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FIELD NOTES

A publication of the Field Naturalist and Ecological Planning graduate students at the University of Vermont



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Cover illustration by Kelly Finan, www.kellyfinan.com

Riparian buffer on page 18 by Kelly Finan, Cooper's Hawk on page 19 by Amy Huntington

OUR LATEST COHORT OF FIELD NATURALISTS AND ECOLOGICAL PLANNERS has spent a good hundred hours cataloging the pitcher plant peatlands and hickory hillsides at nearby Shelburne Pond, amassing information to advise the management of the largest undeveloped wetland complex in the Greater Burlington region. But more surprising than rare cliff ferns or curious weasels, our team uncovered the thoughts and discoveries of the students and scientists studying Shelburne Pond over past decades – natural community maps, archeology sites, Master's theses and projects – all tucked away in boxes, shelves, and hard drives. Discussing the volumes of information with Lynn McNamara, our contact with The Nature Conservancy, she stunned me with her sober summation. "It would be nice to have that information for our management of Shelburne Pond," she explained, "but since we don't, it might as well not exist."

While collecting stray data for Shelburne Pond won't make headlines, Lynn's problem is symptomatic of a pervasive and growing gap between the discovery and use of knowledge. In an era of increasing sophistication and incredible specialization, the reams of information produced by universities and other researchers are staggering in complexity and scale. But knowledge alone does not inspire communities, preserve diversity, or stabilize climates. Knowledge does not solve problems. People solve problems. People in action, sharing knowledge, solve problems. So as our understanding of the world around us continues forward with furious growth, we need to keep an eye behind us. As the gap between the scientific discovery and its application widens, we need more professional generalists, those who strive to collect and connect people, problems, and information in meaningful ways.

Our small program is dedicated to training this future force of translators, of bridge-makers. In the following pages you will find some of our stories of synthesis. Liz Browlee and Connor Stedman write of their work reuniting agricultural systems to natural ones, implementing riparian forests that both produce crops and income for farmers while keeping floodwater from stealing the land. Laura Yayac uses a herd of squabbling twelve-year-olds at a ropes course to reveal how the art of communicating is our most valuable and difficult skill, regardless of age. You can follow Matt Pierle and his exploration of the Carl T. Parson Invertebrate Collection here at the University as he discovers how hundreds of thousands of meticulously pinned and labeled bees and beetles offer us incredible opportunities to understand and protect the world around us. In her interview with Thor Hansen, a program alum and Burroughs Award-winning author, Joanne Garton illuminates who we – the FNEPs – are as people and professionals. And Gus Goodwin articulates the paradox of how protecting an ecoregion spanning New York to New Brunswick requires understanding a single road and its culverts.

From interviews to fiction, there is much more in this edition of Field Notes. Through every word runs a common theme, mindful of the gap between science and application, policy and practice, one person to another. I hope you can read, enjoy, and reflect on what it takes to cross the chasms in your own world. Whether along the marshy shores of a big pond in a small state, or on the marble steps of the Capitol, problems are solved when people stop and find the whole story. The last century of discovery looks almost easy compared to the task of connecting our knowledge into solutions.



The first decade of the 21st Century brought some bad news. The 2005 Millennium Ecosystem Assessment documents global ecosystems under stress, the 2007 United Nations Geo 4 Report connects environmental degradation to increasing poverty and social system instability, the IPCC's 2007 Report warns of definitive global climate change, the 2010 National Research Council's Ocean Acidification Report documents oceans in trouble. In the beginning of the second decade, both scientists and management/planning organizations have begun to respond and adapt to the bad news seriously. Of course, there is a significant lack of agreement on how to proceed. The political process may lag at least a decade behind the discovery process.

There are some signs that global change will merit serious action. In Vermont, the State committed to reducing greenhouse gas emissions by 75 percent by 2020 – a difficult commitment as it has only limited control over sources. However, in the last decade, 104 municipal energy committees have been formed to respond to peak oil, global warming, and related issues. In perhaps what is an emerging trend, this grassroots effort is facilitated by state-wide NGO's. All over the country, people are self-organizing around strategies for change, and forging new collaborative partnerships. They employ a set of new skills in thinking, framing problems and opportunities, and organizing at the local and regional scales.

