policy decisions that will encourage the innovative management strategies and technical improvements needed to assure availability of raw materials on an economical basis.

I am confident, from a technical standpoint, that NRRI is poised to do its part to help the taconite and timber industries. For example, the Institute is engaged in an initiative, supported by the Greater Minnesota Corporation, which uses state of the art digitizing camera technology and associated software to investigate more economical taconite ore fragmentation techniques during the mining process. With regard to aspen, an Institute model has demon-

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Meet Harlan "Pete" Niles

Niles collects Minnesota limestone for Coleraine carbonate project

When you see Harlan "Pete" Niles taking channel samples in a limestone quarry, it's easy to see he enjoys his work — but most of all that he enjoys being outdoors.

"I thought I would like to work outside — in forestry or geology. I just ended up in geology," said Niles, NRRI Scientist in the Center for Applied Research and Technology Development and based at the Institute's Coleraine Research Facility for minerals research.

For the past year, Niles has traveled throughout southeastern Minnesota — from Mankato to the Mississippi and from Cannon Falls to the Iowa Border — collecting channel samples and drill core for Coleraine's carbonate project which will assess the quality of Minnesota's limestone and dolomite deposits.

"I have enjoyed the project. It's nice to visit the quarries and talk with various quarry people. I'd like to do another project like it," he said.

Niles also has been involved with ore evaluation studies at Minntac, including predicting what ore will do in concentrators and how to blend it.

"I'm a geologist — but not working strictly on geology. Part of the job is metallurgical in nature, such as characterizing potential ore material."

As a geologist and scientist with NRRI's minerals research laboratory in Coleraine, Pete Niles has participated in a number of projects, including channel sampling in southern Minnesota for Coleraine's carbonate project.

An Alma, Mich., native, Niles is a graduate of Michigan Technological University in geological engineering and professes that he originally had considered concentrating on exploration geology. However, a summer job prospecting in Ontario during his college years helped change his mind — actually it was the large, black flies that did it.

Niles spent four years as a metallurgical foreman at Gary Steel Works in Gary, Ind., prior to coming to Coleraine. He has been with the Coleraine lab since 1966 when the facility was owned and operated by U.S. Steel. He remained with the lab when it was turned over to NRRI three years ago.

"I have enjoyed the association with NRRI because we seem to be doing the same work as we did with U.S. Steel," Niles said.

When he's not climbing quarry walls, Niles enjoys going to his youngest daughters' basketball and softball games. He also cooks and enjoys his six children and three grandchildren.

Business owners learn how to market their products and services

new program brings marketing to northeastern Minnesota

To assist northeastern Minnesota business owners with marketing, the Center for Economic Development (CED) has developed a new program that assists them with initiating and carrying through their own marketing plans.

Plans for the program began last spring when representatives from economic development agencies in northeastern Minnesota identified a high-priority need for marketing training and assistance for small businesses in the region, said David Martin, of Martin & Associates. Martin, a consultant and former director of the Arrowhead Regional Development Commission conducted the program and worked with CED staff in its organization.

"Businesses in the region were continually running up against problems in the form of a lack of marketing plans or poorly planned marketing plans," Martin said. "Most people in small businesses don't have the resources for a marketing department. They know their product or service very well, but don't have a significant amount of training or background in marketing — and that is an essential part of being successful in business."

With funding from the Grand Rapids-based Blandin Foundation, the program was organized. In March, the program was advertised and from 30 applications, 12 businesses were chosen to participate at no charge. Only existing, operational businesses located in northeastern Minnesota were considered.

Businesses in the region were continually running up against problems in the form of a lack of marketing plans or poorly planned marketing plans.

David Martin

The types of businesses involved included five with a manufacturing orientation, two in tourism, two in media and two in retail.

A cooperative effort with the Arrowhead Community College Region enabled participants to receive community education credits for the course, which met weekly for eight weeks during May and June at Mesabi Community College in Virginia.

"The program was designed in close cooperation with the Arrowhead Community College Region with the idea that, if successful, the program might be offered at other community college sites," Martin said.

During the eight-week program, participants were given an overview of marketing with the ultimate goal of developing a specific marketing plan for their product or business. Subjects covered included situation analysis, pricing strategies, distribution systems, product development, customer research and basic market research techniques.

"The program is a reality-based approach to teaching and learning," Martin said. "We ran the course in a highly interactive way so that the participants in the program were actively engaged in critiquing each other's ideas — it wasn't a straight lecture approach."

Additional sessions will be held for the group in September and December to follow-up on the implementation of the marketing plans, follow participants' progress and assist with any necessary adjustments.

The Center for Economic Development, with financial assistance from the Blandin Foundation, has made marketing one of its focal points. In addition to the new market-

ing program, clients also can receive one-on-one assistance in marketing matters from staff Marketing Specialist Dennis Fink. According to CED Director Kjell Knudsen, marketing is one of the most underdeveloped skills in the region and the demand is quite high for this type of assistance.

"Training and assistance in marketing is of critical importance to the area's economic base through helping the companies survive," Martin said. "Financial planning isn't the only thing that is needed — business owners need to look at their products and the markets for them, their customers' needs and putting together a competent and effective marketing approach."

Modeled after the Center for Economic Development's Entrepreneurial Development Program which teaches people considering starting their own business the ins and outs of the business world, the new Marketing Program had similar success in its first run.

