Life in the Landscape

Scientists of the Minnesota Biological Survey collect data and specimens—and memories.

Photography by Layne Kennedy

In 1872, not long after statehood, the Legislature enacted Minnesota's first natural history survey. Its purpose: to scientifically document the state's geology and native plants and animals. Many surveys were sporadically conducted over the next century.

By the 1980s, a century of population growth and accelerating landscape change had critically diminished and altered many of the state's ecosystems. Conservation scientists recognized this and proposed to build on the foundation of earlier surveys, using a more modern and systematic approach. In 1987, jump-started by state funding recommended by the Legislative Commission on Minnesota Resources and matching funds from The Nature Conservancy, the Department of Natural Resources launched the Minnesota Biological Survey to document the condition of native prairies, forests, and wetlands.

Since then, several hundred survey biologists and ecologists have

Entomologist Crystal Boyd gathers bee specimens from a pan trap, which mimics a tall prairie flower. The fluorescent yellow bowl attracts bees, which become trapped in soapy water.

surveyed the entire state. The Minnesota Biological Survey has developed a record of the complex, rich natural history of Minnesota's landscapes and native plants and animals over the past 25 years. Information collected by biologists is mapped, deposited in electronic databases and museum collections, and published in reports and books. This information has guided conservation in the state, from forest certification and prairie management to additions to state and county parks and natural area networks.

Along with data and specimens, the biologists who work for the survey collect detailed memories of the land and people they meet. They can describe a hilltop in Big Stone County where many years ago they observed a rare violet, a talus slope in the northeastern Border Lakes region where they once recorded a rock vole, or a resting spot beside a prairie boulder where a flock of white pelicans circled above. They can recommend a favorite café in any part of the state and reminisce about kind landowners who share the history of their farms and woodlots, along with "a little lunch." Their days in the field can be long, tiring, hot, and buggy, but they are almost always memorable. When asked what a typical day in the field is like, one ecologist says simply, "There is no typical field day."

Survey scientists gather information beforehand about the things they study, developing a knowledge base about where, when, and how to best search for a particular plant or animal. Their encounters with what they predict are satisfying. For example, a botanist found *Crassula aquatica*, a rare plant last recorded in southwestern Minnesota in 1945. Finding it in ephemeral rock pools in southwestern prairie, he said, "I *knew* that Sioux quartzite outcrops after a recent rain might provide perfect pools for water pygmyweed."

Unexpected discoveries can result in reevaluation of assumptions, survey timing, or techniques. A colleague's discovery of a new location of hidden-fruit bladderwort (*Utricularia geminiscapa*) prompted a botanist to search successfully for the rare aquatic plant 100 miles west.

A scientist's understanding of the landscape grows with experience and with awareness of the effect of environmental changes, from variability in climate to invasive species. To evaluate a hardwood forest, one ecologist recently revisited a site well known to him from the past. He noted that the "ancient cycles of life and death seem to continue." But then he added, "until the earthworms shake things up," as these nonnative organisms spread, reworking soils and altering forest plant populations.

The following essays offer glimpses into the workdays and lives of the biologists and ecologists who contribute to the Minnesota Biological Survey. Though diverse in personality, the scientists share attributes of careful observation and record keeping, as well as stamina and adaptability. Regardless of age, they are curious and constantly learning. Veteran biologists work alongside younger biologists, who bring fresh energy, enthusiasm, and approaches. New survey scientists return from field ventures with that distinctive gleam in their eye as they recount their discoveries. Their life exploring Minnesota's landscape has just begun.