UVM's "Our Common Ground" statement is particularly important today as people with different perspectives and backgrounds build bridges to work on problems in common.

It's mission for accountable leaders in service to the global community reinforces our goal to continue to develop an education for the 21st Century that can facilitate this emergent response to the bad news.

Deane Wang is the director of Ecological Planning and an associate professor in the Rubenstein School of Environment and Natural Resources.



It is said that Harvard graduates CEOs, that Yale graduates presidents, and that Field Naturalist-Ecological Planning (FNEP) graduates Aldo Leopolds. I don't know if that's a fair assessment of Yale and Harvard's contributions to the planet's well-being, but the assessment of FNEP contributions certainly rings true – at least a dozen FNEP graduates have authored books in the last ten years, and (at least) two Field Naturalist authors have received national/international book awards in the last couple years. Can any other program anywhere match that tour de force – even those having 100 times more alumni? I don't think so.

How has this happened? It certainly helps that we have very bright students who have real-world experience under their belt before they enter the FNEP Program. It also helps that our students know what they want and will do what it takes to get it.

But the real credit goes to our professional writing program. Starting with the very first entering class of Field Naturalists, a central element of FNEP training has been students working one-on-one with professional writers and editors to become professionals themselves.

Hiring professional writers and editors is expensive but the results speak for themselves. If you are able, please support this part of the FNEP education by contributing to the Field Naturalist writing program endowment (a description of the endowment and how you can give is forthcoming on the Field Naturalist website). Thank you!

Speaking of the Field Naturalist website, Bryan Pfeiffer (an accomplished naturalist who directs the writing program) will be overhauling our web site this summer and needs your help for the update. If you are a graduate of the program, here's what he needs from you:

- A copy of (or a citation for) any books and articles you have written
- A listing of what you've done (positions, organizations, locations) since you graduated

Please send along what you have been up to. We want to showcase what you've written, where you've been, and what you've been doing. It's very helpful to prospective students and it's a good way to connect with others and stay in touch. Thank you!

Jeffrey Hughes is the director of the Field Naturalist Graduate Program, as well as an associate professor in the Plant Biology Department and the Rubenstein School of Environment and Natural Resources.



Students gather around Bernd's cabin during his winter ecology course.

Photo: Kelly Finan

Bridging the *Value* and *Values* of My Forest

BERND HEINRICH

THERE IS NO ONE TRUTH THAT DEFINES OR DESCRIBES A FOREST. TO SOME A FOREST IS A MONETARY NUMBER IN TERMS OF LOGS, where quantity, commercial value, or the number or size of trees is important. Others value the number of plants or animals that live there. What may distinguish both groups are values, many of which could be involved. Values differ not only between individuals but more importantly they vary at different times for the same person. They can differ hugely in terms of time scale even in the same forest. Decisions made on both the overall value and values on any one day pit one time-frame and interest against the other. How can they be bridged?

It is impossible for me to give an objective answer – who am I to speak to "Truth?" I can only speak to my forest and not to another one somewhere else. I can speak to my value of it at any one time, and to my values that can or cannot be satisfied given what is "on the ground" then, or in a specified time period. Articulating my possibilities opens a window to others understanding of theirs. That understanding perhaps

provides the way to span our otherwise inevitable differences. The mix of considerations are so varied that it is impractical to be inclusive, so I consider here just one example, one that is point specific, yet rooted over a long period of time, both in personal reference as well as in the forest itself.

It starts, and maybe ends, with a blending of idealism and necessity, or realism. While I was a student at UCLA, living in a hyper-hominized environment yearning for the Maine wilds, I joined the Wilderness Society. Perhaps I saw in it the opposite of what I was then in, as the ideal to strive for. To some extent I still do. But after returning to Maine and purchasing a 300-acre lot of overgrown farm well on the way to becoming woodland, I gained additional perspectives. Mostly I saw something very different from John Muir's majestic redwood groves, or the view of the pristine wilderness Bierstadt and others depicted in pictures and letters. They all oozed a sense of permanence that we long for. In Maine on my lot I now saw something to me just as profound and beautiful, but not static – the creation of what looked like credible woodland over a single generation.

