HOW HAS SOUTHERN MINNESOTA CHANGED IN 170 YEARS? ST. OLAF STUDENTS AND FACULTY RETRACE EXPLORER JOSEPH NICOLLET'S EXPEDITION OF 1838.

In Search of Landscapes LOST

BY CHARLIE WHITTLESEY '77

PHOTOGRAPHS BY KATE HUBER '09, AMANDA RUBASCH '09 AND MEG OJALA

WHAT IF YOU COULD GO BACK IN TIME AND REVISIT SOUTHERN Minnesota as it was in 1838? See the roll and sweep of the prairie as it stretched unimpeded to every horizon? Climb each hill without any notion of what might lie on the other side? What if you could speak with Native Americans, pick samples of plants that no European had ever seen, or drink fresh water straight from lakes and rivers?

These *what ifs* were much of the draw for three St. Olaf professors and six students who spent last summer retracing the 1838 expedition of Joseph Nicollet. In addition to reconstructing Nicollet's route from Fort Snelling, Minnesota, to Spirit Lake, Iowa, the group of biologists and chemists analyzed the water quality of lakes and streams along the way and took sediment cores from lake bottoms. Student photographers recorded the entire project, from the fieldwork to the landscape itself. It was a classic example of the interdisciplinarity for which St. Olaf is known.

Minnesota as Terra Incognita

THE FRENCH ASTRONOMER AND MATHEMATICIAN Joseph Nicollet (pronounced *Nik-oh-lay*) charted much of the land between the Missouri and Mississippi rivers for the U.S. government. In September 1838, he left Fort Snelling and traveled southwest to Spirit Lake, Iowa, through a region he called the Undine, named after a German water spirit. He was accompanied by several Native American guides, French voyageurs, and Charles Geyer, a German botanist.

The party crossed the Cannon River near the Carleton College arboretum and followed its banks through present-day Northfield. Along the way, Nicollet and his companions drew detailed sketch maps, gathered plant specimens, spoke with Native Americans, and recorded their observations in journals. The timing was unique. There were no settlers in the region yet, and both the forests and prairies of southern Minnesota were pristine.

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Unlike many explorers who found the prairie dull, Nicollet felt a strong connection to it, and he rhapsodized about it in his journal:

> *There is something magical in the variety of impressions one gets from the sight of the prairies. One never wearies of it.… The fresh breeze that springs up from time to time, the absence of any danger close by (as one can see all around), the lack of any difficulty on the route, the sweet verdure everywhere, the flowers bedecking it, the blue of the sky, the variations of the atmosphere operating always on a grand scale, all of these things combine to arouse one, to free one's spirit.*

Except for the heavy snows that forced the party back to Fort Snelling by mid-October, the trip was successful and uneventful — quite an accomplishment given the expedition's many risks. In less than a month, Nicollet had crossed more than 300 miles of unexplored territory, gathered hundreds of plant specimens, made friends with the local Ojibwa and Dakota tribes, and sketched dozens of maps that he would later incorporate into the first topographical map of the Upper Mississippi basin.

The Expedition of 2007

Recreating the Nicollet expedition was the idea of Charles E. Umbanhowar, Jr., a St. Olaf biology professor and chair of the Environmental Studies department. One of Umbanhowar's longstanding interests was in paleoecology — the reconstruction of past ecosystems based on fossil remains. For years he'd taken sediment cores from lakes, studying the charcoal, pollen and other organic matter to get a clearer picture of the plants and marine life that flourished in Minnesota hundreds of years ago.

His interests led him to a book by Edmund and Martha Bray, *Joseph N. Nicollet and the Plains and Prairies*. The book contained all of Nicollet's journal entries from the 1838 expedition. Umbanhowar was fascinated by the level of detail the journals provided about the landscape, including its plants, people, animals, and geology, and by the interaction between Nicollet and the Native Americans.

Having grown up in Southern Minnesota, Umbanhowar found himself wondering how the landscape of today might compare with the landscape of 1838. Before long, he began working with St. Olaf art professor and department chair Meg Ojala on a photographic journal that documented the Nicollet route as it is today.

