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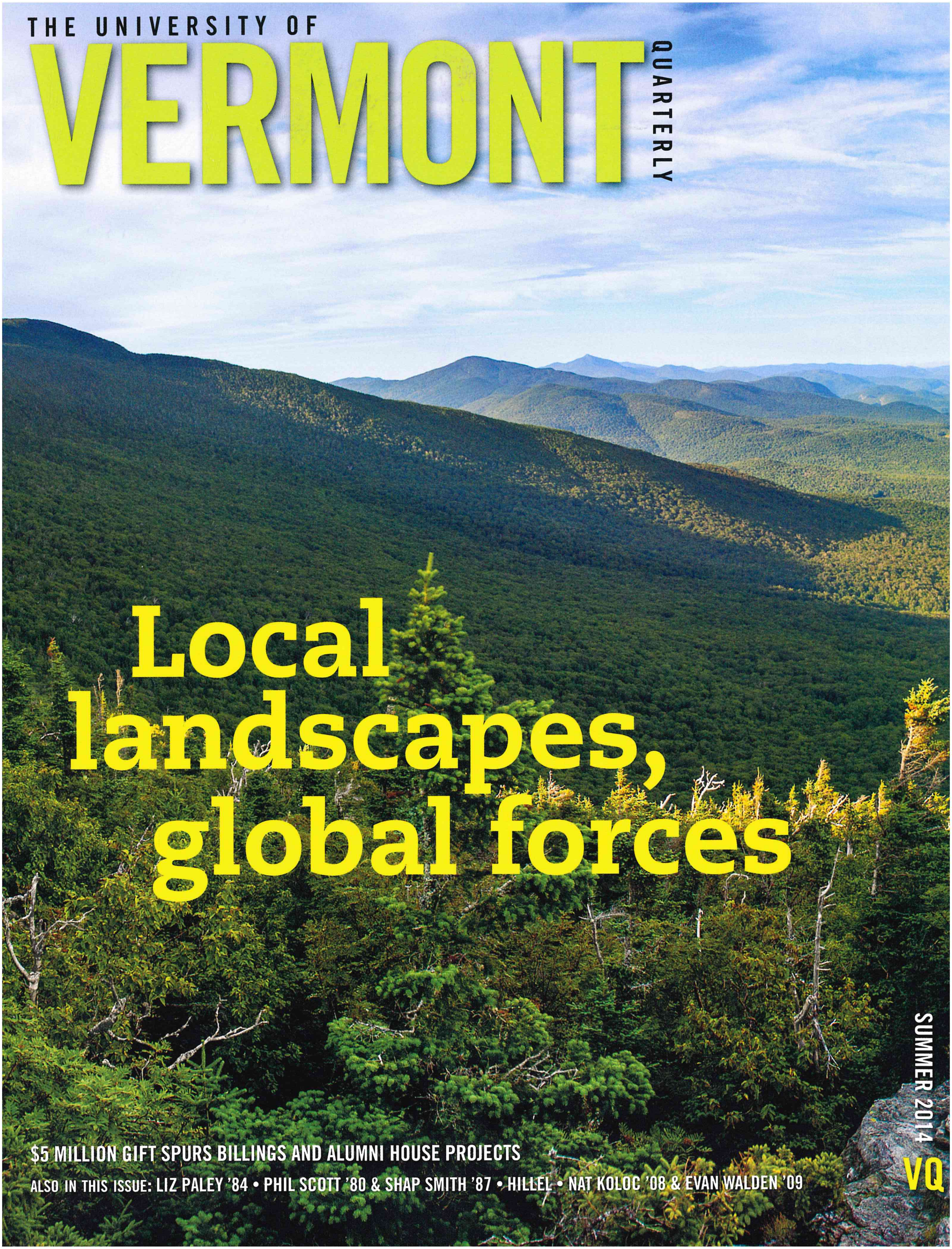


Local landscapes, global forces

$5 MILLION GIFT SPURS BILLINGS AND ALUMNI HOUSE PROJECTS

ALSO IN THIS ISSUE: LIZ PALEY '84 • PHIL SCOTT '80 & SHAP SMITH '87 • HILLEL • NAT KOLOC '08 & EVAN WALDEN '09

SUMMER 2014

VQ

Mansfield to Champlain

Exploring the impacts of climate change

by Joshua Brown

photography by Sally McCay

FOR TWO MILLION YEARS, Vermont was ruled by ice. Glaciers would surge south, retreat north. Each time the ice melted, a raw landscape of scoured bedrock would be revealed. And, each time, life would return.