"We had an extremely positive reaction to the program," Martin said. "Without exception, the participants said it had been of great assistance to them and their businesses. Several even indicated that the program helped them avoid significant mistakes they were about to make and gave them insight into how they need to proceed in their future business dealings."

"I think that this program and the Entrepreneur Program really represent what the Center for Economic Development is all about — reaching out and bringing these needed services to businesses where they live," Martin said. "This is a fine example of UMD providing needed services in the region."

Because of the success of the prototype program, plans are underway to offer the program in Grand Rapids this fall. Applications will be available in mid-September from the Center for Economic Development. The program is slated to begin classes in mid-October.

After national search, Niemi named director of Center for Water and the Environment

Following a national search, Dr. Gerald J. Niemi, associate director of NRRI's Center for Water and the Environment has been named the Center's director.

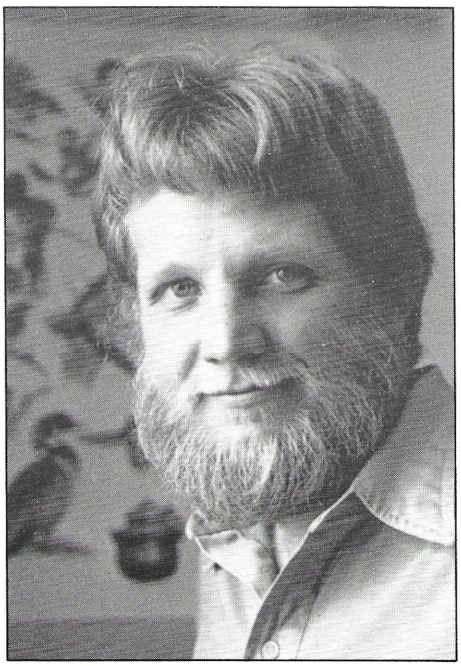
A Duluth native, Niemi has been with NRRI since 1985, first as a CWE research associate and then as associate director. Prior to working at the Institute, he was a scientist with the former Lake Superior Basin Studies Center at the University of Minnesota, Duluth.

In his new position, which also includes an appointment as associate professor in the UMD Department of Biology, Niemi said he will continue to strengthen the Center's prominent standing in the academic community and will emphasize building similar contacts with industry and the private sector.

"We have solid credentials in the academic community and now need to interface with the private sector to bring industry to Minnesota and enhance that which is already here," Niemi said.

A Fulbright Scholar, Niemi is a UMD graduate holding a bachelors in biology and a masters in zoology. He received his Ph.D. in biology from Florida State University. His research specialties are avian ecology and the study of structure-activity relationships.

Niemi lives in Duluth with his wife, Bonnie; son, Jarad; and daughter, Libby.



Niemi

GIS lab ready and open for business

NRRI's new Geographic Information System laboratory is completed and ready for business.

The laboratory, located on the third floor of the NRRI Building, will enable scientists and industry to access computerized mapping and analysis.

The GIS lab is funded by a $348,000 grant from the National Science Foundation's Biological Facilities Centers Program and matching funds from the University. The grant was awarded to NRRI scientists Carol Johnston and John Pastor as principal investigators.

During 12 days of training, NRRI and Twin Cities Campus staff members were taught how to use the new system by representatives of ESRI, the system's software producer.

A computerized mapping system, GIS has a number of uses in research and industry, for example, using data to influence a decision on where to locate plants or mills to minimize transportation costs and maximize the supply of suitable resources.

The NRRI facility is available for use by those outside the University, according to GIS Manager Lucinda Johnson. User fees and guidelines for use of the laboratory facilities are available from Johnson.

At NRRI, the new lab already is being used for a number of research projects including a study of the effects of moose on Isle Royale vegetation, a study of the effects of beaver on the landscape at Voyageurs National Park, and a study involving biogeochemical exploration for minerals.

Johnson stresses that although proposals to use the equipment are being accepted, the facility is geared toward research.

Those using the system will work with personal computers as well as accessing the University's mainframe.

"Our facility is unique in that we set as our mission that we are here to show people the capabilities of GIS and how to use it for natural resources research," Johnson said.

GIS is a valuable tool for the University, as well as the business and private sectors.

"The private sector often has research questions and we're here to get answers to those questions through practical and basic research," Johnson said.

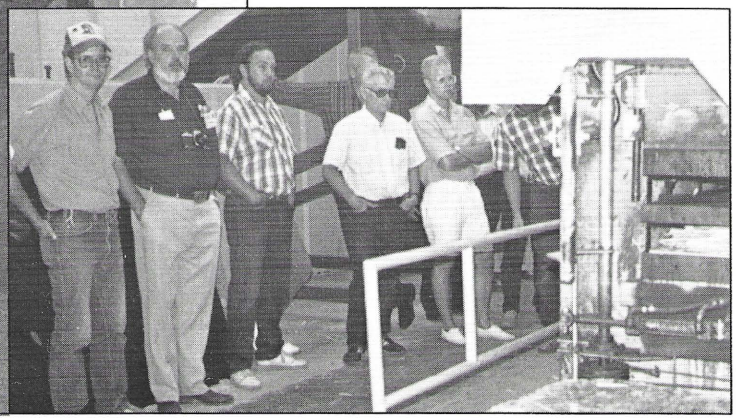
One of the benefits of GIS is that it is possible to examine more variables over large areas than was possible with traditional methods.