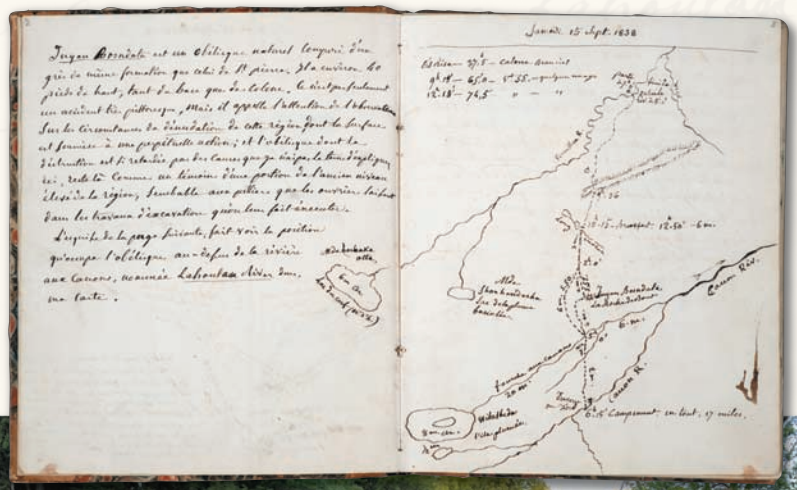
"We started with Nicollet's sketch maps, which are oriented toward lakes and river crossings and astronomical observation sites and include the Dakota place names," says Ojala. "They reveal his respect for the inhabitants of the region. He traveled along an important border between the prairie and the Big Woods. The Cannon River is the firebreak, with prairie on the east and Big Woods on the west. He notes the drama of that border, the dark and the light, the visibility into the distance and lack thereof."

About the same time, chemistry professor Paul Jackson '92 became interested in their work. With a background in chemical separations, Jackson wanted to analyze the lakes and rivers along Nicollet's route and search for contamination or other major changes.

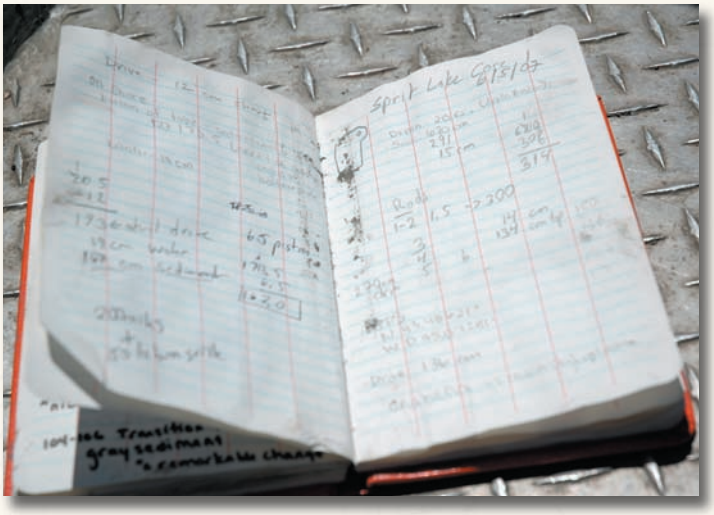
With the project now large enough to enlist the help of St. Olaf students through the college's summer science research program, Umbanhowar applied for and received a grant from the National Conference for Undergraduate Research (NCUR)/Lancy Initiative. According to the terms of the grant, the students, not the professors, were expected to do most of the heavy lifting.

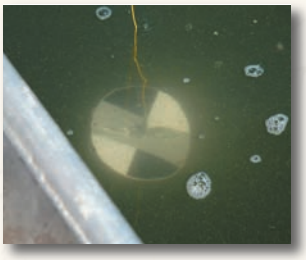
The Nicollet project attracted a large number of student researchers. The six who were chosen shared interests in environmental issues, Minnesota history, land-use, and interdisciplinary collaboration with other students and professors.

"It was very competitive," says chemistry major



ABOVE: Joseph Nicollet's journal entry from Sept. 15, 1838. RIGHT: the Cannon River in Waterford, near the spot where Nicollet's party crossed. Nicollet's sketch maps are oriented toward lakes and river crossings and astronomical observation sites and include the Dakota place names.