About twenty-five thousand years ago, the ice sheet began its most recent pullback, leaving behind the bones of today's landscape: the blunt ridge of Mount Mansfield, the signature profile of Camel's Hump, and a vast puddle of meltwater that would surge and subside—sometimes saltwater, sometimes fresh—to become our Lake Champlain.

As they had more than a dozen times in what geologists call this "recent" ice age, species of plants and animals would blow, blunder, crawl, fly, swim, and hitchhike back to Vermont. Bacteria, lichens, grasses, sedges, brave birds, grazing woolly mammoths, shrubby willows, and whales wending down from the Saint Lawrence River—all would make this place home. Trees were taking root by eleven thousand years ago, and if you were able to stand in a Vermont forest four thousand years ago it would have a familiar air with birch, hemlock, beech, and sugar maple.

Earth's climate has warmed and cooled many times. Millions of species have evolved, spread, and gone extinct. But over the last two centuries, with the rise of an extraordinarily tenacious and sometimes-clever member of the ape family, *Homo sapiens*, the rates of climate change and of extinction have spiked.

"As Vermont's climate changes to Virginia's climate over the next fifty years, what will species do?" wonders UVM biologist Sara Helms Cahan.

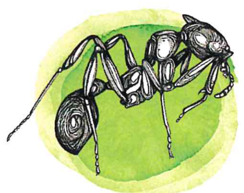
It's a good question. Despite centuries of exploration, most of Earth's life forms are poorly understood or simply unknown. Even here, in the much-loved span from the waters of Champlain to the gentle Green Mountains, many wild plants and animals remain mysterious. And none are immune to the global forces that remake local landscapes.

In Vermont, the average temperature has risen almost two degrees Fahrenheit since 1970. And, unless we stop spewing carbon dioxide, the Intergovernmental Panel on Climate Change projects another four to eight degrees of global warming before the year 2100—on a path to warming far beyond what has been experienced since humans evolved.

Look back not two million years, but more than sixty-five million years—to the hothouse age of the dinosaurs—to find a time when global temperatures were rising this fast. Ditto for extinction. Not since the asteroid strike that spelled doom for T. rex and seventy-five percent of all of life, were species blinking out by the truckload, like they are today.

Sara Helms Cahan knows all of this—and considers what's next. She is one of a diverse group of researchers from across the university who have cultivated a kind of useful double vision. They're looking closely in nearby places—like Missisquoi Bay, Addison County hayfields, and Breadloaf Mountain—shining a light onto the manners and mysteries of individual plants and animals. They're simply curious, as UVM fisheries biologist Ellen Marsden puts it, "about the many lives out there that we don't own or understand."

And through the top of their glasses these scientists keep an eye on a more distant horizon. They wonder which species can persist or be restored in a hotter, wetter Vermont—and they're gathering insights about how the ever-shifting commotion and competition of other life-forms add up within the ecosystems that allow human civilization. In this issue of *VQ*, we step into the field with them—from mountainside to lake bottom—for a look into their work, its questions, and its answers.



Ants

A FEW MILES FROM CAMPUS, John Stanton-Geddes and Andrew Nguyen wander under some hemlock trees in UVM's East Woods, kicking rotting logs. It's a warm, but not hot, July morning. A fine day for finding ants.

"I look by kicking," says Nguyen, taking aim at a mossy lump. "Kick and then they come out and you grab them." In this case, "them" is a common woodland ant species called *Aphaenogaster rudis.*

Nguyen is a doctoral student and Stanton-Geddes a post-doc, both studying with UVM biology professors Sara Helms Cahan, Nick Gotelli, and Bryan Ballif. These scientists want to know what will happen to these ants—and other populations like them from Maine to Georgia—as the climate warms.

Move, sweat, or die—these are three standard paths that many ecologists have thought species could take when dealing with rapid climate change. In other words, it's possible that the ants will be able to get to cooler terrain by migrating north or uphill. Or they may be able to persist in place by making short-term physiological changes—"essentially just toughing it out," says Helms Cahan—a bit like we deal with heat by sweating. Or local populations could go extinct.