The GIS lab at NRRI houses eight computers, a graphics terminal, three digitizers, a plotter and a scanner. The system is located in a new room at the Institute that has been renovated to include special electrical outlets and specially designed lighting.

Additional equipment and access to the system is located at the University of Minnesota, Duluth and the Twin Cities Campus.

For additional information on the GIS Laboratory, contact Johnson, 218/720-4251 or 720-4279.

GIS Administrator Carol Johnston participates in training on the Geographic Information System at NRRI. The GIS lab is available for natural resources research projects.



Attendees of the 1989 Aspen Symposium participated in a tour of the NRRI Building. Here, the group watch the production of oriented strandboard in NRRI's composite wood pilot plant.

Hot topics in Aspen featured at 1989 Symposium

More than 300 representatives of forestry and forest products industries gathered in Duluth in July to attend Aspen Symposium '89, which was organized and sponsored by the BioProducts Division of the NRRI Center for Applied Research and Technology Development.

The Symposium was held in response to the advance in information about aspen since the last Aspen Symposium in 1972. Particular areas of interest included new forecasting models, nutrient cycling, hybrid poplar and aspen and new products.

According to BioProducts Division Director Roy Adams, the Symposium brought new research and concerns in the aspen industry to the forefront for discussion and education.

Symposium participants attended sessions led by a number of national and international experts in aspen ecology and silvics, aspen management and silviculture and aspen products and utilization. Individual topics included Silviculture and Management of Aspen: The Eastern Canadian Scene, Aspen Utilization in the Northern United States, Impact of Gypsy Moth on Aspen in Michigan and others.

A poster session also highlighted the research of 17 exhibitors including Roland O. Gertjejansen, David Ritter, Bruce Popowitz and Yong Chen of the University of Minnesota on Paper Birch as a Core Material for Aspen Oriented Strandboard and Waferboard; Brian Karaim and Eugene Wengert of Alberta Forestry, Lands and Wildlife in Edmonton, Alberta, on Opportunities for Aspen Utilization in Colorado and the Rockies; Paul Olson of the Minnesota Department of Natural Resources on Building a Digital Database and L. David Ostlie of Energy Performance Systems, Inc. on Whole Tree Combustion for Electricity Production.

Optional tours were available for participants after the Symposium which included a tour of NRRI's composite wood pilot plant.

Leech research sucks scientist into thriving home business

To most, leeches are synonymous with fishing — or, in the case of the bloodsucking variety, an unpleasant result of swimming.

But to Phil DeVore, assistant scientist with NRRI's Center for Water and the Environment, leeches mean business.

Five years ago, DeVore became involved in a study first funded by Minnesota Sea Grant and then transferred to NRRI to examine the commercial aspects of leech farming. The research explored the pond culture, life history and life cycle of bait leeches.

"Leeches were a popular fishing bait, but we didn't know anything about the life cycle," said DeVore who saw so much potential in leeches that he currently operates his own leech business — a business that is an extension and continuation of his research.

DeVore spends about 100 hours each week during leech season on his leeches. This year, he estimates that he will sell nearly 2,400 pounds of medium and large leeches to distributors — at an average of 170 leeches per pound, that's nearly a half million leeches. And, DeVore emphasizes that the type of leech he is cultivating is not to be confused with the bloodsucking variety. According to DeVore, it is necessary to keep the bloodsucking cousins of bait leeches completely out of his ponds because they are unsuitable for bait.

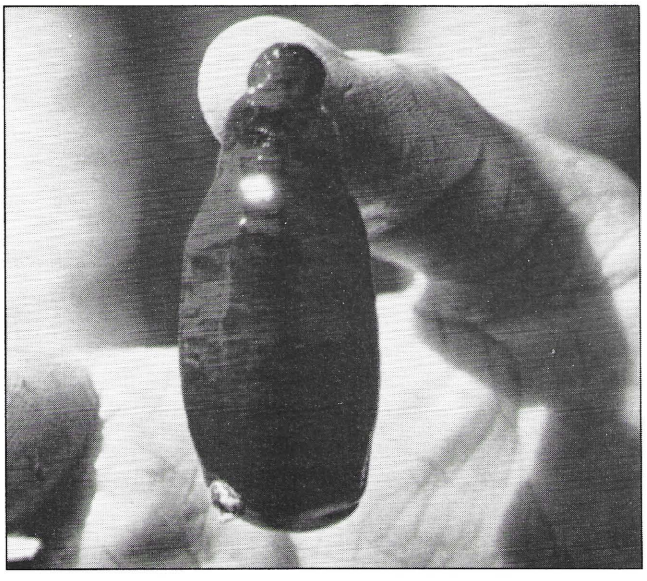
But his research continues. Eight man-made ponds on his farm near Superior are cultivated each year.

"I am a biologist and that is the basic premise of the operation here. I am still looking for answers to the same questions, such as what are the best densities and feeding rates," DeVore said.

But he also is proving that leeches are a viable, commercial product.

