NRRI Now

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In Perspective

Changing with the Times

The Winter 2000 NRRI Now was a special edition devoted to successful projects that the Institute had conducted, under the sponsorship of Minnesota Technology, Inc. (MTI). At the time MTI funding was in jeopardy, and it represented NRRI’s most valuable resource for assisting entrepreneurs and companies with product development and process improvement. The funding was lost in increments over a period of time, but the signal was clear. To continue to fulfill its mission, NRRI and its scientists and programs had to adapt.

And even in the face of troubling economic times, the Institute is adapting. Scientists in the forest product area, for example, have used U.S. Department of Agriculture and National Science Foundation grants to collaborate with secondary wood product companies. NRRI’s peat group is demonstrating results of its research to restore wetlands on a several hundred-acre scale. Credits from these restored wetlands will be used to facilitate construction of county and state roads, and income gained from the sale of these credits will set up a trust and provide additional funding for research in the future.

The NRRI Center for Water and the Environment is already anticipating submitting a follow-up proposal to the U.S. Environmental Protection Agency to extend the work of its $6 million effort on biological indicators and their relationship to the health of the Great Lakes system. NRRI’s Coleraine Minerals Research Laboratory has never been busier in terms of industry contracts. In addition, special grants from the U.S. Department of Commerce are focused on value-added iron nugget research and on mercury removal from coal fired power plant and gas streams.

Now in this issue, we are able to introduce the Northern Lights Technology Center for rapid prototyping center, perhaps the most advanced of its kind at a University in the United States. Establishing this capability to assist our clients has been an Institute dream for a number of years. In typical fashion, with assistance from the U.S. Department of Commerce Economic Development Administration, NRRI has partnered with a private sector company. General Pattern is an acknowledged leader in the emerging field of rapid prototyping and limited run manufacturing. Not only will the Northern Lights Technology Center allow us to assist regional entrepreneurs and companies with their product development efforts, but it has already resulted in a valuable side benefit. General Pattern is establishing a manufacturing arm in the Duluth Airpark and is projected to employ 35 in the first year.

Enjoy reading about the Center in this issue and imagine the exciting things you might like to build using this technology.

Michael J. Lalich
A unique partnership has been forged between UMD and General Pattern—a Twin Cities-based prototype, tooling and manufacturing business—to open the Northern Lights Technology Center at NRRI.

This new Center will provide valuable rapid prototyping services to regional businesses. At the same time, the collaboration will use the University’s research capabilities to investigate new applications and materials for rapid prototyping. It will also offer unique learning opportunities on state-of-the-art equipment for students in science, engineering and technology.

**The rapid prototype process seems almost futuristic. A computer drawing is downloaded to a machine producing a real, 3-D rendering of that drawing—every angle precise, every detail intact. It’s a useable machine part, or a model form to try. For example, it could be a precise model of a new airplane part that needs to be examined for fit and function before going into production. The excitement lies in the technologies’ limitless possibilities.**

This is laser technology rapid prototyping, incorporating the most advanced techniques for developing models and prototypes, as well as limited run manufactured parts, and now it’s in Duluth.

NRRI Director Mike Lalich (left) and UMD Chancellor Kathryn Martin (second from right) accept the grant for the new Center from EDA’s David Sampson (center) and Congressman Jim Oberstar (right).

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**Duluth’s newest bridge to economic development**

UMD opens the Northern Lights Technology Center for rapid prototyping

The Center’s futuristic look fits its far-reaching capabilities.
“UMD and NRRI have just taken a giant step into the future with this new center,” said NRRI Director Mike Lalich. “NRRI’s ability to support economic development by assisting regional business with product and process development will be greatly enhanced.”

NRRI received a grant of $776,400 from the Economic Development Administration to purchase three different rapid prototyping machines. Stereolithography uses laser technology to precisely heat epoxy and acrylic resins to build up a 3-D model. The Selective Laser Sintering process does the same thing, but over plastic or metal powder, heating the powder with computer-driven precision to form the shape. The Solid Inkjet Printer technology uses cornstarch, plaster or ceramic-based raw materials in a layering process. Because of the new Center, NRRI also acquired two additional prototype machines—a Stratasys that builds up models with micro-thin layers of plastic, and a CNC (Computer Numerical Control) machine that makes shapes the standard way, by subtractive shaping.