"But this is not taking an evolutionary perspective," says Nick Gotelli. A fourth and little-studied path is what some scientists are calling "evolutionary rescue." That is to say, large populations of ants could have a trick up their tiny sleeves: latent genetic variation that may have evolved in response to past climate change. As the climate heats up, those individual ants with better biological heat-coping mechanisms will become more common and cold-tolerant variants will become more rare, allowing the population to adapt. "These populations could stay in place," Gotelli explains, "but genetically will change." The deep time etched in their DNA will have saved them.

The ants being collected in these woods and other forests down to North Carolina, are being used in experiments to "figure out how much adaptive potential *Aphaenogaster* actually has," Stanton-Geddes says. This morning he simply needs to find some. "Nobody home here," he says, gently putting a wet log back in place. Then he pokes a trowel into another log. "Ah, look at this," he says, prying back a chunk of rotting wood that erupts with glittering black bodies.

"Here she is!" shouts Nguyen, chasing a larger ant with tweezers. "Here's the queen. She's trying to hide, but she has a big butt." They pop the animal into a clear plastic bottle, and scoop a swarm of worker ants into a Tupperware.

Later, I'm sitting in a windowless lab of Marsh Life Science with Gotelli, Stanton-Geddes, and Nguyen. Here, some of these ants are exposed to high and low temperatures and other stressors, like limited water. Others get shipped to North Carolina and the Harvard Forest where they are put in warming chambers with ants from other regions, to see how they respond to long-term exposure to temperatures they're likely to face in coming decades. Then the ants' genetic material is extracted at UVM to explore their underlying molecular machinery, looking for clues like the production of "heat shock" proteins that could allow these ants to weather new weather.

Their team, sponsored by the National Science Foundation and working with partners at three other universities, aims to have a forecasting model of where *Aphaenogaster rudis*, and related species, are likely to survive. But I want them to clarify something more basic: Why care about individual species at all? Why, as we teeter toward climate catastrophe, would a policymaker pay attention to ants?

Well, for one thing, without ants, "Vermont would be knee-deep in dead insects," Gotelli says. In New England, ants are nature's diligent undertakers and creators of soil. They build about an inch of new topsoil every two-hundred-fifty years. And *Aphaenogaster* is a key forest engineer, dispersing seeds including those of Vermont's beloved spring ephemerals, wildflowers like trillium and bloodroot.

"Ultimately, landscape-scale responses are happening at the species level," Gotelli says. "I don't see how we're going to understand or realistically forecast what's going on at the landscape scale if we don't understand the elements of that landscape." Stanton-Geddes puts it this way: "The species is the biological unit that matters. It would be like talking about economics and ignoring the fact that dollars and pennies exist."

Illustrations by Sarah Rutherford '06

JOSHUA BROWN

Jacob's Ladder

THE NATURAL TURNPIKE is an old stagecoach road that winds through the Green Mountains from Ripton to South Lincoln. Plunge into the forest off this dirt track, and, at about 2,000 feet of elevation, the trees give way to some wet meadows open to the sky. "It's not so good for walking—but moose love it," says Laura Hill Bermingham G'08. In this obscure and lovely place lives an obscure and lovely plant called Appalachian Jacob's ladder. If it's near the June solstice, swat off the mosquitos, look around for a mat of distinctive spinachy green leaves, admire the Jacob's ladder's newly opened, purple, bell-shaped flowers—and contemplate extinction.

"For my graduate work, I studied these plants in nine places, which was a good representation of the populations in Vermont," Bermingham says. Over five years she built a demographic model that projected how these populations might change. What she discovered was "pretty dire," she says, "many of the populations are expected to be driven to extinction over fifty to a hundred years." And that doesn't account for climate change.

What's pushing this wetland plant toward the brink? Like most things in nature, it's not just one thing. This plant is rare and patchy throughout its range from West Virginia to southern Quebec and may be headed for oblivion because of inbreeding problems—without any push from people. More than ninety-nine percent of all species went extinct before humans arrived to name and mourn them. But in some places, like New Jersey, the plant has been eliminated by habitat destruction, road building, ATVs, degraded water quality, and other assaults—without too many tears shed.