Whe the ice goes out each spring, DeVore purchases leeches

NRRI Scientist Phil DeVore sets up to 200 traps each evening on his leech ponds near Superior. The following day, DeVore collects the metal traps, scraping the leeches from the inside.



for stocking in his ponds. Through the season, he feeds them until they are at market size — usually two to three inches long. He sets up to 200 traps each night during the summer and hand sorts the leeches by size (the larger the leech, the more marketable).

"It's a seasonal business going from mid-April to July, but a good one," DeVore said. "I have never had a leech go begging — especially in August when there is a real shortage."

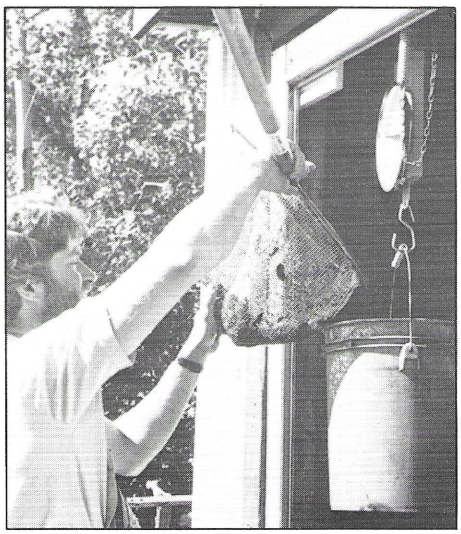
The leeches DeVore stocks also lay eggs June through August (as they are hermaphroditic, each lays cocoons).

This year, DeVore has experimented by not stocking one of his ponds, relying solely on natural regeneration.

During the leech study, it was discovered that the life cycle of the leech totals two years — a very slow life cycle, according to DeVore.

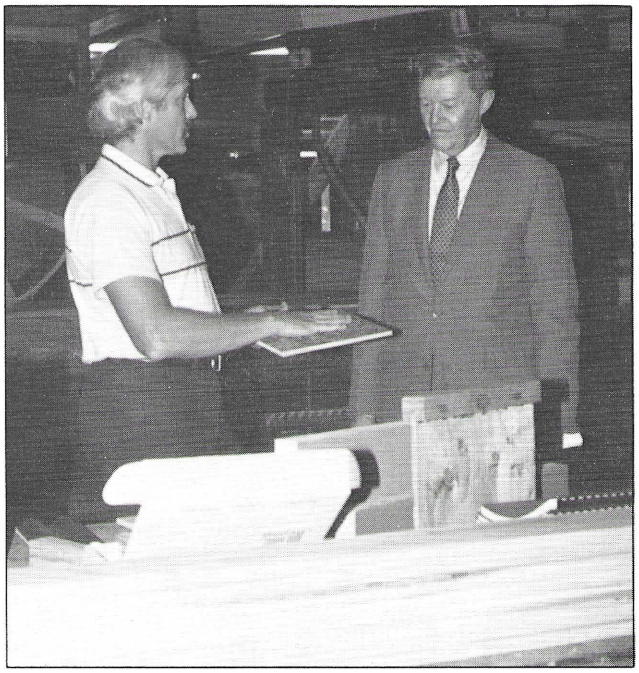
Because he buys leeches at minimum size, DeVore is using results of his research to cultivate his leeches throughout the summer months.

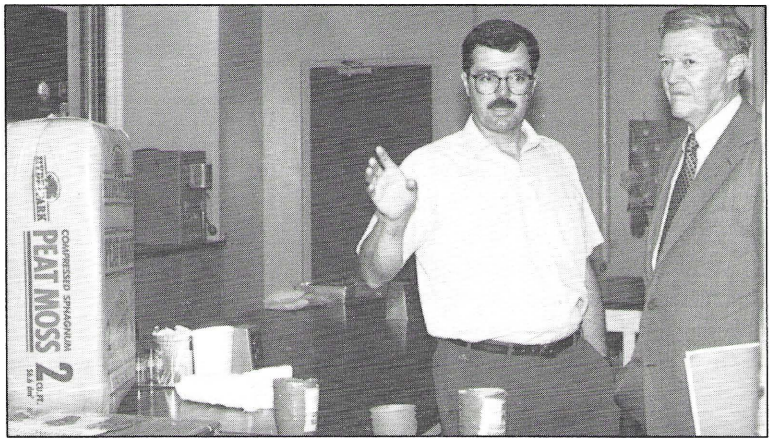
"This has worked well because the research has shown what is good for feeding and increasing the size of leeches," he said. "I have found that it is basic to the management of the species to know its life cycle and how to grow large leeches."



After trapping the leeches, they are stored in holding tanks until a distributor calls with an order. They are then wieghed (left) and packaged in buckets for transport.

GMC vice president visits Institute





Bruce Merrifield, Greater Minnesota Corporation's vice president for research and development, recently was in Duluth. During a tour of NRRI, Merrifield spoke with BioProducts Director Roy Adams about the composite woods pilot plant (left) and with Peat Program Director Tom Malterer (above) about NRRI's peat research.

NSF grant funds study of beavers' influence on the landscape in Voyageurs Park

Few people realize the impact beavers have on the landscape at Voyageurs National Park.

