Minneapolis and Cottonwood Rivers Mapped for Industrial Clay Potential

NRRI geologists prepared maps and digital images outlining the industrial clay potential—mainly kaolin and ball clay—along the Minnesota and Cottonwood Rivers in southern sections of the state.
Although iron ore has long been a dominant factor in Minnesota’s economy, the state is also home to several nonferrous minerals. NRRI geologists recently completed a project in which they developed maps of industrial clay potential in the Minnesota River Valley area.

The 1998 reconnaissance-style survey documented primary kaolin, secondary kaolin and ball clays along the Minnesota and Cottonwood Rivers from Fairfax to St. Peter. In a previous study NRRI minerals researchers identified areas that potentially could be mined for kaolin areas between Granite Falls and Fairfax.

The majority of Minnesota’s primary kaolin is shipped to Iowa to make portland cement, while secondary kaolin and ball clays are used in bricks and pottery. Both kaolin and ball clay are derived from ancient bedrock, which is often exposed along river valleys in southwestern Minnesota. These “young” clays were formed during the Cretaceous Period, 65 to 135 million years ago, by weathering 3.5 billion-year-old bedrock.

Using visual identification and occasional drill core samples, over 100 unique clay sites were located, mapped, described and ranked according to industrial potential by geologists Larry Zanko and John Heine. NRRI’s Julie Oreskovich digitized that information and combined it with geological archives to create a digital map stretching from Granite Falls to LeSueur, highlighting and ranking areas for industrial clay development. Dr. James Grant of the UMD Geology Department also provided bedrock outcrop maps he produced in the late 60s.

“This was really an effort to take existing data, do some field work and develop a geographic information system-based map of potential areas,” said Zanko. “The next phase is to take a closer look at the areas we identified as having ‘high’ potential.”

The resulting map and related information are now available to the mineral industry, the general public and local officials—the Department of Natural Resources (DNR), Minnesota Geological Survey and Minnesota River Valley Coalition on Kaolin. These accurate tools will be helpful in making land-use decisions related to zoning regulations and permits.

“We must provide good information to the public and public officials, who are responsible for planning, zoning, and permitting for clay mining decisions. With these maps we are ahead of the game,” noted Martin. “When the time comes in the business cycle to propose investment in mineral development, we would like the community to be prepared and informed regarding mineral resource planning and zoning. This process takes some time. NRRI has made a solid contribution to the effort.”

Minnesota’s natural clay deposits support three major clay producers: Minnesota Valley Minerals, Inc. based in North Mankato, Northern Con-Agg, Inc. based in Plymouth, and Ochs Brick and Tile, Inc., which operates a plant in Springfield. NRRI works with these companies to improve understanding of the geology, characteristics and resource potential of the state’s industrial clays.

NRRI’s John Heine examined kaolin deposits along the Minnesota River.
Avian Ecology

Diversity initiative begins ninth year

Spring is in the air and so are the birds. NRRI avian researchers will soon embark on their ninth consecutive year of bird monitoring in northern forests. Initiated in 1991, Minnesota’s Forest Bird Diversity Initiative looks at how breeding birds react to human interference such as logging and road construction. The project also shows property owners and loggers how they can minimize effects while maintaining the forest’s productivity.

By studying one piece of the northern ecosystem, researchers discover clues about the overall health and sustainability of the forest. Long-term bird monitoring allows scientists to differentiate between natural cycles and actual changes in total population or species types.

The Initiative includes 1,200 sampling sites in 17 Minnesota counties. The project originated in the Chippewa and Superior National Forests in 1991 and later expanded to include the Chequamegon National Forest along with the central and southeastern areas of the state. Researchers monitor over 150 bird species, logging both the total number of birds and number of each species sighted or heard at each site during a ten-minute period during the breeding period from June to mid-July.

To Date

Results to date show an increase in both total population and number of species in northern Minnesota. While twenty-eight species increased across the regions studied, twenty species decreased including the Golden-crowned Kinglet, Gray Catbird, Canada Warbler and Indigo Bunting. However, the fragmented forests of southeastern Minnesota reached a four-year low in total bird population. Seventy-four percent of the species decreased since monitoring began in 1995.