Bermingham's first study—and then a later one for the U.S. Forest Service—showed that in Vermont the plants' biggest threat is the way woodlands and wildlife are managed. The closing of the canopy, as regenerating forests mature, reduces sunlight above these plants; "it doesn't compete well with trees," Bermingham says. And the main culprit is another hoofed critter, besides moose, that loves to snack in a wet forested meadow: white-tailed deer. There is growing scientific evidence that burgeoning populations of browsing deer—no longer controlled by now-extirpated wolves and mountain lions—are a major threat to the health of eastern forests.

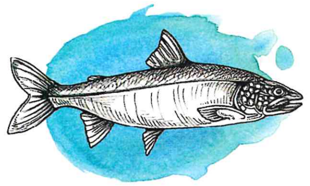
Speaking to the plant's possible extinction, Bermingham says, "You can't think about it in isolation. It's part of a functioning wetland complex in the Green Mountains—wetlands provide a huge ecosystem service to humans—and their function is built from thousands of species interacting."

But forecasts may not be destiny. So on a steel-gray February morning, on the first floor of Jeffords Hall, Bermingham, a lecturer in UVM's department of plant biology, is gently transplanting small shoots of Appalachian Jacob's ladder. This summer, she and undergraduate Madeleine Hassett '15 will begin an experiment growing these plants in warm gardens outside Jeffords and comparing them with wild plants in the cooler mountains—to test how Jacob's ladder may bear up under climate change.

"If we find that rising temperatures negatively affect this species, that's another dire predicament for this plant, because its dispersal is limited," says Bermingham. Research, like that done by Bermingham's colleague Brian Beckage on Camel's Hump, shows that some tree species are quickly moving upslope in the Green Mountains in response to global warming. But, with seeds that don't blow in the wind or stick to moving animals, "Jacob's ladder can't really get from here to there," she says.

Unless people move them. Among conservation biologists there is increasing consideration of a controversial practice dubbed "assisted migration": moving endangered species to habitats where they don't currently live, but where they might have lived, say, five thousand years ago, and where they might be more likely to survive in a climate-changed future.

Bermingham has re-introduced Appalachian Jacob's ladder—one of 167 plant species listed on the USDA's Natural Resource Conservation Service database as threatened and endangered in Vermont—to a wet meadow along the Natural Turnpike where it was observed in the 1980s, but wasn't present when she went back in recent years. But what about moving it farther uphill or far to the north, out of its current range? "We don't have any results to indicate that's necessary," says Bermingham, and then pauses, "—yet."



Lake Trout

JUST OFFSHORE FROM the Grand Isle ferry terminal, Ellen Marsden bobs up and down in an aluminum rowboat watching a television. It's a flaming-gold, perfect November evening. One of the lumbering ferries passes by close enough that kids wave down from on deck, but Marsden's attention is fixed to the screen. This isn't a wacky holiday outing. She's looking for lake trout.

In the stern of the rowboat, one of Marsden's graduate students, Bret Ladago G'13, and a technician, Lee Simard '12, lower a mini-submarine—a hand-built, bright-orange, square contraption mounted with a pair of GoPro cameras and several tiny propellers—into the lake. In the twilight, the monitor glows with a brightly lit stream of bubbles as "Zippy" descends to the reef below. First, we can see one fish. And then the camera pans, and there are hundreds of densely packed fish—breathtakingly beautiful, ghost-like lake trout, swimming across the screen in black and white.

Scientists identify them as *Salvelinus namaycush*. Other names include mackinaw, lake char, touladi, togue, siscowet, and paperbelly. Lake trout—a deep-water predator and popular sport fish found in many northern lakes in North America—disappeared from Lake Champlain in 1900. "It's a mystery," says Marsden, a fisheries biologist who has been studying lake trout here and on the Great Lakes for twenty-five years. Overfishing was probably involved, and perhaps habitat destruction—"but, basically, we don't know why."

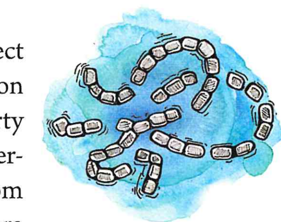
And from that mystery another has arisen: why can't they seem to be restored? She points to the screen. "These fish are all stocked, every one." Some stocking of lake trout began in 1958 and a coordinated program to restock the fishery was launched by the State of Vermont in 1972. "That's 78,000 fish from the hatchery each year," Marsden says—but almost none of them successfully produce adult offspring. (Marsden did catch one unclipped wild trout last year onboard UVM's research vessel, the Melosira; "Second such fish I've seen in sixteen years," she says, "Did a little happy dance on deck.")