This new center gives NRRI another venue for promoting economic development in Minnesota. The ability to make parts and prototypes faster than ever before is an attractive lure for businesses that regularly change their designs, and to industries needing machine replacement parts no longer available. Applications for the medical community and for geological research are also waiting to be explored.

General Pattern started in 1922 by President Denny Reiland’s grandfather, making tooling patterns for the foundry industry. The company is headquartered in Blaine, Minn. with production facilities in Ham Lake, Minn., and Dearborn, Mich. It also operates two international engineering and production facilities, one in the United Kingdom and one in Germany.

Because of the connection with the Northern Lights Technology Center, Reiland has decided to further expand his company, with plans to open an injection molding facility in Duluth, bringing additional jobs to the area.

“I’m proud to have General Pattern welcomed into the Duluth community through this new Center,” said Reiland. “As a fast-paced and growing business, we see great opportunities ahead through this alliance with the University and the hard-working, well-educated workforce this area provides.”
NRRI hosts international biology conference

No time or place is more fitting. This summer, more than 1,200 biologists, representing more than 25 countries, concerned with land-water interactions will convene on the shore of one of the largest fresh water lakes in the world during The International Year of Fresh Water.

University of Minnesota Duluth’s Natural Resources Research Institute (NRRI) and Continuing Education Program, and the University of Minnesota’s Sea Grant Program and Conservation Biology Graduate Program are hosting the 17th Annual Society for Conservation Biology Conference June 28 through July 2, on the coast of Lake Superior in Duluth.

Fresh water can no longer be taken for granted. The management and understanding of land, water and marine systems are essential to effectively deal with problems like coastal pollution, loss of coral reefs, maintaining biodiversity and fresh water shortages worldwide.

“We are honored to host this annual meeting which will be the largest science meeting ever in Duluth,” said NRRI’s Gerald Niemi, conference co-chair. “The Society for Conservation Biology is one of the fastest growing science groups, with more than 8,000 members. Our goal for the meeting is to provide state-of-the-art information on the loss and conservation of biological diversity—one of the greatest dilemmas facing mankind.”

The scientific program will include 15 symposia focusing on a wide variety of conservation issues, including coastal wetlands, climate change, management of wide-ranging species, land-use planning, and marine reserves. Over 700 abstracts have been reviewed for presentation at the meeting, and several workshops and organized discussions are planned.

Plenary presentations will be given by Michael Dombeck, Pioneer Professor of Global Environmental Management at the University of Wisconsin-Stevens Point and former director of the U.S. Forest Service; Jane Lubchenco, Valley Professor of Marine Biology and Distinguished Professor of Zoology at Oregon State University of Alberta; and Joy Zedler, Aldo Leopold Professor of Restoration Ecology at the University of Wisconsin-Madison.

The public is welcome to attend the conference or visit several Duluth art galleries, which are adopting the conference theme of land and water interactions in gallery shows. For more information, access the conference Web site at www.conservationbiology.org/2003, or contact the conference administrator, Kris Lund at (218) 726-7810.
Leaving strips of forested areas along rivers and streams is a common practice in forest management. The theory goes that when these areas are logged, leaving behind riparian zones—a strip of wooded area about 32 yards deep—will protect the water and wildlife. However, two recently published NRRI studies have found that it may not be beneficial in all cases, especially not for interior forest birds like the Scarlet Tanager, Eastern Wood Pewee, and Ovenbird.

“For many birds, those narrow forest corridors are like an ecological trap,” said Hanowski, an expert in bird studies. “The birds that nest in them are very susceptible to predation.”

Both studies were funded by the Minnesota Forest Resources Council to add to the understanding of how well the prescriptive logging practice works in different forest situations. Using state-of-the-art geographical information systems (GIS) technology, NRRI researchers simulated large-scale applications of logging practices that are used regularly on a small-scale basis. The computer model allows researchers to see the broader implications of leaving buffer zones of trees along streams, lakes and wetlands. They found that forest interior wildlife fares better in larger forested areas, rather than on the edges where they are more easily found and caught by predators.

“As you’d think, the wider buffers, about 64 yards, created more interior forest,” explained Hanowski. “The water bodies are close enough together in our study area that wider buffers came together, forming isolated forest ‘islands’, which has more interior habitat for birds.”