“The monitoring results become increasingly important as time goes on,” noted NRRI avian ecologist JoAnn Hanowski. “Birds are great indicators of habitat change and condition, and therefore changes in their numbers will alert us to significant changes that have occurred in habitats over the landscape. We can use this information to make management recommendations that will mitigate future changes or restore forest conditions.”

This is the largest long-term monitoring study ever conducted in the Upper Midwest and the monitoring methods developed by NRRI researchers are known for their comprehensiveness. Forest birds could be providing more than $100 million per year in economic benefits to Minnesota forests by eating caterpillars such as spruce budworms that slow tree growth rates.

Cast of Players

The study has a cast of many players including Jerry Niemi and JoAnn Hanowski leading the NRRI team, Lee Pfannmuller of the Minnesota Department of Natural Resources, plus cooperation and funding from the USDA’s Forest Service and the Legislative Commission on Minnesota Resources (LCMR). Industry leaders Potlatch Corporation, Boise-Cascade, Inc. and UPM Kymmene Blandin have designated three one-square-mile areas of forested land for the study.

The ultimate step in this ongoing project is sharing the information with forest users—loggers, public forest managers, private landowners and the forest industry. Over the past five years Initiative researchers have conducted classroom and field workshops, developed and distributed forestry planning booklets and presented results to forest stakeholders. This technology transfer puts valuable planning information into practice.

“The forest products industry needs this information,” noted David Ohms, Resource Manager for Potlatch Corporation. “We’ve already used some of the data to better integrate the needs of forest birds and their habitats with industrial forest management.”

Continued initiative funding has been requested. However, long-term information that relates to forest changes—from before a forest is cut, as it grows and possibly as it is cut again—is the key to understanding human impact on Minnesota’s greatest economic asset—its natural resources.
Environment North

Aquaculture

Baitfish cash crop

Collaborative research involving NRRI and Minnesota Sea Grant Program researchers, Carl Richards, Jeff Gunderson and Paul Tucker, is looking at the feasibility of spawning and raising hornyhead chubs (sometimes known as red-tails) in an indoor aquaculture facility. If successful, the information will provide a cost-effective alternative fish source for the Minnesota “cultured” baitfish industry.

Currently, most baitfish is harvested from wild ponds and streams and then sold wholesale to bait shops. However, increased harvesting has led to some areas being stressed. In those situations, the Minnesota Department of Natural Resources will close that pond or stream to harvesting. The cultured bait fish industry, which generated $1.7 million in sales in 1996 (the most recent statistics available), will provide both product for a growing industry and jobs in rural areas of Minnesota.

After one year of research, the project has shown amazing results. Last year, forty percent of the fry (just short of a year old) and 98 percent of the juveniles (nearly two years old) grew to marketable size by mid-May of 1998. 1999’s growth rates are approximately four months ahead of last year’s. In their native environment, it takes red-tails three years or more to reach marketable size.

Another aspect of the project looks at “forcing” a spawn and hatch in man-made containers. Approximately 30 red-tails were placed in a controlled temperature and light environment. To simulate a natural winter situation, the water temperature was gradually decreased to 43 degrees and light “hours” were reduced. These steps will stall the fish’s sexual hormones until the temperature and light hours are increased—similar to what happens in later winter. Researchers hope to “force” spawn in the near future. If this is successful, it will be one of the first instances of “forced” red-tail hatches indoors.

“Our work with red-tail chubs provides a unique opportunity to mix our knowledge of the biology of these animals with a good opportunity for economic development in the bait industry,” said Richards. “These fish are an excellent candidate for combined indoor and outdoor culture.”

Researchers are also working with several private cultured baitfish growers to establish their own indoor facilities for raising and spawning red-tails. The technology and knowledge developed from this Minnesota Technology, Inc. (MTI) project will be shared with the business collaborators.

Fun Fish Facts

According to a recent study by the National Survey of Fishing, Hunting, and Wildlife-Associated Recreation, anglers spend $50 million on bait annually in Minnesota.

In 1996, there were 56 cultured baitfish growers in Minnesota.

90% of Minnesota’s cultured baitfish is sold in the state.