"It's a native species in the lake," Marsden says, "And so we're trying to understand what it requires for them to become self-sustaining again. Why pay for something that could be naturally produced?" Marsden's research program over the last decade has carefully looked for the cause of the trout's troubles. She's shown that the hatchery fish survive well into adulthood; they find reefs, mate, and successfully spawn eggs in high densities; the eggs hatch, many fry emerge and find food. And then at about four weeks old, the fry leave their spawning reefs to go off to deeper water. Which is where the happy story ends. "It's hard to follow them at that point," she says, "and we never see them again."

Exactly one year later, in November of 2013, Ellen Marsden and another graduate student, Tori Pinheiro, are doing surgery on thirty adult lake trout. They anesthetize them with a drug called Aqui-S, make a small incision, insert a transmitter the size of a AA battery, stitch the cut closed, and let them go. And then, all winter, the fish swim under the ice making weird pinging noises. You can't hear them, nor can the fish, but receivers at spawning reefs can. They're part of a new network launched by UVM's Rubenstein Ecosystem Science Laboratory called the Champlain Acoustic Telemetry Observation System (CATOS) that allows scientists to track fish throughout the lake.

Marsden and Pinheiro are studying the tagged fish to gather basic facts about the courtship of lake trout. "It's one step in finding the hang-up that is preventing the fry from maturing into adults," says Pinheiro. "In order to implement any kind of restoration plan, we need to know more. Right now, there is very little known about spawning behavior in lake trout." Pinheiro's first peek at her CATOS data is already turning up some surprises about how long males and females are on spawning sites, and how the fish are on the move—including one lusty lake trout that traveled from Grand Isle to Arnold Bay, a trip of some fifty miles, in eight days.

SALLY MCCAY



Cyanobacteria

WE'VE WALKED A MILE out on the frozen surface of Missisquoi Bay. Trevor Gearhart checks our location on a handheld GPS. "Yep, this is it," he says. Peter Isles fires up a reassuringly large, safety-yellow drill. He grips both handles as the auger chews through almost three feet of ice. Lake water comes surging to the surface. "You could drive a tank out here," he says, looking down into the black hole.

Unlike most people who schlep a sled full of gear onto this bay in mid-March, Isles is not looking for fish. He's come with Gearhart to collect water, mud from the bottom—and plankton. He's especially interested in three types of cyanobacteria—sometimes called blue-green algae—*Aphanizomenon*, *Microcystis*, and the benign-sounding *Anabaena*.

These are microscopic plankton that float around in Lake Champlain. They're native, but not always benign. Given a diet of phosphorous pollution, they become major culprits in algae blooms that can foul beaches with green scum, produce dangerous toxins, and suck the oxygen that fish need out of the water.

Cyanobacteria are single-celled organisms that photosynthesize, making their own food from sunlight and carbon dioxide. They're like plants, but on a different, more ancient, branch of the tree of life. When excess nutrients wash off the land—from farm fields, roadways, eroding streambanks, or wastewater treatment plants—cyanobacteria chow down like a teenager.

In Missisquoi Bay, phosphorus concentrations have been increasing steadily for two decades, blowing past targets established by the EPA. Like some other shallow parts of Lake Champlain, the ecosystem in Missisquoi Bay is now dominated by cyanobacteria. "And we would expect that climate change is going to worsen the problem," Peter Isles says.

Isles and Gearhart are doctoral students working with geologist Andrew Schroth and biologist Jason Stockwell, director of UVM's Rubenstein Ecosystem Science Laboratory. They're all part of a large project called RACC—for Research on Adaptation to Climate Change. Involving nearly thirty faculty members from UVM and other Vermont colleges, the project has funding from the National Science Foundation to explore a difficult question: how will Lake Champlain react to the double whammy of climate change and land use change?

As one step toward answering this question, Gearhart sits on a blue cooler, filling bottles with lake water from a small, chugging pump. He'll take these back to the lab to "see how nutrient and phytoplankton composition changes through the water column," he says. A few yards away, Peter Isles lowers a metal tube into another hole he's cut in the ice. This is an optical sensor that records dissolved oxygen, several pigments specific to cyanobacteria, and other measures of the water.