TOP LEFT: Annie Fedorowicz '08 and chemistry professor Paul Jackson '92 testing water clarity using a sechchi disk (ABOVE). TOP RIGHT: Student journal used to record lake sediment and clarity data. RIGHT: Susan Olson '08 and Annie Fedorowicz taking core samples from the bank of the Cannon River.

Susan Olson '08, whose fieldwork focused on several aspects of current and historical surface water quality. "You had to write a personal statement telling why you should get the job. And the professors looked at your transcript, your research experience and the number of faculty members who recommended you."

Annie Fedorowicz '08, another chemistry major, was chosen to help Olson with the water testing. Becky Huncosky '08 and Allie Pyan '09, both biology majors, would help Umbanhowar with lake-sediment core collection and analysis.

Kate Huber '09 and Amanda Rubasch '09 would add the key visual element by photographing the landscape and all the researcher's activities. They would also help Ojala digitize Nicollet's maps and journal pages and create a website that documented the entire project.

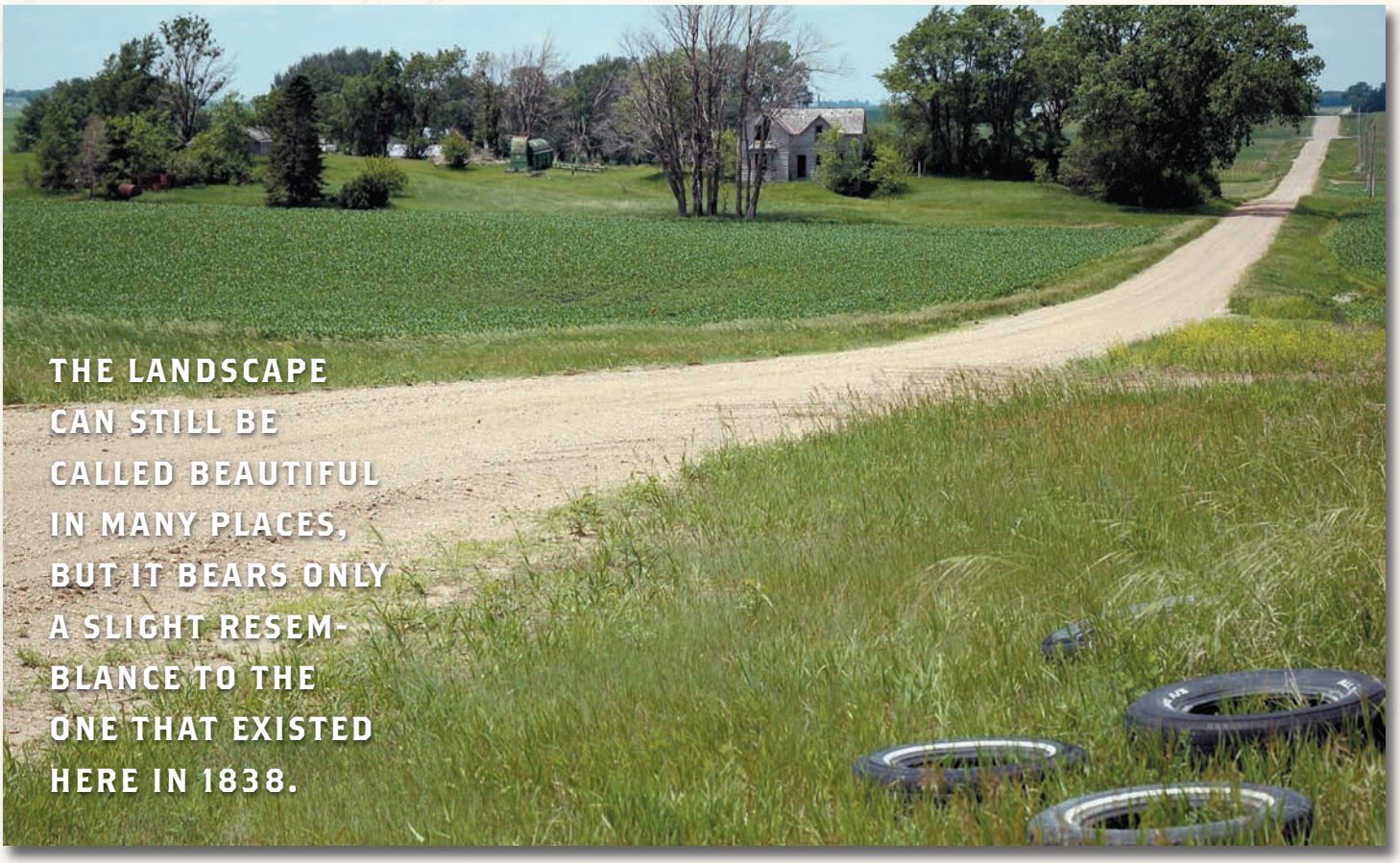
"Working with the students was the best part of the project," Ojala says. "In the beginning I had my own preconceptions, but I didn't want to direct them too much and instead let them discover things for themselves. You give something up that way, but you can't predict the insight and creativity you get in return."