But at NRRI, Research Associates Carol Johnston and John Pastor have been awarded a grant from the National Science Foundation for a three-year study on Animal Influences on the Aquatic Landscapes, Vegetative Patterns, Successional Transitions and Nutrient Dynamics. The award came as a subcontract to the University of Minnesota from the University of Washington. Co-principal investigators on the original proposal included Johnston, Pastor and former Director of NRRI Center for Water and the Environment Bob Naiman.

"We basically are trying to learn to what extent the beaver affects rivers and streams in northern Minnesota," Johnston said.

Johnston and Pastor will use the sophisticated mapping technology of NRRI's Geographic Information Systems and field work to complete the three year study.

"We use the beaver because their ponds are easy to identify and they change rapidly with time," Pastor said.

According to Johnston, the effect of the beaver ponds has increased since 1940 when 69 beaver ponds were evident. Today, about 835 ponds are included in the study.

"We are trying to figure out where and why they build the ponds and the effect on the forest surrounding the ponds," Pastor said.

Aerial photos of Voyageurs and the Kabetogama Peninsula dating back to 1927 will be used to assess changes in the landscape. Changes in the ponds and forests will be entered on the Geographic Information System to produce maps showing changes over time, allowing the scientists to analyze and produce comprehensive models of those changes.

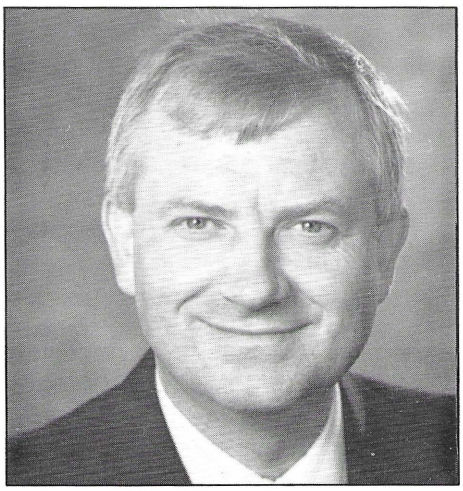
Van Hale named director of NRRI Business Group

The NRRI Business Group will be under new direction this year with the recent appointment of Thomas Van Hale as its director.

Van Hale, formerly assistant director of the Group, will be taking over the position formerly held by Kjell Knudsen, who has held a dual role of director of the Center for Economic Development and the Business Group. Knudsen said the change was necessary due to the Center's rapid growth and the necessity for him to concentrate on the future directions and management of the Center. The Center for Economic Development is a joint venture of NRRI and the School of Business and Economics.

The Business Group is one of three divisions in the Center and is focused on business development projects in conjunction with technical projects at NRRI.

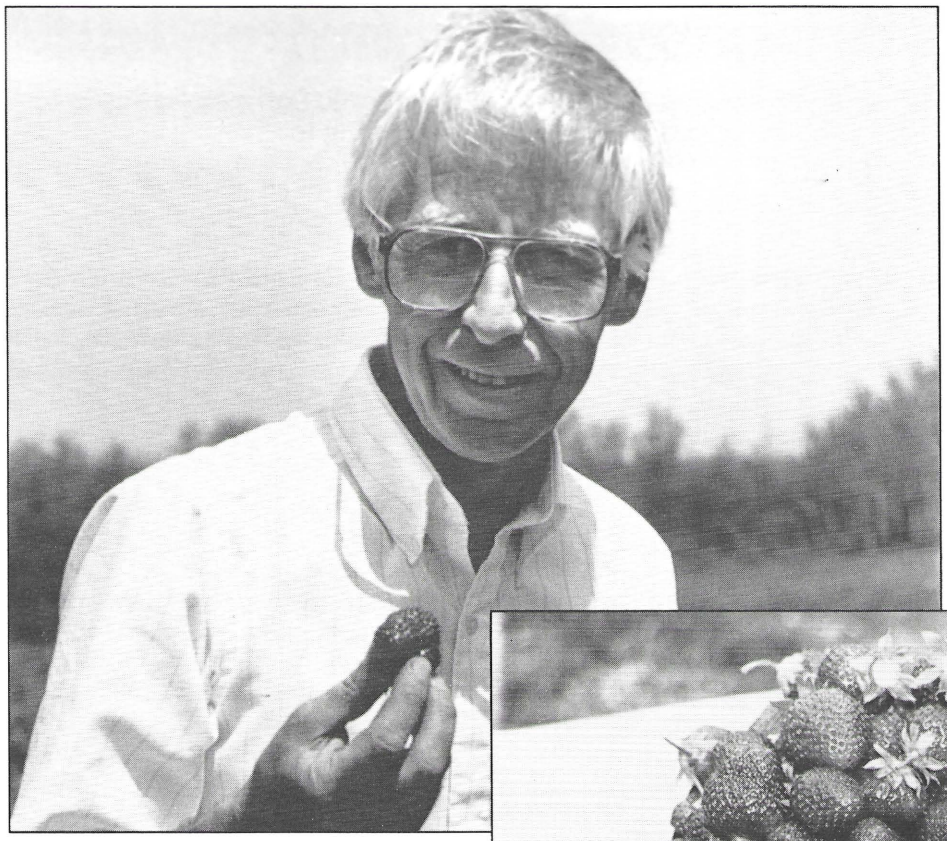
A St. Cloud native, Van Hale has been with UMD since 1986, initially as a special assistant doing research and teaching. He was named the Business Group's assistant director in 1987. In his new position, he will oversee the Business Group's economic development programs and daily operations.