The second study looked specifically at how birds respond to different tree harvesting methods—clear cut, grapple skid and cut-to-length. Hanowski and her team found that in the first year, there wasn’t a big difference in birds at the different sites, which she says is due to the birds’ site fidelity.

“They’ll come back to the site thinking it was exactly the same as last year, not realizing someone harvested it when they were down in Mexico, or wherever they winter,” said Hanowski. “Once there, they don’t have a lot of opportunity to go somewhere else. They try to nest and find a mate in the adjacent forest or riparian buffer.”

In the second year, however, the birds disperse from harvested sites. They found that for interior forest birds, the narrow buffers were an inadequate habitat. In comparing the grapple skidding harvest method with cut-to-length, they found that the Winter Wrens, a bird that nests in understory brush piles, were less affected by the cut-to-length method because there’s less disturbance of the understory.

Burdett is working with the Superior National Forest to study the habitat lynx frequent and their range. Radio tracking is the most recent addition to their ongoing efforts to learn more about lynx in Minnesota. The researchers captured two male lynx in the Isabella area and fitted them with radio collars. They will continue to track these animals and hope to put collars on additional lynx over the next several years.

Searching for lynx presence started in January 2002 with a backtracking study. Cat tracks found on a road were followed into the woods to lynx scat or hair that could be collected for DNA testing. This technique confirmed lynx presence in the Forest, and the need for more intensive lynx studies.

From March 2002 to September 2002 the Forest Service has sent samples to the Rocky Mountain Research Station-Carnivore Genetics Laboratory for analysis confirming multiple lynx in northern Minnesota. Multiple sightings, including sightings and videos of lynx with kittens, provide good evidence that there is a reproducing population of lynx in the Superior National Forest.

Lynx sightings occur where there are also signs of snowshoe hare—usually good conifer cover near shrub or new growth aspen. (Snowshoe hare forage on young aspen sprouts.) Lynx also frequent older coniferous forests of cone producing age, which is a preferred food for red squirrel (also a common prey of lynx.)

“Lynx is not a species that’s incompatible with forest management practice. They will go anywhere there is snowshoe hare,” said Burdett, a PhD candidate whose doctoral research is based on the lynx study.

The information from this research is being used by the Superior National Forest to plan projects to avoid adverse effects to lynx. Habitat needs of lynx are also considered in the analysis for revising the Forest Plans on the Superior and Chippewa National Forests.

Sightings of live (or dead) lynx can be reported to the nearest office of the Forest Service, Park Service, US Fish and Wildlife Service, or Department of Natural Resources.

Minnesota’s big cat is back. Since being listed as a federally protected “threatened species” under the Endangered Species Act, the Canada lynx population in Minnesota seems to be rebounding. And NRRI researchers are on their trail.

“Concurrent with listing lynx as ‘threatened’ comes the need to know a whole lot more about the species,” explained NRRI biologist Chris Burdett. “We want to know: Will they stay? Will they starve? Will they move to Canada, or to Wisconsin or Michigan? We need to know what they’re doing and how they’re doing.”

“Lynx is a species that’s not a species that’s incompatible with forest management practice. They will go anywhere there is snowshoe hare,” said Burdett, a PhD candidate whose doctoral research is based on the lynx study.

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Partnerships in Action
NRRI’s GIS Lab lends expertise locally

“Coming together is a beginning, staying together is progress, and working together is success.” —Henry Ford

NRRI worked cooperatively with the University of Minnesota’s Center for Rural Design to build a “how-to” guide for land-use for communities in the Lake Superior Basin. The goal is to guide community development to protect the area’s fragile shoreline, trout streams and watersheds, all of which affect the Lake Superior.

Because of Duluth’s steep slope toward the lake, streams away from the shoreline were also carefully studied through this program. NRRI research capabilities were used to study Miller Creek as it weaves its way through the expanding Miller Hill shopping areas. Studies of the natural resources on the hill started some 15 years ago when serious development began, which gives researchers well-documented historical data to work from. NRRI’s GIS mapping lab and land-use software have been valuable tools for making development decisions that will help protect the water quality. Complete information about the Lake Superior Decision Support Systems projects can be seen at: www.nrri.umn.edu/lsgis.

