

## A perpetual-motion green machine



BusinessNorth photo by Ron Brochu  
UMD Assistant Professor Mike Mageau checks the growth of a plant at Silver Bay's greenhouse.

*Silver Bay eco project could become template for rural sustainability*

By RON BROCHU

Despite growth in the green movement, there haven't been many projects that improve the environment while generating a profit without public subsidy. Proponents of that concept, however, are hopeful about meeting both goals through a project in Silver Bay.

"It makes sense, and it works economically," City Administrator Lana Fralich said about the new greenhouse system that's a key component of the 110-acre Silver Bay Eco-Industrial Park.

The development features an ecological process through which food and energy are created through the consumption of wastes and emissions. The process is designed to be sustainable. If successful, sponsors plan to replicate the design so that it can be used by other communities.

"The concept of the park is to align businesses together so that one company's waste becomes another company's feedstock," said Project Coordinator Bruce Carman, and the greenhouse is a primary component. "That's where we're going. We need to look at businesses in that fashion," he said.

### A closed loop

It's not just a garden enclosure. The 8,600-square-foot greenhouse structure also houses tanks to raise fish and a trough to grow algae, creating a closed loop in which each form of life nourishes the next.

The concept was developed by UMD's Center for Sustainable Community Development, led by Assistant Professor Mike Mageau, in collaboration with Silver Bay officials. A preliminary design was completed on campus, with LHB in charge of the final engineering and Ray Riihilaoma in charge of construction. The investment totals \$1 million.

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## Mathews: A career building resources for entrepreneurs

By BETH BILY

Mary Mathews, president and CEO of the Entrepreneur Fund, will be retiring from the organization she founded more than 20 years ago at one of its busiest periods.

As traditional business financing has become difficult to obtain in the wake of the banking crisis and tighter loan scrutiny, the Entrepreneur Fund has helped fill the gap, Mathews said.

"Since 2008, when banks began cutting back on commercial lending, we've been busier than we've ever been," she said.

Her retirement plan was announced last month. She'll leave her position in mid-2013. The Entrepreneur Fund's board will begin a search for her replacement this fall.

Booming business at the nonprofit means Mathew's successor, who will take the post next June, must hit the ground running.

"I'm excited to leave an organization that's in pretty good shape," she said, and eager to watch a new CEO take it to a higher level.

### An entrepreneurial vision

Creating a strong resource for the region's entrepreneurs was exactly what Mathews and attorney Nick Smith had in mind when they began developing the Entrepreneur Fund concept in the mid-1980s. They envisioned an organization that would build entrepreneurial spirit and an entrepreneurial culture in the

Mathews continues on A8



Mary Mathews

## Pollution solution?

*Research may lead to pollutant mitigation for nonferrous mining, water and wastewater*

By MANJA HOLTER

Nonferrous mining holds the promise of many opportunities on Minnesota's Iron Range.

Mining Minnesota, an industry advocate, asserts that more than four billion tons of crude, nonferrous ore bodies are deposited in the northern part of Minnesota. Those deposits hold large quantities of precious metals, such as nickel and copper, the demands for which are expected to grow steadily over the next few years.

While technology has advanced dra-

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Photo courtesy of NRRRI

NRRRI researcher Igor Kolomitsyn (left) and American Peat Technology President Doug Green are leading a research effort which potentially offers a way to mitigate sulfide pollution resulting from nonferrous mining.



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# Peat deposits are plentiful in northern Minnesota



Photo courtesy of the Natural Resources Research Institute  
Pictured above is pelletized peat

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matically to minimize mining's impact on the land and regulatory agencies are more stringent than ever before, non-ferrous mining remains controversial. That's because copper and nickel are bound with sulfides, which can create sulfuric acid, with devastating environmental effects, when combined with both oxygen and water.

Although no nonferrous mining companies are currently operating in Minnesota, several, such as PolyMet, Twin Metals and others, are in various stages of development. But it's clear with vocal opposition to nonferrous mining that any company that begins such operations will have to demonstrate the ability to comply with tough environmental protection guidelines. One regional company, based in Aitkin, appears poised to clear that path. It's found a potential solution to mitigate the impact of nonferrous mining in its own backyard.

American Peat Technology (APT) was started in 2003. The company's president, Doug Green, has 19 years of experience in the mining industry. He and his team believe peat holds great promise to ensure the safety of nonferrous mining in this state and beyond.

## An answer found in nature

Peat deposits are plentiful in northern Minnesota. When the last glaciers disappeared 10,000 years ago, they left behind shallow lakes in which cattails, reed and sedges grew. When they died, these plants sank into stagnant water where anaerobic conditions allowed the plant ma-

terial to decompose so slowly that peat was formed. APT has analyzed the peat's molecular structure with the assistance of Igor Kolomytsin, PhD, a researcher with the University of Minnesota Duluth's Natural Resource Research Institute (NRRI).

Over time, researchers began to understand the mechanisms that enable peat to naturally adsorb and dissolve heavy metals. By chemically modifying the peat granule, APT also has been able to achieve the adsorption of sulfate ions. This adsorbing affinity makes the altered peat a potential medium for water treatment, although challenges with passing water through the fibrous raw material remained. It took APT five years to design a suitable solution to that problem: a now patented, active heat process that turns the peat into a stable granule, forming the product APTsorb.