—Carmen Converse, MBS supervisor

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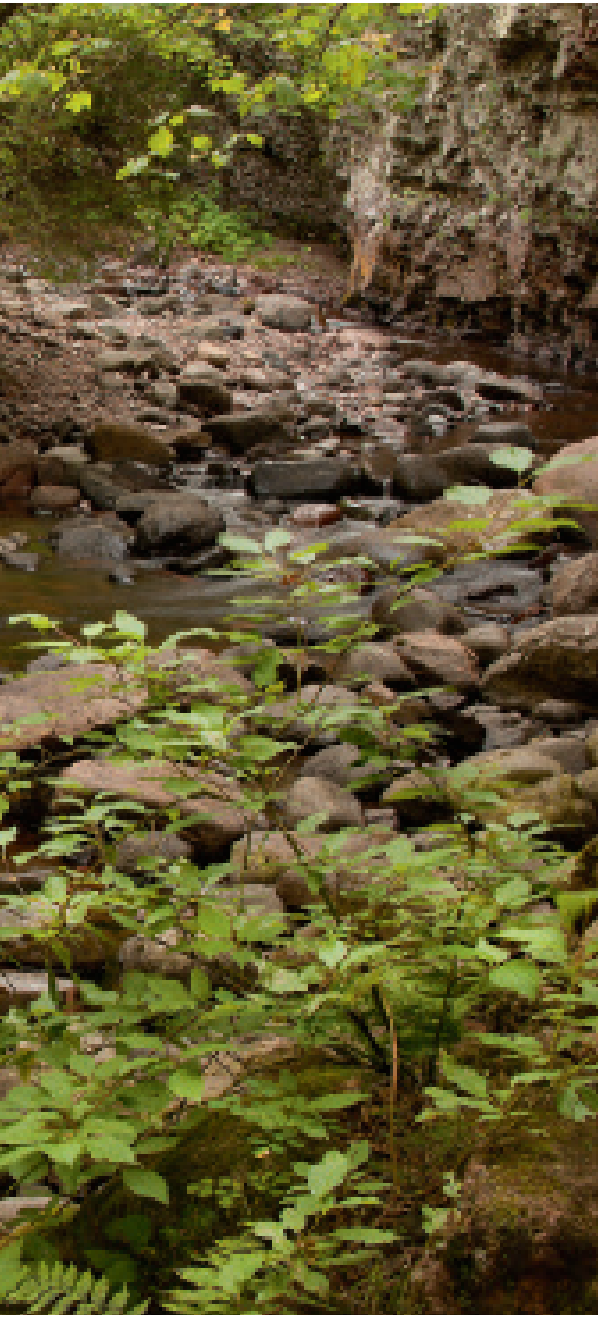
With a 20X hand lens, plant ecologist-botanist Chel Anderson examines the fine features of a long beech fern. Though this common fern can be distinguished without magnification, identifying many plants, especially mosses, requires learning and looking for features that are too small to see with the naked eye.

Flash of Serendipity

By Chel Anderson

A 21-year-old with intense curiosity about all things natural, I landed on Lake Superior's North Shore in 1974 to begin my first real job in natural resources. A couple of years into my exploration of my new home territory, I met a woman doing graduate work on rare plants—a suite of species not included in field guides. I eagerly enlisted as another pair of eyes in the woods and on the water looking for the seldom-seen plants. Among the most surprising to me was a dung moss, *Splachnum rubrum*, also known as umbrella moss or parasol moss. I was intrigued by her brief description of tiny plants whose ephemeral lives depended on a chance meeting with moose "gems." I couldn't wait to find it. But I didn't yet fully appreciate the role serendipity often plays in the pursuit of wild things.

Twenty-six years and hundreds of wetlands with thousands of moose gem piles later, my search ended on a sunny, warm June day, deep in an undisturbed area of boreal forests and wetlands in Superior National Forest. Accompanied by a host of blood-seeking flies, I high-stepped through deep sphagnum moss hummocks, crisscrossed by a moose trail or two and dotted with stunted black spruce. I scanned plants, recording herbs and sedges harbored in sunny openings between dense patches of blooming Labrador tea, pale laurel, leatherleaf, and bog rosemary. I admired the exquisite forms and patterns of this familiar community. Searching with an ingrained rhythm and a specific kind of focus—open to seeing everything but especially attentive to anything unfamiliar—I gazed slowly from left to right and back again. With an involuntary snap, my head and eyes returned to the right, attention snagged by something I couldn't describe and couldn't immediately find again.



Chel Anderson records GPS location and details of the native plant composition along the Kadunce River.

"What was it? Was it anything?" I wondered, visually groping around, unmoving lest the view change. Suddenly, through shrub branches and a few inches above the moss carpet, I spotted them: Dime-sized, deep-pink to pale-pink parasols shimmered in dappled light near the base of a hummock. My delight erupted in a series of hoots, whoops, and laughter, even as I wondered if it was a dream. Feeling a mix of awe, gratitude, joy, and reverence I lay down, my face at their level. Carefully parting the surrounding sphagnum, I found the hidden, delicate leafy stems and essential decaying moose gems from which they grew—gorgeous, absurd, sublime, improbable.