LAKE SUPERIOR COASTAL PROGRAM
Funding Source: Minnesota DNR & NOAA

The skills of NRRI’s researchers are an important part of a collaborative effort administered by the National Oceanic and Atmospheric Administration with the Minnesota Department of Natural Resources and the Environmental Protection Agency. The program’s goal is ambitious: to preserve, protect, develop and, where possible, restore or enhance coastal resources along Minnesota’s North Shore. However, the information needed by scientists to study this beautiful stretch of land and water was scattered and the
maps were technologically archaic. NRRI’s GIS specialists were able to compile data from many state and federal sources to provide highly detailed maps of the coastal area, then make it easily accessible in three formats: website, disk and hardcopy. The web address is: www.nrri.umn.edu/coastalgis.

NEMO - NON-POINT EDUCATION FOR MUNICIPAL OFFICIALS

Funding Source: Minnesota Sea Grant, U.S. EPA, Lake Superior Coastal Program, Great Lakes Commission

An important part of both coastal studies is the need for city and county planners to understand how developed areas affect watersheds. Impervious surfaces—roads, roofs, parking lots and sidewalks—block the natural flow of water to the water table, adding sediments and pollutants as the water flows overland into nearby streams and Lake Superior. The U of M’s Sea Grant Program administers a Non-Point Education for Municipal Officials (NEMO) program and NRRI is helping with the information analysis.

Working with city planners in Duluth, Grand Marais, Proctor and Fond du Lac, NRRI’s Gerry Sjerven and George Host conducted analyses on urban watersheds within the city boundaries. Aerial photography was used to measure the impervious surfaces, and the researchers determined how current and proposed future development affects each city’s water quality. Officials from any towns and cities in the area are welcome to make use of this expertise. Minnesota Sea Grant’s NEMO Coordinator Jesse Schomberg says their goal is to show people how land use affects water quality. “We give them the tools to make good choices about development—where it should happen, where it shouldn’t and some of the design criteria that can be used when areas are developed,” he said.

MINNESOTA POINT PROTECTION PROJECT

Funding Source: Legislative Commission on Minnesota Resources

The conflict between airport safety and preservation of an old growth pine forest led to a more detailed look at the natural resources on one of the city’s most valuable and vulnerable strips of land—Park Point. Working with the Park Point Community Club, NRRI researchers mapped vegetation changes resulting from expansion of the Sky Harbor Airport and other Park Point land uses. They compared an 1861 map with more recent maps and aerial photos to show how the already thin peninsula is being whittled away by water and wind erosion. It takes just one walk along the beach to notice the “blowouts” which are increasing both in size and number. These blowouts are the direct result of unrestricted wind on the unprotected sandy soil. As a result of this study wind fences are being installed and hardier grass species are being planted to lessen the impact of humans and nature on the fragile ecosystem on Minnesota Point.

NATURAL RESOURCES INVENTORY OF DULUTH

Funding Source: MN DNR, Lake Superior Coastal Program, and City of Duluth

Duluth is known as a city of woods, water and wildlife, but keeping it healthy and attractive as a growing metropolis requires detailed information and careful planning. The city needed a natural resources inventory so that comprehensive planning decisions could be made. NRRI’s GIS researchers compiled information from sources such as the Minnesota Department of Transportation, the Land Management Information Center, and the Department of Natural Resources. Using the latest technology, they were able to update and upgrade the data on Duluth’s wetlands and forest cover, with more detail and expanded coverage.

NRRI GIS researchers Brian Allen and Paul Meysembourg, with supervision from Carol Johnston, identified wetlands throughout the Duluth watershed area and existing forested areas within the city. This important information is useful in both land-use planning decisions and wildlife management on city-owned land.

NRRI’s detailed mapping capabilities, field studies and compilation of GIS information resulted in a catalog of city natural resources and sensitive areas, with better information to protect these areas.

“Our job is not just to create data, but to try to merge it into something people will actually recognize and use. The most important thing is to be as informed as you can be. When you make a decision, know ahead of time how it impacts the environment.”

—Gerry Sjerven, NRRI-GIS
NRRI in the field

Revisiting Minnesota’s Gold Prospects

As always, the glitter of gold draws the eye of geologists and investors. However, finding gold in Minnesota’s complex mix of rocks has always been like finding the proverbial needle in a haystack. Yet, NRRI geologists are re-investigating evidence of that golden needle lying deep in the ground northeast of Soudan in Northeastern Minnesota. The gold-bearing zones occur in 2.7 billion year old rocks that, worldwide, host some of the highest grade gold deposits in the world.