Van Hale

"I hope to continue to do the good job we have been doing and continue to take advantage of the opportunities set forth for us," Van Hale said.

Holding an undergraduate degree from St. Cloud State University and an MBA from UMD, Van Hale has worked on a number of Business Group development projects in such diverse areas as wood furniture manufacturing and the development of a sawmill. He lives in Duluth with his wife, Karen; and daughters Amber and Rachel.



Dr. Johannes Aas shows off the pick of this year's crop of strawberries. As anyone who has tried them will attest, they are among the best available anywhere.

continued from page 1
researching and recommending several cultivated berry varieties, known as cultivars, that grow well in this climate and are adaptable to a pick-your-own operation.

Lakewood's business started small. For ten years, Dr. Aas grew only raspberries on a small patch. Two years ago, Mike and Marsha moved onto the farm and rapid expansion since then has resulted this year in 18 acres of berries — which translates to approximately 40,000 pounds of strawberries and 30,000 pounds of raspberries for the picking and eating. The Aas's estimate that their expansion will top out at approximately 50-60 production acres.

Initially a strictly pick-your-own business, the Aas's now have more than enough berries to sustain that part of their operation and are expanding into the wholesale market — which is expected to account for about 25 percent of the business this year.

"Prior to Lakewood, no one around here has previously achieved a consistent quality and quantity of berries to catch buyers' attention," Dr. Aas said. "We are going way beyond pick-your-own and will provide consistently good berries for the wholesale market."

In order to bring attention to their berries, the Aas's tempted various Northland chefs, caterers and food distributors with the high quality of their berries at a business-to-business open house this summer.

"We want to show wholesalers and others that local produce is the way to go," Marcia Aas said. "Minnesota-grown is the best and the freshest and we want to create more opportunity to use berries that are locally grown, rather than shipping them in from other states."

Committee's efforts improve work environment

Take a little ingenuity, some imagination, a little flair and a lot of good taste and you've got what makes the results of the NRRI Humanization Committee's work such a hit.

It wasn't long ago that the NRRI Building was turned over to the University of Minnesota, Duluth in, well, mint-military condition. Most say it looked like a bomb shelter, but let's just say it wasn't exactly homey.

But in the past five years, phases one through four of renovation work have created a pleasant work environment (and even a windowed conference room) within the building.

But something was missing.

There were no pictures on the walls, no plants, no displays — none of the little touches that makes an office environment more — human.

Thus evolved the NRRI Humanization Committee. Efforts began with the work of Senior Scientist Steve Hauck, Scientist Tom Levar and Research Associate John Pastor. Believing that the expanses of empty wall space in the Institute could use some brightening, they requested staff members to submit favorite slides and negatives. The photos chosen were enlarged, framed, and today grace walls throughout the Institute.

But the staff's efforts didn't stop there.

The Staff Association was requested by Director Michael Lalich to submit proposals to include in phase IV construction. A steering committee from the Association put together a request that resulted in a $10,000 appropriation for building humanization.

Another committee was formed consisting of Senior User Services Specialist Sandy Sterle, Principal Secretaries Eulie Markham and Gloria Anderson, Library Assistant Sue Hendrickson, and Office Specialist Mimi Delyea. Their mission — further humanize the NRRI environment.

"We started by talking and getting ideas together of what suited and what would fit," Markham said. "We decided on a natural resources theme. We did find limitations, especially in areas that are unimproved and we couldn't do anything to."

The group started with greenery — plants (real) now grace formerly empty corners in the attractive new windowed conference room on the third floor — more plants (silk) adorn the second floor conference room.

And they kept going, visiting boutiques, art shops and stores.

Soon, bookcases filled an expanse of empty wall. Furniture was rearranged into comfortable positions. Conversation pieces, including interesting sculpture and books, now filled spaces that nobody talked about, much less noticed before. Batik wall hangings now catch the eye in large areas. More staff photo enlargements grace empty wall space.

"Ideas and artistic arrangements are usually what caught our eye," Anderson said. "And we discussed where we would put something and where it would fit."

The group also paid careful attention to areas where the public would spend time, in addition to securing prints and other decorative touches for each division office.

And they aren't done yet.

"Our job isn't done," Sterle said. "We'll see what the next construction phase does to the building and in the future we would like to spend a bit more time planning. But this is really a good start."

NRRI Humanization Committee members Gloria Anderson, left, and Eulie Markham, right, assisted in choosing the attractive shelving units and art objects the committee has added to the NRRI environment.

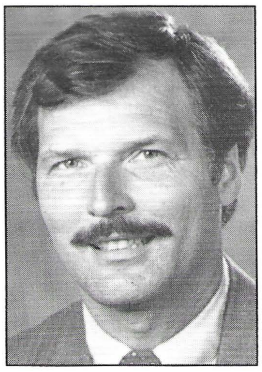
Mueller named director of business innovation center

Mark J. Mueller, who has more than 20 years of experience in economic development work, has been named director of the recently-established Northeastern Minnesota Business Innovation Center (NEMBIC).

NEMBIC is one of the first innovation centers around the state established by the Greater Minnesota Corporation to address regional business and technology transfer needs. NEMBIC is based in Olcott Plaza in Virginia, Minn., and is administered by the Center for Economic Development, a joint venture of NRRI and the School of Business and Economics at UMD.