Before my discovery that day, I had no conscious thoughts of *Splachnum rubrum* as I walked and watched. A couple of descriptive sentences and a line drawing were all I had to go on for a search image. But by virtue of showing up with a human mind evolved to notice and pay attention to its surroundings, I was poised to see pink parasols, no matter how long it took for a flash of serendipity to give me a chance and a deeply satisfying experience.

Bees collected in soapy water-filled pan traps are bagged, labeled, and stored for identification during the winter.

Wild Prairie Winds

By Crystal Boyd

As the newest member of MBS, I had my most memorable experience on my first day in the field. On May 14, 2013, I traveled to Chippewa Prairie in Lac qui Parle County to sample native bees. Native bees face many of the same challenges as honeybees do, so my experiments this summer would help MBS to monitor them in the future. If my protocols worked during this initial trial, I would use them all summer long. If they failed, I'd need to quickly scramble to find protocols that worked at Chippewa Prairie.

It was sweltering hot when I arrived, with temperatures of 90 degrees and the sun blazing in clear skies. I set out for my first sampling area in a patch of recently burned prairie. The land was flat, crispy, and black, with tiny stubs of green grass just beginning to grow. I laid out my pan traps, which were colorful plastic bowls filled with soapy water. Bees attracted by the color would get stuck in the water until I collected them the next day. But would the bowls still be here when I returned? It was windy—so windy—and the gusts increased all afternoon. I worried that the bowls would scatter like milkweed seeds on the wild prairie winds.

Leaving the burned section, I headed into tall grass. Pale lavender pasqueflowers whipped all around, withstanding the hot gusts. I peered over a bluff and into a wetland below. Dry cattails stretched like a straw-colored river into Lac qui Parle, and sunny marsh marigolds seemed to smile up at me. It was a moment of peace and beauty.

The next day, however, I returned with a sense of concern. The wind had reached speeds as high as 35 miles per hour, and it would provide

Using a sweep net, entomologist Crystal Boyd collects flying insects that aren't attracted to pan traps and big bees that are strong enough to escape soapy water.

decisive evidence about the need to modify the traps. I let out a sigh of relief when I saw the red, orange, and yellow bowls dotting the black ground just where I'd left them.

I began collecting the specimens, and a large queen bumblebee flew heavily in my direction. She drew closer and closer—and landed on my side! My bright blue T-shirt must have looked like a large, nutritious flower. She tested for nectar with her long, black tongue and, after a few tries, flew away toward sweeter rewards.

It felt like a special greeting for a bee researcher to be welcomed by a queen. I thought about the new beginnings for Chippewa Prairie that seemed promising in so many ways: the recent burn, the early-season pasqueflower, and the gravid native bees. These changes echoed fresh beginnings in my own life, as a newcomer to MBS. My first day with Chippewa Prairie seemed like the initial meeting of two parties soon to become fast friends. May the future hold many more memories just as dear.

Ornithologist Steve Stucker raises his battered clipboard and binoculars in a practiced motion to identify a distant bird at Roseau River Wildlife Management Area. During point counts, Stucker stands in one place for five minutes and counts all the birds that he can identify by sight or song.

Birds of the Border

By Steve Stucker

My first look at the Roseau River fen was late in September 1990, during my first year of MBS bird surveys. This rich fen—a wetland dominated by fine-leaved sedges growing on a deep layer of peat—extends nearly 4 miles northward to the Manitoba border and more than 8 miles east to west. Uninterrupted by trees or any shrubs over waist height, the far horizon is lost in the shimmering, hazy distance.

This remote site is on the Roseau River Wildlife Management Area at the edge of the aspen parkland region, a transition zone between prairie and coniferous forest. Extending from northwestern Minnesota north and west through the prairie provinces of Canada, aspen parkland is characterized by a mix of prairie, open wetlands, aspen groves, and oak savanna on nearly level terrain.

Returning the following May, three of us set off toward the Canadian bor-

der to investigate the fingers of black spruce and tamarack extending out of Manitoba. As we trudged across the spongy ground, a migrating peregrine falcon came sailing low overhead. When we finally reached the edges of the lowland conifers after a 2-mile hike, we spotted a great gray owl.