Red-tails have been known to sell for as much as $8.00 per dozen.

In 1995, nearly 1.5 million fishing licenses were sold in Minnesota.
Thanks to a new interactive project at NRRI, all Minnesotans who have access to the Internet will be able to obtain information regarding the water quality of four different Minnesota lakes. These facts are important not only because some communities obtain their drinking water from local lakes, but also because water quality directly affects plants and animals.

Three monitoring devices, Remote Underwater Sampling Stations (RUSS), developed by project partners NRRI, Apprise Technologies, Inc., and the University of Minnesota Duluth, were recently launched into Lake Minnetonka and Lake Independence, both just west of the Twin Cities area. The RUSS units were instituted as part of a two-year Environmental Protection Agency (EPA) EMPACT, or Environmental Monitoring for Public Access and Community Tracking, project.

RUSS is composed of sensors that collect water quality data such as pH, temperature, turbidity, conductivity and dissolved oxygen from the lake. This data is then transmitted from RUSS to an Internet web site.

RUSS serves as a major technological breakthrough because scientists will no longer have to actually be on a lake to gather the information. Cellular or satellite communication permits scientists and Minnesota citizens to access and analyze the water information 24 hours a day, seven days a week, rain or shine.

Equally important, because of the EMPACT grant, NRRI’s team, composed of Rich Axler, George Host, Elaine Ruzycki and Norm Will, was able to partner up with Hennepin Parks, the University of Minnesota Duluth Education Department, the Minnehaha Creek Watershed District and Minnesota Sea Grant. The partnership provided the opportunity to develop an interactive means to make the RUSS data more “user-friendly” for classroom and public use. Soon, anyone will be able to visit an EMPACT Web site linked to the RUSS units where they will be able to view current trends in water quality. The site is located at www.nrri.umn.edu/empact.

According to Host, putting all of the RUSS information on an easily accessible Web site means that all Minnesotans “will be gaining access to a state-of-the-art technology that provides important information on the health of Minnesota lakes.”

The EMPACT site will provide both basic and detailed information for interested citizens. For instance, “As the lakes freeze, you can watch oxygen depletion occurring on a daily basis,” said Hennepin Parks Water Quality Manager John Barten, one of the project coordinators. “Students and interested citizens will be able to see the difference in dissolved oxygen loss between a bay with good water quality and a bay with poor water quality. Lakes with poor water quality tend to lose oxygen much faster. You can see what happens to a lake when we let too many pollutants enter it.”

The researchers received the $425,000 EMPACT grant in January 1999. They were only one of eight groups that were awarded the grant out of 108 applicants from across the nation.
Three years after its inception, the Minnesota Hybrid Poplar Research Cooperative is well on the way to fulfilling its mission. Since the beginning, Cooperative members have worked to produce genetically superior hybrid poplars, improve cultural practices, increase yield and transfer its gained knowledge to the public.

The Cooperative has established study sites at 14 locations across northern and western Minnesota. With over 90 acres of experiments in place, researchers have ample opportunity to study the hybrids’ optimal nutrition, or fertilization, rates as well as yield tests. This information is then made available to all members at the Cooperative’s quarterly meetings.

NRRI researchers Bill Berguson, Dan Buchman and Bernie McMahon are concentrating on the breeding program. Scientists from the U.S. Forest Service North Central Forest Experiment Station, the Agricultural Utilization Research Institute and the University of Minnesota Crookston complete the research team. In addition, they have field tested 80 new clones for disease-resistance and growth potential. In terms of breeding, researchers collected native poplar resources to provide a broader gene pool.

“We are breeding new hybrids using native poplar plant materials and pollen from Canadian cooperators to produce 45 new families,” reported Berguson. “These are the first families of the Co-op’s genetic program and will be used to produce more new hybrids.”

Berguson expects to plant over 1,250 new clones at each of three sites this summer. “When you try to evaluate that,” noted Berguson, “you need a plan or it can get out of hand in a hurry. So, based on statistical analysis of the existing data, we have developed the most efficient screening process possible.”