In his new position, Mueller will work with existing businesses and potential new businesses to assist in development of new products and processes.

"One of our primary goals is to attract and develop value-added businesses in northeastern Minnesota and to diversify and expand the economic base of the region," Mueller said.



Mueller

A native of Appleton, Wis., Mueller holds a B.S. in natural resource management from the University of Wisconsin-Stevens Point and a Masters of Science in water resource management from the University of Wisconsin-Madison.

He comes to NEMBIC after 11 years as executive director of the Northwest Regional Planning Commission in Spooner, Wis. While in that position, he directed and administered a comprehensive planning and development program for a 10 county area. Mueller also served the Commission as assistant director from 1974 to 1978 and as water resources planner from 1971 to 1974.

Niemi wins EPA research award

A paper co-authored by Gerald Niemi, director of the Center for Water and the Environment, has been recognized with an award in the annual Scientific and Technological Achievement Awards sponsored by the Office of Research and Development of the U.S. Environmental Protection Agency.

The paper, Use of Respiratory-Cardiovascular Responses of Rainbow Trout in Identifying Acute Toxicity Syndromes in Fish: Part 2. Malathion, Carbaryl, Acrolein and Benzaldhyde, was co-authored by James McKim, Patricia Schmieder, Richard W. Carlson and Tala R. Henry of the EPA's Environmental Research Laboratory in Duluth.

The Achievement Awards is an EPA competition to determine outstanding peer-reviewed research publications by EPA scientists.

NRRI co-sponsors Peat Symposium at Bemidji State

NRRI's Peat Program recently co-sponsored the International Symposium on Peat/Peatland Characteristics and Uses, held at Bemidji State University.

Scientists from around the world attended the symposium, including five noted scientists from Hungary, Ireland, Poland and Mainland China whose visit was sponsored by NRRI.

As part of the Symposium, NRRI also organized a tour of the NRRI Building and peat research areas led by Peat Program Director Thomas Malterer. The tour included a discussion of peat over sand filtration systems at Norway Beach; a tour of Minnesota Sphagnum, Inc., a horticultural peat operation near Floodwood and a tour of NRRI's Fens Research Facility.

Knudsen at Aqua Nor '89

Center for Economic Development Director Kjell Knudsen and Phil Bakken of the Iron Range Resources and Rehabilitation Board were the official representatives of Minnesota at Aqua Nor 89, the fifth international conference and exhibition on fish farming techniques and equipment in Trondheim, Norway, August 11-16. Knudsen and Bakken were in attendance to gain information about the state of the art of fish farming technology and technologies aimed at making fish farming environmentally sound.

GMC/NRRI partnership

GMC and NRRI form a vital partnership for state's future

Editor's note: This is the third of a regular column in NRRI Now provided by the Greater Minnesota Corporation in recognition of NRRI's status as the natural resources research arm of the corporation.

By Bruce Merrifield
Vice president for research and development, GMC

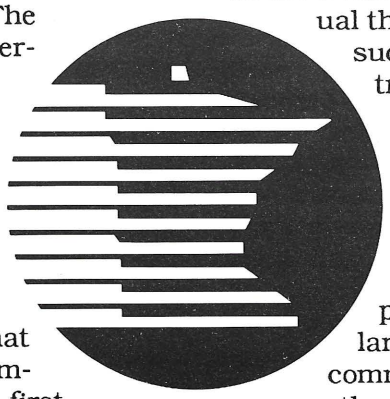
Small companies which emerge as a result of entrepreneurship, innovation and advancements in technology have become the driving force in America's economy. Since 1980, the 600,000 to 700,000 small firms created each year in this country have contributed something approaching 19 million new jobs. That equates to about 90 percent of the job creation which occurred in the United States during that period.

The small business entrepreneurial process, which has developed uniquely in the United States, is important for every state and every sector of the economy. From computer-related industries to natural resource-based companies; from Silicon Valley and Route 128 to the peat fields and mineral rich region of northern Minnesota, the opportunity for economic growth and job creation will depend upon the extent to which the genius of our local communities can be tapped and linked to the unparalleled applied research capacity of our universities and research institutes to produce new ideas, new products and new businesses. In that challenge, the Natural Resources Research Institute and its partner, the Greater Minnesota Corporation, play a vital role.

America currently spends about $15 billion in just basic research, filling the reservoir of knowledge. This investment is more than ten times greater than that which any other nation in the world spends or can spend. The advantage such a commitment to basic research produces for our country is enormous. The challenge which confronts us is to establish the sorts of mechanisms and programs which will bring together that reservoir of knowledge with the inherent creative entrepreneurial character of our people. The result will be accelerated economic growth and job creation.

The NRRI and its relationship with the Greater Minnesota Corporation is an excellent example of what can result from combining creativity, a first rate applied research Institute and an innovative, flexible program for community-based, market-driven business creation. The applied research projects currently underway, as a result of this partnership, possess the potential to create innumerable new environmentally sound industries representing countless new businesses and jobs for our state. Those industries, businesses and jobs will all be based on new technologies and new uses for resources previously viewed as having limited utility. Joining native Minnesota creativity with focused applied research and a catalytic agent, such as the Greater Minnesota Corporation, has resulted in those limits being swept away, replaced by unlimited opportunity.