Back a third time in early June, MBS bird-survey technician Karl Bardon and I were heading out before sunrise to conduct point counts (an observer stands in one spot for a five-minute interval, counting all birds seen or heard) and search for rare birds specializing in sedge habitat, such as yellow rail, Wilson's phalarope, and Nelson's sparrow. A deep, water-filled ditch separated the dike's narrow, two-track trail from the fen. We hauled a canoe off our truck and down the bank, put it in the water, and paddled 3 feet to the other side. As we stepped onto the fen, water poured off it and into the ditch in a vast sheet.

I headed west, following a compass bearing and counting my paces so I could reconstruct my path. As this was before the time of GPS units, I had to determine my position by triangulation, sighting to three different points with my compass—the truck parked at the dike corner one-half mile to the southeast, a clump of tamarack 2 miles to the north, a clump of trees several miles to the southwest.

The broad-winged hawk is a common nesting species in the aspen parkland region.

The odd clicking calls of yellow rails bounced across the sedges. A Nelson's sparrow sang softly from a small clump of thick vegetation, and sandhill cranes bugled in the distance. The yellow rail, a nocturnal, robin-sized, quite reclusive bird, remains on the ground and nests there under a canopy of dead sedges. Rarely observed, this species is highly sought-after by birders. Unlike most other songbirds, Nelson's sparrow frequently sings at night. This small, secretive songbird prefers the same sedge habitat as the yellow rail. It builds a cup nest on the ground in a clump of grass or sedge. While not overly secretive or rare, the 4-foot-tall sandhill crane prefers to nest in remote wetland areas. Its loud calls can be heard for miles.

Circling far to the north, I sloshed along in my knee-high rubber boots, accompanied by a small cloud of mosquitoes and deer flies, which typically increase as morning progresses and bird activity dies down. Longing for shade as the sun climbed higher, I headed for a distant patch of tamarack and black spruce. There I sat down on a small tamarack log for a snack and a drink of water. After freshening up with a good dose of insect repellent, I began the long slog back to the truck.

Revisiting the fen late at night, we watched fireflies flash in numbers seeming to mirror the stars above, as the endless pebblelike clicks of yellow rails skipped across the sedges and Nelson's sparrows gasped their wheezing songs. These amazingly wild expanses of native vegetation make the aspen parkland region my favorite part of Minnesota.

In the summer field station at Red Lake WMA, Erika Rowe and Norm Aaseng, both plant ecologist-botanists, use a microscope to identify mosses collected in the peatlands.

On the Water Track

By Norm Aaseng

One of my favorite places in Minnesota is a large, sedgy, island-dotted wetland north of Upper Red Lake in the interior of the Red Lake Peatland Scientific and Natural Area. It is vast and wild, uncrossed by roads, as remote as any place in Minnesota. The only easy access is by helicopter.

In August 2011, I flew in to the water track for the second time in my life. My colleague Erika Rowe and I helicoptered from the town of Waskish, 25 miles to the southeast. We wanted an on-the-ground look at the distinctive patterns (seen on aerial photos) that are created by sedges, shrubs, stunted spruce, and tamarack islands, which had developed over several thousand years under the influence of slow-moving water that flows through the peat. The area was also prime habitat for several rare plant species on our radar.

Approaching by air from the east, we saw an armada of small teardrop islands of tamarack advancing upstream into the horizon across a wavelike grassy plain. Alternating linear pools and vegetated ridges made up the plain. Into the distance, the islands diminished until just grasses and low shrubs remained. Light glinted off the water surface—evidence that the ground was waterlogged.

The pilot flew us to the midpoint of the water track and began to descend. Patches of color emerged as we flew lower. We made out orange-yellow circles of what we thought was some kind of rush or sedge and amoebalike bright-green patches, possibly shrubs, amid gray- and yellow-green swaths of wiregrass sedges. The pilot found the firmest place he could land and dropped us off. Before his return, we had several hours to cover the survey area.

We quickly found the rare linear-leaved sundew (*Drosera linearis*) and determined that the orange-yellow patches were another rare plant, sooty-leaved beak-rush (*Rhynchospora fusca*). We kept our heads down, probing the vegetation, recording plant species, navigating as best we could through quaking peat, sedge hummocks, and pools of water up to our knees.