Despite the difficulty of the search, NRRI’s Dean Peterson, who has spent years mapping minerals in Minnesota, says this is a great place to be a geologist. The rocks in Northeastern Minnesota are among the oldest on the continent, formed during Archean geologic period. The wide variety of minerals in these ancient formations is both amazing and frustrating as economic geologists search for minerals with mining potential, then map them for interested investors and mining companies.

“The rocks in this area are very, very complex,” said Peterson. “Minnesota’s geology is complicated because we’re in the center of the continent, and the rocks get younger as they formed out toward the coasts. So on the Mesabi Range you’ll find one series of rocks, then along the North Shore there’s another, and south it’s different again.”

Prehistoric mountain-building has also tipped this area’s volcanic rocks on their sides, making it more difficult to find deposits because they go down instead of across. Once they’re found, however, they’re easier to mine. That’s why NRRI’s geologists think mining companies will be especially interested in the additional information gathered on these gold-bearing zones. Getting to the gold will require underground mines, which will cause fewer disturbances to the environment and less mining of waste rock. The economic potential is greatly enhanced.

Peterson presented his highly detailed maps to The Institute on Lake Superior Geology in Iron Mountain, Mich., which shows the results of his search for economically viable gold deposits.
FIELD RESEARCH

If you give a moose a forest...

NRRI research shows effect of moose browsing on Isle Royale

At over a thousand pounds and six feet tall at the shoulder, the twig-chomping moose is a formidable diner on Isle Royale National Park. A recent study by NRRI scientist Ron Moen for the National Park Service shows how moose munching—as much as 25 pounds of brush per day—can change the composition of the forest and also eat away potential fuel for fires.

“The park service wanted to know how the moose are affecting the vegetation on the island, especially if they’re altering it to the point where a forest fire would be less likely to occur,” Moen explained. This past winter’s low precipitation makes this information especially important, particularly if a hot, dry summer lies ahead.

To conduct the three-year study, Moen used field research from ongoing Michigan Technological University studies. He also enhanced a computer model called Linkages, developed by NRRI scientist John Pastor, that simulates how a forest grows.

By entering information already known about which trees grow on Isle Royale and moose browsing preferences, Moen was able to “grow” a simulated forest on the computer that has the same characteristics as the forest on Isle Royale. Comparisons of the computer model to actual tree measurements taken on Isle Royale show that the simulation is consistent with documented field research. Moen used a computer fire model developed by the U.S. Forest Service that simulates how quickly fires spread given a variety of circumstances.

“We ‘planted’ about 20 tree species that are found on the island, then ran simulations with moose browsing that corresponds to low and high moose populations,” said Moen. “We saw very different forests resulting. It is really amazing how well the simulation model is able to predict forest growth.”

The virtual forest was “planted” to replicate a forest 150 years old, and then moose populations were added to the model, just like on the actual Isle Royale where moose are thought to have appeared around 1905. The simulation confirmed the researchers suspicions that in the older boreal forests moose browsing had little effect, except on the understory species, but moose foraging alters forest growth in areas that burn and are re-growing.

Young aspen branches and leaves are one of the moose’s favorite foods. By eating down the saplings, they don’t grow into trees that shade young trees seedlings and there aren’t as many twigs and branches to fuel fires. The fires that have started on the island over the past 50 years have not spread into large wildfires because of this. Unwittingly, the moose may actually be making their own life more difficult. Uncontrolled fires would allow more new saplings of aspen to grow and providing more moose food.

The effect of the moose on the island’s vegetation complements research done by Michigan Technological University scientist Rolf Peterson on the relationship between the island’s wolf and moose populations. Monitoring animal populations and tree growth allow researchers and the park service to understand the interactions between these island dwellers and plan for the future.

Drawing by John Pastor
In Business

Paving a new road to economic growth

Byproducts from the taconite pellet making process have been piling up for decades in largely unused piles. But, research has found that these coarse taconite tailings have the potential to be a sellable product, ready to roll from the Iron Range.