Wendell Johnson of the University of Minnesota Crookston and Ed Wene of the Agricultural Utilization Research Institute have focused on plantation management and assisting large-acreage growers in the northern and western reaches of the state. Industry members’ roles include allowing researchers access to their plantations for nutrition analysis and yield studies. These “in-kind” contributions, according to Berguson, are invaluable in terms of data availability and accumulation.

Three years into the Cooperative’s formation, Berguson believes they are right on track. “We have started out of the blocks and are doing well,” he noted. “We are reaching our stride in terms of research.” He anticipates the Cooperative’s first clones could be scaled up for commercial distribution by 2001.
The sport of skateboarding is making a tremendous comeback with today’s youth after suffering popularity lapses in the 70s and 80s. In fact, skateboarding is now the sixth largest participant sport in the United States. But, the market of products geared towards skateboarding has not been able to keep up with the rapidly increasing number of skaters. Although there is a great demand for obstacles such as ramps and boxes on which the athletes perform tricks, there are very few companies that manufacture complete ramps.

To address this issue, two Duluth entrepreneurs, Sunny Helbacka and Gerald Sabol attended NRRI’s Entrepreneur Development Program (EDP) and, upon program completion, collaborated with an NRRI forest products research team to begin market research. The outcome: SunRamp™ Solutions, Inc. was born.

Shortly after joining forces, the NRRI project team, Helbacka and Sabol began product development. SunRamp™ Solutions, Inc. aimed to design a ramp that distinguished them from other ramp manufacturers. The team developed the first prototypes using a method in which, according to NRRI researcher Brian Brashaw, the plywood ramp is “vacuum-molded” and glued to ensure the proper ramp curvature.

The team created twenty different prototypes, which were first tested in NRRI’s mechanical laboratories. The prototypes were then sent to two local skate parks where the skaters themselves, tested them. Helbacka and Sabol are now beginning production.

These products have a few features that distinguish them from other types of skate ramps: SunRamps™ are portable, cost-effective, and less labor intensive than most other ramps on the market. Prior to the development of SunRamp™ Solutions, Inc., most manufacturers tended to use traditional carpentry methods to fabricate skate ramps. Also, while many of today’s ramps are produced from concrete, these ramps are constructed from a unique combination of plywood, laminates and plastics. Additionally, Helbacka and Sabol save on shipping expenses because most of the construction materials are readily available from companies across Minnesota.

Helbacka and Sabol plan to begin marketing SunRamps™ over the Internet this summer to generate an overall market response. Their long-term goal is to provide ramps to local neighborhood and city park systems because, according to Helbacka, “There are wheels everywhere and nothing to ride them on.”

NRRI forest products researchers participating in the ramp project include Pat Donahue, Brian Brashaw, Suzanne French, Steve Kossett, Victor Krause and Bob Vatalaro. The initial product research began thanks to a $20,000 grant from Minnesota Technology Inc. (MTI) in July of 1998.
The faces of business

Business specialist Joseph Barrett brings over 20 years of international business experience to the Arrowhead region.

Barrett wears two hats, both with the same mission, but at separate locations. The Vermilion Community College in Ely and the Northshore Business Enterprise Center in Two Harbors provide accessible office space for area residents to meet with Barrett.

As part of the UMD Center for Economic Development, Barrett focuses on entrepreneurs by assisting with business plans, financial analysis, restructuring and accessing capital sources through Small Business Development Centers.

Barrett recently held the first of several workshops on international trade entitled: “Global Marketing on a Shoestring.” While this session was not intended to provide a step-by-step plan for marketing globally, it was intended to stimulate interest in international expansion for small to medium-sized businesses across Minnesota.

“I’ll be sharing my experiences and encouraging companies in northeastern Minnesota to start looking at international markets,” said Barrett. “Interested business owners can start by simply selecting a country they are interested in knowing at a deeper level and studying geography, people, language and regions.”

Residents of Ely and Two Harbors can now start bringing a Minnesota perspective to their world.

Forlund to direct natural resource-based businesses

Kathy Forslund, who has been with the Center for Economic Development, since 1988 was recently promoted to Associate Director in charge of the NRRI Business Group. In her new role, Forslund will be in charge of all natural-resource based projects within the Center.