When we realized it was time to return to our pickup spot, I paused to look at the horizon and remembered my first visit to the peatland in 1984. I

Norm Aaseng and Erika Rowe enter a GPS location for establishing a vegetation plot in a northern peatland.

had flown in with several other people to get a look at the water track, a candidate for inclusion in Minnesota's network of scientific and natural areas. We had reached the end of our visit that day, and the helicopter had already made one trip back to Waskish, carrying out everyone but me.

I stood alone in a sea of grass. Small clumps of trees, scattered here and there, receded into the distance; otherwise the land was flat, open, and grassy as far as I could see. Far off to the west, I made out a thin, dark line—the beginning of a tamarack and black-spruce forest that marked the end of the water track, maybe 10 miles away. No sounds, other than the wind rippling through the grasses in waves. No signs of anything human. I had no idea before then that a place like this existed in Minnesota. Living daily surrounded by buildings, power lines, roads, cropland, and forests, I seldom have a chance to see a horizon unmarked by human objects. It is easy to forget the vastness of the water-track landscape.

Standing with Erika on my return visit, waiting for the helicopter, I marveled once again that such a place still exists.

Leaves of Iowa golden saxifrage are on a map showing the species' distribution in Minnesota. This plant is rarely more than 3 inches tall.

Cold Rock and Electric Wire

By Michael Lee

Now approaching 20 field seasons, I find that marking one day or discovery that stands above the rest becomes more difficult with each passing year. One that comes to mind is a day in a canoe with fellow plant ecologist-botanist Scott Zager on the South Branch of the Root River in southeastern Minnesota bluff country. It was my second summer and Scott's third with the Minnesota Biological Survey.

We were staying in a big, old farmhouse rented by MBS in Fillmore County. At dawn I was awakened by the sound of the hard-rock band AC/DC blasting through the TV speaker. Scott had rented the videotape of a live AC/DC concert from a local gas station the evening before. This got my heart pumping, and the events of the day kept it going strong until dark.

Our plan was similar to most days afield—to search for rare plants and assess the ecological condition of the landscape, in this case, the steep, forested bluffs and bottomland along several miles of river. That summer many of the county's small, normally shallow streams had been swollen enough by heavy rains to allow passage of Scott's whitewater canoe. Traveling by canoe, we could cover more area in less time than we could by hiking, the typical access method for MBS field ecologists.

As we had on several recent trips on other fast, winding stretches, we encountered barbed wire and electric fences across the water, usually just as we rounded a bend at breakneck speed. It was truly a memorable experience to be accosted by such a barrier. Scott received the worst of the beating as he was in the stern. In the bow I was usually able to jump out, pulling the canoe to shore, but the swift current often carried the stern around and into the fence before Scott could get out. Luckily, a few scrapes, scratches, bruises, and wet clothing and gear were as bad as we ever experienced. Also, I think I was tougher back then in my late 20s.

What stood out that day was the discovery of the state's largest algific (cold air) plant community and largest population of the endangered Iowa golden saxifrage (*Chrysosplenium iowense*). This rare plant grows only on algific talus slopes, where cold air and water from underground ice caves emerge through rich, rocky soil and limestone talus on north-facing slopes. The ice caves are fed by precipitation entering through blufftop sinkholes and then freezing in winter.

Rare and localized, algific slopes are home to a number of plant spe-

Plant ecologist-botanist Michael Lee scans a steep north-facing slope along the South Branch of the Root River.

cies that occur much farther north and to several species of land snail that are understood to be ice-age relicts present nowhere else. Iowa golden saxifrage is a small member of the Pleistocene flora that dominated the blufflands 15,000 years ago when the climate was much colder and glaciers covered most of the surrounding region. Bluff-country populations of Iowa golden saxifrage are disjunct by hundreds of miles from the nearest ones in boreal Manitoba. We also documented populations of other uncommon plants in cold microhabitats in southeastern Minnesota.

Like most days afield, this one was long. It began early, and we were not strapping the canoe back onto the vehicle until after the sun had gone down. We were hungry, wet from intermittent rain, bruised from fence entanglements, tired from paddling a half-dozen miles and climbing steep bluffs many times. But we were exhilarated by our discoveries. We carried steaming bags full of plant specimens, many pages of data, and a greater understanding of some of the state's rarest plants. The complexity and huge size of the newly found algific plant community—maybe 10 acres, compared with most, which are less than an acre—helped us better understand how sinkholes and ice caves can have a dramatic influence on vegetation. All good stuff for an ecologist.