This spot on the ice is the same place where a buoy floats in the summer, sending the same kind of sensor up and down through the water. On this freezing morning, no cyanobacteria populations are ready to bloom. "But what is the summer going to start with? How many nutrients? What are the plankton doing? Where are they hanging out below the ice?" Gearhart wonders.

With this kind of information, the RACC project is building computer models that refine global-scale climate forecasts down to the scale of Lake Champlain. These will let scientists and policymakers make educated guesses about what will happen to the health of the lake in a warmer future.

"There is no 'environment' in some independent and abstract sense," writes the great geneticist Richard Lewontin, "Organisms do not experience environments. They create them." Cyanobacteria, it appears, are now creating Missisquoi Bay in their own image—meaning that it may now be in what biologists call an "alternate stable state." The zooplankton that eat phytoplankton have a hard time dealing with too many cyanobacteria. Fish may not be getting the nutrients they need. Decaying algae create low-oxygen conditions that release more phosphorous from sediment. A cyanobacteria monoculture often reigns. "These are self-reinforcing systems," Isles says, "once you flip it over, it's hard to flip back." The RACC project, among its many goals, aims to help people understand what they'd need to do to flip Missisquoi Bay back to "clear water with lots of aquatic plants, fish, and not too many cyanobacteria," Isles says—and how easy it might be for other parts of a climate-changed Lake Champlain to flip to algae blooms.

Bobolink

JUST OVER THE TOWN LINE from Bridport, cattle farmer Phil Wagner stands in the sunshine on North Cream Hill Road looking across one of his hay fields. A warm breeze blows up from the Shoreham Swamp, and it feels like early summer. But the winter-killed stubble of grass, pale and yellow, shows no sign of starting to grow. It's actually mid-April, too early for haying. And too early for bobolinks.

"As I was cutting the hay last year I would see the bobolinks landing over here," Wagner says, pointing along a ragged hedgerow, "and then swooping down into the uncut grass over there." But these birds won't be back until May. Before they start building nests down in the grass of this field, they've got a lot of flying to do to get to Addison County from northern Argentina.

Still, once they do get here, any bobolinks that land in Wagner's twenty-acre field have a pretty good shot at mating and successfully raising a family. That's not true of many other bobolinks that return to intensively managed hayfields across New England. Just about the time the young birds are ready to set wing, the tractors will be coming through with their mowing bar.

"They're cool to look at," Wagner says, "Allan says they sound like R2D2."

That's Allan Strong '83, an ornithologist in the Rubenstein School of Environment and Natural Resources, who has been studying bobolinks and other grassland birds throughout the Champlain Valley since 2002. He's caught thousands of birds and talked to dozens of farmers—and thought about what both need to survive.

"The only reason that we have the species in Vermont is because we have a farming community here," Strong says. For thousands of years, bobolink—*Dolichonyx oryzivorus*, a yellow-capped black bird that looks like it's wearing a tuxedo backward—nested on prairie. Vermont was covered with forest. But when land was cleared in the eighteenth and nineteenth centuries, these birds moved east. "That legacy is the reason we have these birds here," he says.

The statistics for both grassland birds and grass-growing farmers in Vermont are trending worrisome. The USDA, which helps fund Strong's research, reports a seventy percent decrease in farms in Vermont, and a seventy-four percent loss of acreage of harvested hay, between 1950 and 2000. Paralleling this slide, there has been a seventy-five percent decline in bobolinks over the last forty years.

"There is this strong tie between our agricultural indus-

try in Vermont and the ecology of these grassland birds," Strong says, "but also a bit of antagonism." Since the 1960s, farmers have moved toward earlier and more frequent hay harvests because protein levels in grass are higher in the early season. "These early-hayed fields are really attractive to these birds," says Strong, "But they're future death traps."

When bobolinks look for a good place to nest, their search is probably based on landscape cues carried from deep in their history, when they lived on the prairie. But now, when they settle in a modern Vermont hayfield, they stand little chance of successfully raising young because they don't have enough time before the first cutting—nor enough time to try re-nesting between cuttings. The tractors crush the nests or the cut field exposes baby birds to predators.

Strong's research, done in collaboration with researcher Noah Perlut G'07, has shown that delaying cutting until at least early July, ideally into August, lets more bobolinks nest successfully.

Recognizing the financial impact this would have on farmers, Strong is helping to lead the Bobolink Project, a non-profit research program at UVM in collaboration with UVM Extension and the University of Connecticut. "Basically, we're raising money from the general public to pay farmers for a delay in the second cut—so bobolinks have enough time to nest," Strong says. It's testing the idea that people will put their money where their conservation values are.