## From lab to manufacturing

Mark Krezowski, executive advisor for partnering programs at APT, said they're now focused on taking the product from concept to marketplace: "We have proven in the lab that we can create this product specific to sulfate ion adsorption, now we're determining the most economical way to produce it."

APT executives plan to begin full-scale production within the next two years at an estimated cost of \$250,000. To help with financing, APT received a direct loan from the Iron Range Resources and Rehabilitation Board for \$100,000 in April 2012, which will be repaid when the venture becomes profitable. Addi-

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tional financial support was provided by the NRRI Development Fund, which has backing from the Grand Rapids-based Blandin Foundation and other entities. Research efforts are generating five full-time jobs, including Kolomytsin's as well as two assistants at the NRRI. Two more jobs were created at the plant site in Aitkin and involve project management, quality control and production.

Meanwhile, what's keeping APT viable in today's market is its product, bio-APT. This peat-based agricultural product is APT's most profitable and in many ways was the forerunner to APTsorb. The annual sale of 13 million pounds of bio-APT allows the company to focus their research and development on its metal adsorption product, which is the basis for long-term strategic planning.

"We invested 2.3 million dollars in our new product over the last eight to 10 years," said Krezowski, adding that APT's owners have never taken a penny of profit from the company but instead reinvested all earnings into research and development since the company's inception. This investment is partially a response to the mining industry's water discharge needs. "We're letting the market drive us and really hope we can help out Minnesota and the mines."

When asked how exactly APTsorb is being physically used, Krezowski explained that it is "as simple as putting it in a sand filter and passing the aqueous solution through the filter." The chemical processes are an exchange and bonding of electrons known as complexation and ion exchange mechanisms. The active sites of the peat molecules go out and bond with the heavy metal and other compounds that can be attached to the granule. These formed bonds are so strong that it is safe to discard the used material without the fear of renewed dissolubility. In fact the loaded granule passes the U.S. Environmental Protection Agency's Toxicity Characteristic Leaching Procedure (TCLP) testing, allowing for disposal at landfills.

"We used our product in dozens of test sites for the past five years but for the last three years we worked very closely with one mining company where we completely characterized a product for their metal adsorption needs," said Krezowski. "This summer we plan to implement a full-scale use of our product using a large ion-exchange tank that we designed for their needs."

#### A low cost alternative

There has long been knowledge, in scientific and other circles, that peat has a natural ability to remove heavy metals from water. But with its traditional use

still in the agricultural industry, APT finds it must educate people about their product and how they use peat. "We explain that it is not a physical filter, but rather a chemical adsorption media," said Ryan Menzel, vice president of operations and safety.

With APT being the first company to produce a durable, strong peat granule that still preserves its characteristics of ion adsorption, the manufacturer's competition in non-existent: "There are no direct competitors because currently no product does the same like ours," stated Menzel.

The indirect competitors are the resin based metal adsorption materials. But a \$500 to \$1,200 per cubic foot production price tag clearly demonstrates that the peat based product is a low cost alternative: it can be produced at a sixth of that expense with the same performance.

While APT's product is effective with heavy metal removal, not every kind of peat works. Only reed sedge peat has the qualifications specific enough for the APTsorb product. But the company surveyed its land and found that there will be no shortage of raw material.

"We currently harvest 160 acres of land for peat but have 320 acres under permit. That's a 100-year supply at our current production level," said Menzel. Furthermore, the company is acquiring more land, bumping the total acreage up to 480. "That's a 140-year supply. Even if we get our production up to 10 times of the current level, we still would have a 50-year supply."

APT also is experimenting with making their own peat by keeping a hay bale immersed in water and pulling it up every so often to test the decomposition. Essentially, peat growth is just a bacterial process, and by creating the perfect environment they're "trying to fool Mother Nature and create peat 100 times faster."

"Ideally, we want to produce peat as fast as we're using it and therefore make our company truly sustainable," stated Green. However, none of the currently used land is being remediated. Over the last five years nine inches of the 140 harvested acres have been removed- the company's permit allows them to dig 7 feet down before any remediation is required.

#### The buyers

There are three main focus markets for APT's metal adsorption product mining, industrial waste-water as well as storm-water. To meet each industry's specific needs the company is engaging in further development: the third generation of APTsorb can be modified in different ways to bond specific ions in greater amounts. However, with an output of 500 pounds per day the production is still pi-

lot in scale. Nevertheless, within the next two months APT is planning to be on line with a new production site in the city of Aitkin, with the capability to produce several thousand pounds per day. This first production level will generate two new full-time jobs. Green points out that if this venture works they will incorporate it into an even bigger facility which could create upwards of 10 production jobs, all paying a minimum of \$20/hour.

To develop further distribution channels Krezowski spends a lot of time attending different shows around the country. That's where he forms partnerships and gathers ideas about how to market APT as a solution.

When asked what the company's greatest challenges are, he points to the attitude of the mining management: "They don't believe that a company from Minnesota can help them. They are looking

for complicated solutions that they think should come from somewhere else. They don't look in their own backyard."

And while the thermal and chemical treatment of peat is anything but simple, the proximity of the solution to the problem could tip the scale.

*Manja Holter is a freelance writer based in Remer, Minn.*

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