Huncosky echoes the sentiment. "I was a fun way to work with the professors. They were there to guide us, but they expected us to make decisions and do things on our own. We weren't just their assistants," she says.

Fedorowicz and Olson, for example, had to repair a leaky boat they used while testing the water clarity of different lakes. At specified points, they would take a reading known as a *secchi depth* by lowering a black-and-white "secchi" disk and measuring the depth where it vanished, a reading which, over time, can be used to measure changes in water quality. Getting an accurate reading was a challenge, given the unpredictable wind and weather on the lakes.

Although the work was demanding and sometimes unpredictable, it was just what the students were looking for. "It was one of the reasons I signed up for the project," says Olson. "I knew I wasn't going to be in a lab all summer synthesizing a molecule."

The students also traveled to Washington, D.C., where they worked at the Smithsonian Archive and the Library of Congress and searched the National Herbarium in the Smithsonian American Museum of Natural History for the plant specimens taken by the German botanist Charles Geyer. All of Geyer's specimens at some point had disappeared; some believed that the crate containing them had fallen into the Mississippi River, others thought that they were lost on the overland journey to Washington, and still others believed they were sitting undiscovered in the national archives.



THE LANDSCAPE CAN STILL BE CALLED BEAUTIFUL IN MANY PLACES, BUT IT BEARS ONLY A SLIGHT RESEMBLANCE TO THE ONE THAT EXISTED HERE IN 1838.

"It was like a large-scale treasure hunt," Huncosky says. "Charles [Umbanhowar] would tell us to search for a particular genus, and we might go through five or six cabinets before we found anything with a Nicollet label on it." By the end of the trip the students had found eight of the nearly 400 specimens that Geyer had taken on the trip to Spirit Lake and another 67 specimens from an 1839 expedition that Nicollet led up the Missouri River and then on to Devil's Lake in North Dakota.

But the high point of the project was the three-day trip from Northfield to Spirit Lake. The group loaded all their testing equipment, computers, digital cameras and a GPS device into a college van, piled inside it, and hit the road. They used plat maps (showing divisions of property on a piece of land) to pinpoint Nicollet's route through the countryside and followed the township roads that crossed over it. Figuring out the route was difficult, but they were able to find many of the locations Nicollet described, especially his campsites and river crossings.

"The plat maps of the 1850s divided the country into one-mile squares. We couldn't travel on Nicollet's diagonal down to Spirit Lake," says Ojala. "We had to make a lot of 90 degree turns and zigzag our way down on county roads. Dakota names for many places were dropped by that time. It was divided up for settlement and the squares prefigured the roads that would eventually crisscross the region."

Many of Nicollet's sketch maps turned out to be surprisingly accurate. Although he did use the standard surveying equipment of the time, the maps were largely based on astronomical observations he made from campsites every night.

"In one place he refers to these 'pretty little hills,'" Umbanhowar says, "and we found them. We drove over this rise, just the way he described it, and, sure enough, there were these pretty little hills."

Landscapes Lost

Although much of the data gathered on the expedition is still undergoing analysis, it's apparent that Minnesota has changed dramatically over the past 150 years.

"In his journal Nicollet describes the water as being clear, and one has to assume, drinkable, but today the water is a lot murkier," says Jackson. "It's hard to find a lake in southern Minnesota with a good secchi depth. We found a lot of suspended material, algae, microorganisms and solids from development and agriculture."