I once saw cutting down any trees, as H.D. Thoreau did of the cutting down of a huge white pine tree, as a defiling of the ideal. Stumps, piles of slash, and open spaces where there were once beautiful trees were damaged goods. They were scars on the earth. Most of all I saw a half acre or so of my own log landing as a moonscape in the midst of my 300 acres, after I had it selectively logged to help pay for the purchase and the annual taxes.

This log-landing seemed devoid of plant life. It was a trash-heap where feller-bunchers had stripped the limbs off trees, and other machinery had battened down a deep layer of branches. It seemed impossible to me that anything could sink roots down through all the debris. Still, after a couple of years it was sprouting some green, and a woodcock used the bare ground as a staging area for its sky dance, which I could hear in April and May from my cabin a half mile away. Undoubtedly it attracted mates, because I then found hens with chicks. I returned to the clearing with a bag of acorns, and on a Hail Mary threw a few acorns around.

Twenty years later there was, of course, not a trace of slash left. All had been converted to fertile soil, which grew patches of raspberries, viburnum, sedges and grass. It had sprouted fifteen to twenty foot-tall pin and black cherries. An apple tree and several red and burr oaks showed signs of heavy moose browse, but were now escaping, shooting up some two feet per year. I called it "The Moose Pasture" because moose not only browsed there but also rutted there in the fall, leaving their antler scrapes on the young trees. It was also a haven for bumblebees, an oasis of fruit for migrating birds, a unique nesting place for Mourning, Nashville, and Chestnut-sided Warblers, species found nowhere else in an otherwise closed forest. Cedar Waxwings and a pair of Olive-sided Flycatchers were other species that had, as far as I know, never been there before. Nearby the quaking aspens were growing vigorously,

and attracting Ruffed Grouse and the beavers from nearby Alder Brook were harvesting the trees out of a previous thicket of fir and spruce. I planted several American chestnut trees, which grew phenomenally and are now producing fruit every fall. Blue Jays spread the seeds through the woods, "planting" them to grow where the light gets in. At last count I found 52 young chestnut tree offspring of this planting of four trees. In retrospect it seems to me that if the landing hadn't been there, I should have created it.

Casual wood-walkers visiting this place and knowing something about it would appreciate the beauty. However, they would have been shocked had they seen it when it was "created." They would not have had the advantage of understanding how the nature of the place "worked" its magic through time. Time provided the bridge to understanding this. Without that bridge, there would be one party who sees the "moonscape" and the other who sees a forest of balsam fir trees, or one of logs, and all might have been polarized.

Except for the practitioners, the foresters, naturalists, and perhaps land-owners, most people are subjected to what amounts to sound- or sight-bytes. They seldom have the opportunity to see a "movie" of a place unfolding in their minds. They are not privy to the continuum record. Experiencing the "now" in context of the known past is always more convincing, more over-powering, than what might be. It is our responsibility to educate others to see the continuum, to consciously provide the narrative in a concrete form. To show the here, the now, and the in-between, is to build the best bridge that can be.

Bernd Heinrich is an author, scientist, and professor emeritus at UVM. Every January he leads FNEPs on expeditions around his cabin in Maine during his Winter Ecology course.



Photo: Kelly Finan

FROM THE DEPARTMENT CHAIR

Two Ways to look at a Roadside Ant-Plant

DAVE BARRINGTON



THE FIELD NATURALISTS HAVE OFTEN BEEN ENTHUSIASTIC MEMBERS of the Plant Systematics Field Trip to Costa Rica that I lead. During the trip, we travel the country, seeking out original forests in which to come to know the prominent members of the plant community in the light of tropical-plant diversity. It's a rich experience, from the hyper-humid sea-level forests with their giant canopies far to the south to the sun-drenched, stunted thorn-adorned scrub along the driest coasts to the northwest, to the bamboo-dominated alpine of the highest reaches of the country. The Costa Ricans are a warm and welcoming people. I have been in some of the remotest parts of the country among its poorest people; even there or perhaps especially there if you stop in a dooryard for directions they will invite you in and offer you something to eat and drink—if only fruit from the trees in the yard—but always with a warm smile.