In addition, she will serve as a liaison between CED’s Small Business Development Center (SBDC) satellite offices, other Minnesota SBDC offices and NRRI. Forslund will also help scientists determine the commercial feasibility of products under development at NRRI.

According to Forslund, the appointment will streamline services for NRRI and the Center’s clients.

“My goals are to identify those businesses that could benefit from technical assistance from the NRRI scientists or the Business Group and then to facilitate the delivery of that assistance,” said Forslund. “Natural resource based businesses can contact me to see what types of assistance are available to them from NRRI.”

Forslund will continue to work directly with small business owners, expanding businesses and entrepreneurs, offering customized business assistance through the NRRI Business Group.
Seasonal employment in northern Minnesota, by definition, is part-time. So George Rule decided to add a winter business to complement his summer contracting business. That seasonal business is turning full-time now—which is good news for Rule and the town of Britt.

While driving home one night, Rule and his wife, Susan, saw a barrel sauna. The style really caught their eye and they stopped to investigate. Rules decided to add a barrel-style sauna that was portable and affordable for the consumer to their existing customized-sauna line.

Through trial and error, the actual forming of the eight-foot barrel sauna was an art that took a while to perfect. Still, persistence paid off and Sisu Sauna manufactured and sold seven saunas during the first year. The very first barrel sauna went to their accountant. The second year, the business doubled its output. In 1999, the goal is to sell 50 saunas and the business is off to a good start with seven saunas sold in slightly over three months.

After 18 years as a contractor, Rule knew the value of planning for his business. Through Minnesota Technology in Virginia, Rule contacted Jim Skurla of NRRI’s Business Group for assistance with a brochure and marketing plans.

“George is an enthusiastic and talented person,” said Skurla. “Our next step will be working on a business plan for the next five years. His goal is to build his business to be full-time and he already has ideas for additional products.”

Sisu Sauna’s barrel holds six to eight people and includes all the basics: stove (either electric or propane) and sauna necessities such as wooden bucket, soap and sauna brush. Or Sisu Sauna will custom-design a sauna for the basement or garage according to the space available. “Saunas provide an endless array of possibilities,” said Rule. “It’s like creating art.”

**SISU:**

1) A Finnish concept that defines the Finnish people and their character.
2) A stubborn determination to do what must be done, regardless of cost.

**The popularity of Sisu Saunas turned a seasonal business into a full-time venture.**
A nearly three-year collaborative effort between NRRI, Koochiching County and the Minnesota Department of Natural Resources (DNR) is paying off. Berger Peat Moss of Quebec, Canada, recently signed an agreement to develop a peat harvesting operation in the Pine Island Bog, near Big Falls.

Berger will annually harvest about two inches of high-grade Sphagnum moss peat from an 800-acre plot. This rich product of wetland decay is essential to the horticulture industry as a greenhouse growing medium and a soil additive (see All About Peat).

Berger expects to invest $1.5 million in equipment, field preparation and building construction. The company plans to begin preliminary work as soon as permits are issued, as early as spring, 2000. Although the anticipated 20 jobs will be seasonal, they will complement the timber industry which operates primarily during the winter months. The residents of Big Falls welcomed this economic opportunity, sending 200 letters to Berger, in support of development.

Local Boom

“The Big Falls community greatly appreciates all the hard work and long hours that former Commissioner Gary Bowman and the NRRI peat group have invested,” noted Big Falls Mayor Rod Burmeister. “Their knowledge and expertise have been the guiding force that has brought the project this far along.”

While 20 seasonal jobs might seem hardly worth the effort to some, it could mean an economic boom for the 350-person community. “If you create 30 jobs in Big Falls, it’s the same as creating 3,000 jobs in the Twin Cities,” said former Koochiching County Commissioner Gary Bowman. Spin-off and contract jobs such as trucking and pallet making are also expected.

Koochiching County has over one million acres of peat bogs, the most of any county in the state; however, only a portion of that is considered marketable peat. The Pine Island site has been considered for many years to be an ideal place for a peat harvesting operation in an area that especially needs the economic boost. It wasn’t until recently that Bowman began fitting the intricate economic development pieces together.