The water also has a high concentration of nitrogen and phosphorous from fertilizers. "It makes the algae grow rapidly," Jackson explains, "but when it gets too thick it dies off and sinks to the bottom. The bacteria that feed on it use up all the oxygen, and as a result the fish die from oxygen deprivation."

The researchers also found traces of caffeine in the water, which enters from caffeinated drinks being poured down drains, as well as through human waste. More importantly, caffeine serves as a marker for many pharmaceuticals and personal care products. "If you find caffeine in the water, you'll find the latter, too," says Jackson.

Charcoal in the lake sediments record the common occurrence of fire in the landscape Nicollet traveled through, says Umbanhowar. The sediments also document a significant increase in phosphorus inputs into lakes following the large-scale establishment of Euro-American agriculture no more than 20 years after Nicollet's trip.

Although the scientific data still needs more scrutiny, the photographic evidence is undeniable: the landscape of 1838 no longer exists.

Waving fields of prairie grass have been replaced by row after row of corn and soybeans, and Nicollet's open sweeps of land are now the familiar checkerboard of Midwestern farms. Meanwhile, the few surviving native plants struggle against invasive species such as European smooth brome and leafy spurge. Ancient oaks have been cut down and replaced by elm and basswood. Hills have been mined for sand and gravel. Ditches have been dug and lakes drained to produce more usable land. Highways and roads crisscross the countryside while a matching highway of telephone and high-voltage wires runs overhead.

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ABOVE: Student photographers Amanda Rubasch '09 (with camera) and Kate Huber '09 documenting plant specimens.
LEFT: Allie Pyan '09 (left) and Becky Huncosky '08 at the National Herbarium in the Smithsonian's National Museum of Natural History in Washington, D.C.

LANDSCAPES LOST [CONTINUED FROM PAGE 47]

The landscape that remains can still be called beautiful in many places, but it bears only a slight resemblance to the one that existed in 1838. Even some of the lakes that Nicollet and Geyer described have vanished.

"He describes Munger and Manyaska lakes as having beautiful water and white cliffs, but today you can't find these lakes," says Jackson. "They were drained for agriculture."

You can, however, see their shorelines on satellite photos, now only swales surrounded by trees. You can also see the drainage ditches cutting through the lakebeds, which keep them from filling back up. More obviously gone are the Dakota Sioux and Ojibwa people and cultures that once existed in southern Minnesota.

"Nicollet was very interested in the Native Americans, and they, in turn, held him in high regard," Umbanhowar says. But Nicollet knew that once European settlers moved into the area, the land would be seen as a resource and the native inhabitants would be forced out. "He was well aware that he was recording things for posterity."

An Uncertain Future

While the plains of 1838 can't be brought back to life, the issue remains of what to do with the future.

"We have a lot of options for minimizing the impact we have on the land, but we're not using them," Jackson says. "For example, we could use no-till or low-till practices to grow traditional row-crops and pursue grasses or perennial crops for biomass production. And our farmland no longer has natural buffers along rivers and roadways. We plant right up to the ditches, so all this material run into the lakes and streams. Why couldn't we leave a 50- or 60-foot buffer to protect them?"

Umbanhowar agrees with Jackson. "Nobody imagines that we can do away with agriculture and convert everything back to prairie grass," he says, "but we do wonder why we couldn't have preserved just a little bit more. What if one out of every 100 sections of land had been kept in its natural state? Then we could celebrate the landscape we have today and still appreciate the landscape we had in 1838."

The truth is, relatively little is being done to protect the small amount of natural landscape remaining in southern Minnesota. But, it doesn't have to stay that way. Many of the students reflected that the project had taught them how much our landscapes change and that nothing stays the same forever.

"We interact with our landscape on a daily basis," says Kate Huber, who has a self-designed major in ecologically sustainable community design. "That means we can change it if we want to. It's really a matter of setting priorities, coming up with creative solutions, and finding the right incentives."

The same hope was expressed by nearly everyone who worked on the Nicollet project: that it would make people think about how we use our land and what we can do to improve it. And so far, the group's efforts seem to have done just that.

stolaf.edu/academics/nicollet

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