One time, the group tumbled out of our microbus, bidding our driver to wait while we explored the tangle of disturbance colonizers at road's edge in a mid-elevation rain forest. Among the intimidating array of plants in the tangle of vines and tree saplings and downright weeds was a fine young plant of the signature tropical American pioneer tree *Cecropia*, recognizable by its deeply lobed palmate leaves. I always look forward to the *Cecropia* episode, because it is a great example of ant-plant interactions. So, out comes my machete and I hack down one of the *Cecropia* shoots, go at it to open the

beautiful interior (large pith interrupted by walls every couple of inches). Out spill the adults, eggs, larvae, and pupae of the Azteca ants that live in the interior, to the delight of all hands.

Just then, the big SUV stops and the window rolls down. It's a Costa Rican family out for the Christmas holiday. The father says, "My kids want to know why you are cutting down their trees?"

The striking thing about the people of Costa Rica is that, through a careful educational effort over the past forty years, they have come to have ownership for all the living things in their country in a way that leads them to be protective of the rich heritage in the country. The secret to the success of this educational effort was that they started with the children quite awhile ago, and now those children are adults with children of their own. Here I was, an American professor with the rather noble goal of enriching my students with insights into the complexity and elegant order of the tropical forest, explaining to a couple of Costa Rican kids that I was sorry that I hurt their plants as my own students looked on, delighted at my embarrassment.

Dave Barrington is the Chair of the Plant Biology Department at UVM. He leads a plant systematics field trip in Costa Rica every other year.



MEET TEAM AD

Team *Arisaema dracontium* (Green Dragon) is not your typical FNEP cohort, so these are not typical biographies. For something more conventional, please visit www.uvm.edu/~fntrlst/ and www.uvm.edu/~rsenr/epc/?Page=class2014.html



MATT CAHILL

AMHERST, NH

Six years ago Matt sat in an old hayfield, far north in Vermont and looked around. He was fresh to the state, fresh to school, fresh out of ideas. A wispy old professor in a sweater with patched elbows sat beside him and pointed to a distant hill. "Can you tell me which trees are firs and which are spruce?"

No. Emphatically no. Matt didn't even realize one could tell trees apart to begin with. But that question like a seed grew one thought and then another: What is the difference? Why is there a difference? Why does anyone care? Propelled by his curiosity, Matt slowly learned to sort: warblers from sparrows, admirals from fritillaries, fir from spruce.

In the years since that afternoon in the hay Matt has steadily answered his questions and sorted his finds. Matt still hears his professor with his calm raspy voice, only now he is asking, "Can you tell me what makes people care?"



GUS GOODWIN

ALTOONA, WI

Looking out the window of the small airplane, Gus Goodwin felt that he might be reaching the peak of his conservation career. And it was only his first conservation job.

Beneath him, the 161,000 acres of working forest were indistinguishable from the protected lands that surrounded them. The purchase of these lands by The Nature Conservancy and eventual transfer to public ownership marked the largest deal of its kind in Adirondack history. The airplane was packed with eager reporters who fawned over the land and the recreation and conservation opportunities that lay ahead. Gus was honored to have earned a seat on the plane and hoped that the rest of his career would be as eventful.

Since then, he has realized two things. First, even if you might have "peaked" at age 20, you can't retire to a life of rock-climbing and hanging out with friends. And second, although the plane ride makes a great story, the real highlight of the job was working with passionate, motivated people and knowing that Gus's efforts, however small, contributed to a project whose benefits will last for generations.



MATT PIERLE

UPPER GREAT LAKES REGION, MI

Matt Pierle, tinkering away in his workshop, is on a mission: fastening leather straps to titanium tubing, lubricating fittings, testing for proper torque, dreaming up new combinations and configurations. In between adjustments, he's shoving wool socks, down vest, and healthy snacks into pockets, giggling and scheming on coming explorations.