Coarse taconite tailings have great potential as the fine aggregate component of roadbed aggregate—an increasingly valuable commodity in growing metropolitan areas. The coarse tailings are equivalent to manufactured sand, while being more dense, durable and skid resistant. NRRI researchers have been conducting extensive studies on the viability of using this taconite industry waste as a marketable commodity. This information is being made available for reference by the Minnesota Department of Transportation and others for road construction planning.

It takes around 20,000 tons of aggregate to make a one mile stretch of four-lane highway, and tailings are a proven aggregate in road building in towns around the Iron Range. But the metro area has an increasingly short supply of crushed stone and gravel and an even greater demand for road building. Finding a way to get it down there makes sense. Cost effective transportation, probably by rail, is the key.

“Research shows that if growth continues the way it’s going, demand for aggregate in the seven-county metro area will outstrip available permitted supply in 10 to 15 years,” explained NRRI researcher Larry Zanko. “There’s increasing demand for construction aggregate because of development, but development also keeps gravel pits and quarries from expanding. No one wants a gravel pit in their backyard.”

Taconite tailings have commercial potential
People don’t often think of how extensively aggregate or gravel is used, yet 51 million tons of aggregate are used in Minnesota each year. Building one new home requires some 120 tons of aggregate.

Enter taconite tailings—EVTAC Mining in Eveleth has a 37-year supply to get rid of, and there are four other western Mesabi Range taconite plants in operation with large supplies as well. NRRI researcher Julie Oreskovich said the tailings have gotten considerable use in northeastern Minnesota road reconstruction projects, most recently for Highway 169 between Virginia and Chisholm.

The study included mineralogical and chemical analyses of coarse tailings at the five western-most Mesabi Range taconite operations. Research continues in the evaluation of market potential and acceptance of tailings as aggregate beyond Minnesota. The researchers are also investigating viable transportation options. Results of their study will be published this summer.

Apprise Technologies, Inc. wins 2003 “Labo” Award

By definition, entrepreneurial ventures are risky business. But when they succeed, they leave ripples of economic development in their wake. That’s why the Joel Labovitz Entrepreneurial Success Awards are a coveted achievement for Duluth area businesses.

NRRI has been instrumental in helping many start-ups succeed, including one of this year’s “Labo” winners, Apprise Technologies, Inc., recognized for their emerging new technology in sensor-based research equipment.

“NRRI has been critical in the growth of Apprise from the very beginning,” said Apprise President Chris Owen. “It started with encouragement and support by NRRI, to partnering on private sector-University federal grant opportunities and providing incubator space during our early months of start-up.”

Apprise was launched in 1997 with one product: a remote underwater sampling station called RUSS. The RUSS unit allows multiple users to request, download and analyze water quality parameters from a remote location. From this beginning, Apprise has grown to develop solutions for the biomedical, environmental and process control instrumentation markets worldwide, currently employing 17-24 people at their Duluth facility.

“We continue to have a positive relationship with NRRI and hope Apprise will act as a model for future ventures originating out of NRRI and its important research,” Owen added.

Other 2003 “Labo” award recipients are Superior’s Choice Fish, Two Harbors (Micro-Entrepreneurial); The Whistling Bird, Gilbert (Emerging Entrepreneur); Trail Center Lodge, Grand Marais (Gazelle Entrepreneur); Northland Machine, Grand Rapids (Mature Entrepreneur); William Henning, Ely (Entrepreneurial Leadership); and Mike Ives, Grand Rapids (Lifetime Achievement).
Taconite ore is one of the toughest rocks in the world. It takes three tons of the low-grade ore to make one ton of taconite pellets in a long process of mining, crushing, separating, concentrating, mixing and pelletizing. From beginning to end, the operation requires massive machinery and considerable energy, as well as ingenuity to keep the industry innovative. NRRI’s Coleraine Minerals Research Laboratory has the best minds in the business to focus on one goal: strengthening Minnesota mining.

This is Part Two of a two-part series on the expertise and research skills made available to the mining industry at the Coleraine Lab. Each person lends to the lab’s overall synergy—working together they have a greater effect than what could be accomplished with the sum of their individual skills.

**Harlan “Pete” Niles**

Having a first-hand historical perspective on the ups and downs of taconite mining is a luxury not lost on those who rely on the long experience of Pete Niles. He started at U.S. Steel just as the industry was making the switch from direct red ore to manufacturing taconite pellets in the late 1950s.