Minnesota State Representative Irv Anderson, who played a key role in the negotiations with the Department of Natural Resources on the price the county will pay for peat rights, indicated great satisfaction with the progress the proposal has made. “This is an important milestone for Koochiching County because it has lost more population than any other county in the entire state,” noted Anderson. “Pine Island Bog represents economic development utilizing an abundant natural resource.”

NRRI’s Kurt Johnson joined Yves Gauthier and Regis Berger of Berger Peat Moss to examine peat samples in the Pine Island Bog.
NRRI’s Role

The Institute has been conducting scientific studies to characterize and learn about the Pine Island site for over 10 years. Based on this understanding and an indication of market potential, NRRI researchers proposed an intensified effort to the Koochiching County Board and offered Minnesota Technology funding as a match to the effort.

Kurt Johnson, Tom Malterer and Craig Maly of the NRRI peat group were instrumental in matching the Pine Island Bog with Berger by acting as a liaison between Koochiching County and the company. The team also compiled existing information about the bog during the negotiation process, bringing their knowledge to the table.

When Berger showed an interest, the NRRI team arranged a guided field visit to the bog and assisted with an elevation survey to determine drainage potential. They will continue to help the project through the permitting and licensing process by supplying details for the Environmental Impact Statement.

The project has been supported, in part, by a grant from Minnesota Technology, Inc. and matching funds from Koochiching County. “The technical expertise from NRRI was and still is extremely important,” Bowman said. “The ability to leverage local funds with MTI’s assistance has been a wonderful asset to Koochiching County.”

Only about 1,000 of the total 130,000 acres of Sphagnum moss peat in Minnesota are currently being harvested. NRRI researchers estimate that Pine Island Bog can be harvested for 30-40 years. At that time, Berger will re-flood and replant the bog, using peatland regeneration techniques being tested by NRRI researchers. Peat production is a highly-regulated industry with about 15 companies located across the state.

All About Peat

Peat is the result of many years and layers of vegetation decaying in stagnant, oxygen-poor water. Prized by gardeners and horticulturists, peat is used in soil mixes and as an additive for its acidic and water-retaining characteristics.

Minnesota is home to 7.5 million acres of peat, including 130,000 acres of highly desirable Sphagnum moss peat, the most in the lower 48 states. Almost 150,000 acres of peat are protected from harvesting in Scientific and Natural Areas. Due to its ecological characteristics, a peat bog fills valuable roles as a water filter, overflow basin and home to unique plants and wildlife.
Project Highlights

Annual Awards

Successful regional entrepreneurs will again be recognized during Small Business Week at the Seventh Annual Joel Labovitz Entrepreneurial Success Awards on June 10. Winners will be awarded in four categories: emerging entrepreneur, start-up entrepreneur, mature entrepreneur and inventor. This year’s awards are sponsored by the UMD Center for Economic Development, Park State Bank, Duluth News-Tribune and KUMD.

NRRI Researcher Awarded

Barb McCarthy, wastewater treatment specialist, received the 1999 Environmental Health Professional of the Year award from the Minnesota Environmental Health Association, an organization of professionals dedicated to public health issues concerning drinking wells, wastewater treatment, swimming pools and food preparation facilities. McCarthy oversees several experimental sites.

Technology Award

On June 8, University of Minnesota President Yudof will present the 1999 Technology Enhanced Learning--Innovation Award to the Water on the Web researchers. Led by Bruce Monson of UMD’s Education Department, the team includes NRRI’s Rich Axler, George Host, Elaine Ruzycki, Norm Will and Alexander Tokhtuev, along with scientists from the Minnesota Sea Grant Program, Apprise Technologies, Inc. and Lake Superior College.

Experts Meet at NRRI

The majority of the world’s eminent mathematical chemists gathered at NRRI this spring for a one day symposium. Experts from seven countries presented their research.

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.

Michael Lalich, director

Center for Water & the Environment
Jerry Niemi, director

Center for Applied Research & Technology Development
Thys Johnson, director

Center for Economic Development
Stephen Marder, director

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NRRI Now is published to provide information about our programs and projects. For details call (218) 720-4294.

Non-Profit Organization
U.S. Postage Paid
Permit No. 705
Duluth, Minnesota

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