America has engendered an entrepreneurial culture unique in the world. It offers an individual the opportunity to try, succeed or fail and to try again without suffering either personal or social penalties. It has the most flexible capital development capability in the world. It possesses the world's largest market with a common language. It has more than 4.5 million trained scientists and engineers - the



GREATER MINNESOTA CORPORATION
BUILDING A GREATER MINNESOTA

Continued

largest pool of such talent in the free world. In short, America has everything in spades. If we can continue to provide the assistance and strive to remove barriers, such as antitrust laws which have inhibited collaborative efforts, the high cost of capital which discourages investments in next generation developments, and oppressive liability laws which stifle innovation and technological advancement, we can out-produce anyone or any country because we have created a unique climate in which such production and innovation can flourish.

America has the strength, resources and educational and applied research capacity to assert its global innovative and technological dominance. It is important that it does so immediately in order to position itself to meet the competitive challenges of the 1990s and the 21st century. Minnesota has taken impressive and important steps in that repositioning such as the creation of the Greater Minnesota Corporation with its flexibility and freedom to develop partnerships which can address all forms of innovative opportunities. The realities of the future will require that all other states begin that process as well, and Minnesota can be the national model for that process.

Merrifield

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strated that thinning of aspen stands has the potential, not only to alleviate the projected aspen shortfall in 10 or 15 years, but also to insure that sufficient aspen could be available for industry expansions. Encouraged by the NRRI model and by the forestry industry, the State Legislature has authorized an NRRI pilot research program on aspen thinning. In conclusion, however, I must reiterate that these technical efforts alone will not be sufficient to encourage industry to take a long-term approach to resource management that will be of greatest benefit. Minnesota must be willing to assist these industries through appropriate tax policies and incentives to encourage resource development and infrastructure improvement in areas such as transportation. If this is done, the timber and taconite industries will continue to be the backbone of the Northeastern Minnesota economy well into the 21st century.

Peat program reps. a hit in Russia

NRRI Peat Program Director Tom Malterer and NRRI Scientist Tom Levar recently visited Russia for the Eighth International Peat Congress.

During the Congress, Malterer presented a technical paper, which later was published in a Russian publication, and Levar participated in the poster session.

But the highlight of the trip was the tribute paid to foreign attendees in the form of a poem written by their translator, Ldea Bernstein. Malterer and Levar were impressed with Bernstein and felt her poem should be shared with those in the United States.

By Ldea Bernstein

I should have never
learned that peat
In case you do know
how to treat,
Its slurry substance
can produce,
So many items: fuel
juice, then additives
and fertilizers,
All over plastic
hot house pots,
From tiny to enormous sizes
and this and that and oh,
whatnots!

But for the Congress
of peat experts,
I would have never
felt or guessed,
That boggy substance
can be pressed,
And cut and heated
and transformed,
Into a matter
this way formed,
With better quality
at that —
For no one ever to regret.

But for the Congress
of great scholars
My range of views
May've been as small as
Some bogs or swamps
that are, save God,
Deprived of peat or
peat-like sod.
Now when the Congressmen
have parted
My care for peat -
it has just started
And thinking much
of peat researchers
I wish them gains
with the least of tortures.

Staff publications and presentations

•Center for Water and the Environment Director **Gerald J. Niemi** recently had the paper *Use of Respiratory-Cardiovascular Responses of Rainbow Trout (Salmo Gairdneri) in Identifying Acute Toxicity Syndromes in Fish: Part 3. Polar Narcotics*, published in *Environmental Toxicology and Chemistry*, Vol. 8.

•NRRI Librarian **John Sandy** presented a paper on *The Implementation of An Online Catalog in a Special Library* at the Upper Midwest Microcomputers in Libraries Conference in St. Paul in August.

•NRRI Research Associate **Subhash C. Basak** recently presented the paper *A Graph Theoretic Approach to Predicting Molecular Properties* at the Seventh International Conference on Mathematical and Computer Modelling in Chicago. The paper was co-authored by CWE Director **Gerald J. Niemi** and **Gilman D. Veith**, Director of Duluth's EPA laboratory. Basak also was a member of the conference organizing committee and chaired the session, *Mathematical Modelling in Molecular Design*, which was jointly organized by Basak, Niemi and **Milan Randic**, distinguished professor at Drake University in Iowa.

•**Thys Johnson**, director of the Center for Applied Research and Technology Development, has been named acting department head of industrial engineering in the College of Science and Engineering at the University of Minnesota, Duluth. Johnson will continue as CARTD director during the term of his appointment.

•**Tom Malterer**, Peat Program Director in the Center for Applied Research and Technology Development, recently co-authored the article *Removal of Trace Elements from Western Fly Ash Leachates Using Minnesota Peats*. The paper was presented at the Fifteenth Biennial Low-Rank Fuels Symposium in St. Paul.

NRRI Now

The Natural Resources Research Institute was established by the Minnesota Legislature in 1983 to foster economic development of Minnesota's natural resources in an environmentally sound manner to promote private sector employment.

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NRRI Now is published quarterly to provide information about current programs and projects at the Institute. Comments and contributions are welcome. For additional information about the Institute, call 218/720-4294.

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