“I liked seeing the progression from natural ores to taconite,” said Niles. “And now we’re seeing another step in the evolution of mining with direct reduced iron.”

He has also worked on the finishing end at a steel plant in Gary, Indiana. He worked with the “sintering” process (fine iron particles are combined into small pellets), and in the semifinished rolling mill where railroad tracks were made.

Those experiences were valuable, but at the heart, Niles is a geologist. He has spent the majority of his career sampling drill core and identifying minerals. By calculating the chemistry, he can tell the engineers if the ores have the right mix to make a good blend for the concentrating process.

“Here, they use me for my microscopic work,” he said. “If I’m working with an ore or other material, I want to know exactly what it is. I guess that comes with being a geologist.”

**Tom Larson**

Studying under the wing of the University’s Endowed Taconite Chair Iwao Iwasaki for his master’s degree was a rigorous training ground that Tom Larson is still grateful for.

“Working for Dr. Iwasaki taught me to be very thorough,” said Larson. “For example, if I thought a test wouldn’t produce results, it didn’t matter. I had to run the test anyway, and observe whether or not it produced results. Assumptions were just not allowed.”

Larson’s metallurgical engineering background and research on mineral separation processes come together nicely for his role as senior scientist at the Coleraine Lab. Each day, he calls on the statistical analysis skills he learned while working in the electronics industry and the managerial knowledge he gained working in the plant at U.S. Steel-Minntac and Cleveland Cliffs.

While Larson’s knowledge of the industry runs deep, it’s his ability to envision problems and approach them with creativity that keep the mineral concentration process running smoothly to further Iron Range mining research.

**Dick Kiesel**

Binders and binder mechanisms to turn wet taconite powder into balls is a specialty of Dick Kiesel. It’s also a specific area of expertise that’s unique worldwide.

Kiesel has five years of experience in taconite pyrometallurgy research and development, focusing on the agglomeration process—making the green pellet balls that are fired before
shipping off to the steel mills. As program director for high temperature processing, Kiesel is the resident furnace and firings expert for performing metallurgical furnace testing and pilot scale production of taconite pellets. His background in mining industry environmental issues is also coming into play. He’ll be operating a new state-of-the-art mercury sampling unit and flue gas emissions analyzer. Kiesel is also drawing on past experiences with direct reduced iron to operate two new induction melting furnaces that will melt down direct reduced iron (DRI) for analysis.

**JEREMY PLETKA**

On the other end of the experience spectrum is Jeremy Pletka who started at the Coleraine Lab in 2001 fresh out of college with a master’s degree from Michigan Tech in metallurgical engineering.

His research on plastics recycling and plastics recovery from industrial waste sites has transferred well into understanding minerals processing technology.

“In plastics and in minerals, you have this mixture of materials,” Pletka explained. “The principals of mineral processing apply in both cases with the goal being to produce a marketable product.”

Pletka is quickly gaining skills in scale-sized flotation processes and in blending ores. He also works with local mining companies to increase mill productivity. Pletka appreciates and readily leans on the years of experience and skills of his colleagues at NRRI’s Coleraine Lab. His goal is to learn all he can about a variety of minerals processes.

“I hope what I add is a fresh perspective and some new ideas,” he said.
Staff Highlights

Branching out

NRRI scientist Carol Johnston will be transferring her wetlands and Geographic Information Systems (GIS) expertise to South Dakota as Professor and Director of the Center for Biocomplexity Studies. The Center helps researchers in biology, engineering and the geosciences obtain funding for research with new approaches to the study of the interactivity of regional flora, fauna and the environment.

Johnston started at NRRI in 1985 doing post-doctoral research on the influence of beavers on the Minnesota landscape, which has branched out and continued to influence many further studies. She was instrumental in securing funding for NRRI’s state-of-the-art Geographical Information Systems lab which has proven critical for the comprehensive research NRRI undertakes. During her years at NRRI, Johnston has supported the careers of 18 employees and 44 students.

She is looking forward to her new role, facilitating the research of four institutions: the University of South Dakota in Vermillion, the South Dakota School of Mines and Technology in Rapid City, the EROS Data Center in Sioux Falls, and South Dakota State University in Brookings, where her office will be located. Johnston’s new position starts full-time in July, however, she will continue to collaborate with NRRI on the Great Lakes Environmental Indicators project.

Johnston to direct biocomplexity research in South Dakota

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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