Farmers who bid to join the program agree to not cut hay after May 31 and then wait sixty-five days until the next cut—in exchange for about $160 per acre. Phil Wagner enrolled twenty acres. Last year, he was able to get one good haying in before June and used the money to improve his manure management set-up. "But it's insurance if we don't get that first cut," he says, looking south across the grass, "and I like being part of the project. It helps the bigger system."

American Chestnut

YOU CAN FEEL THE FUTURE of Vermont's forests by visiting some huge blue pots, buried in the ground, just off Spear Street. "Yeah, it's pretty hot," says Gary Hawley, putting his hand up to a circle of white lamps that radiate down, twenty-four hours a day, onto eighty tree seedlings in one pot—including twenty American chestnuts.

And new trees for this future forest are also growing inside the greenhouse here at UVM's George D. Aiken Forestry Sciences Laboratory. Kendra Gurney G'08 opens a plastic bag and takes out some large coffee-black nuts. They're partially sprouted, and she gently covers each nut and its baby-white rootlet with soil in a tube. She's planting American chestnuts.

If you've even heard of American chestnut, you may believe it to be a plant of the past. Growing up to a hundred feet high and more than twelve feet wide, *Castanea dentata*—the Redwood of the East, some call it—once dominated two hundred million acres of woodlands from Alabama up the spine of the Appalachians, reaching the northern edge of its range in the Champlain and Connecticut River valleys of Vermont. "In many places, about half of all the trees were chestnuts," says Paul Schaberg, a U.S. Forest Service scientist and UVM research professor.

Then, in 1904, a fungus, accidently brought from Asia, began killing the American chestnut. It was a thorough and terrible disease, "leaving nothing but skeleton trees," Gurney says. There were probably four billion chestnuts and, except for a few single trees or oddball stands that missed the blight, they all died by the 1950s, taking down a central member of East Coast forest ecosystems, beloved by barn-builders and hungry bears alike.

But it might be brought back from the dead. Schaberg '81 G'85 '96, has been collaborating with Gary Hawley '78 G'82, a research associate at UVM's Rubenstein School of Environment and Natural Resources, and Kendra Gurney, their former student who is now a regional scientist for the American Chestnut Foundation—to see what place a new kind of American chestnut might have in a climate-changed Vermont.

Since 1983, the American Chestnut Foundation has been breeding trees to develop a population of chestnuts that are resistant to the blight. In 2009, the foundation's first "Restoration Chestnuts 1.0" were planted in a real forest. The big goal: restore the species across its range.

But what the chestnut's range will be in a warmer future isn't so simple. The UVM team's research shows that chestnut nuts and shoots can barely tolerate the coldest temperatures of a Vermont winter, which may complicate restoration efforts in northern New England. On the other hand, "with climate change, there are going to be winners and losers," says Hawley, as he looks down into one of the blue pots full of pencil-thin trees, "and those species, like chestnut, that are at the northern extreme of their range may do well." This experiment should help to find out by exploring how four tree species cope and compete under a steady add-on of 3.6 degrees Fahrenheit—the same amount of warming expected in coming decades.

And, no surprise, a Virginia chestnut is not the same as a Vermont chestnut. "So we're working to find the few remaining American chestnuts in Vermont," says Schaberg, "and then get people to climb these trees and pollinate them by hand," to form crosses with blight-resistant ones. To have a day when, like Johnny Appleseed, volunteers will be able to plant nuts by the thousands—there will need to be trees that aren't just blight-resistant, but also adapted to local conditions.

Last summer, I went hiking in some forested lowlands near Middlebury. The woods looked lovely but I couldn't see them as whole. I've often pondered the words of the great conservationist Aldo Leopold, who wrote, "One of the penalties of an ecological education is that one lives alone in a world of wounds. Much of the damage inflicted on land is quite invisible to laymen." That day I wondered what the trail might have looked like with the gravitas of a few mature chestnuts. Perhaps I wouldn't have felt that sense of loss, tinge of sadness if I'd known that just a few miles away, on a U.S. Forest Service research plot in the Green Mountain National Forest, these UVM researchers had hundreds of chestnut seedlings planted, looking for the best trees to heal the wounds. **VQ**

SALLY MCCAY