It's his answer to Darwin's ship *The Beagle*, to Powdermill, the 1982 Honda Civic that Robert Michael Pyle drove during the world's first Butterfly Big Year. Matt is building, of course, the quintessential naturalist's touring bicycle.

Matt's rig is a bike-loving naturalist's excuse to migrate with the birds, chase down colorful insects, botanize by day and camp under the stars. It's a mobile lab and a micro-wunderkammer on two wheels. Binoculars, check. Camera, check. Sketchpad, check. Hand lens, check. Insect net, check. Vasculum, check. Field guides to birds, mammals, plants, check, check, check. Getting a smart phone would shave the weight of this naturalist-powered rig significantly.

What should he call this balance between self-propulsion and place based exploration? Right now he calls it S.O.L., The Speed of Life.



JOANNE GARTON - MONTPELIER, VT

When Joanne was a little girl, she thought that everyone in the universe called his or her own planet "Earth." Earth was not a proper noun, but another name for home. Now grown-up, Joanne wonders about the fundamental presumptions of this thought. The first, that there are other beings in the universe who refer to their own planet in some way, she still assumes is true... somewhere. The second, that humans identify with the landscape, wildlife, and weather of home as being parts of an entire planet to which they belong, raises some important concerns. How have humans thought themselves out of nature? Through work as a field geologist, a design/builder, an environmental scientist at reclaimed contaminated sites, and as part of a trail construction crew, Joanne is getting her hands dirty to find out how ecological science and design can ensure that the foundation of home will always be the natural Earth. Look for her this summer in central Vermont where she will be studying rural backroads and their impact on local watersheds. She one day hopes to design multi-purpose parkland corridors in both built and natural environments.

CLARE CROSBY - AUSTIN, TX

Clare brakes hard on the powdered slope, a difficult task for a Texan on cross-country skis. She and fellow naturalists spend the next several minutes puzzling over a set of tracks—five toes, long, loping. For the next several hours they ski only in short bursts, punctuated by lengthy tracking forays. Despite her best efforts, Clare is no typical student on Spring Break—shedding all academic thought in favor of sun or ski. Instead she dives into practicing her newly minted naturalist skills. Clare enjoys sneaking work into play.

Clare also relishes sneaking play into work. She composes essays on her guitar and she would rather use her prized mini colored pencils than take notes in pen. She busts out Zumba moves for warmth on frosty field days. And she would rather be doing just about anything than sitting at the computer writing this bio.



KELLY FINAN - HOP BOTTOM, PA

Balsam fir buds are an unpleasant snack for humans; they disintegrate into bitter scales that stick to your teeth as you try to chew them. The red squirrel would disagree, as he nips the tips off of these trees all winter. Kelly is fully aware that she is not a red squirrel, but hours gathering data on balsam firs, alone in the snowy Maine woods, can make a Field Naturalist do strange things. She thought, "If squirrels eat them, they can't be that bad, right?" Needless to say, she was disappointed. Being the reserved sort, she told no one of her strange snack.

Hours later, the class gathered in the cabin's lantern-lit dining area, warm and full of (normal) food. One student at a time, Bernd began inquiring about the progress of the Winter Ecology projects. His gaze eventually shifted to meet Kelly's. "Kelly, how did the buds taste?" In that moment, she knew she was in the right place.

LAURA YAYAC - CHESTER SPRINGS, PA

Clammyweed. The name could title a horror movie, but the backdrop here is much more indie drama, full of colors and sun and quirky characters. It's nearing the end of botany class, and Laura's mind is swirling with herbaceous plants and scientific names. She's elated when she recognizes the gummy seed pods and weather beaten stalk. For her, this renewed acquaintance with clammyweed is a small victory. It's the first plant she keyed out by herself. With limited background in natural history, Laura's been challenged and thrilled to watch partridge berries, fisher tracks, and dolostone become part of her working knowledge.

But Laura is as fascinated by group dynamics as by nature, and collaborative learning is key to why she's here. Teaching her cohort about clammyweed was a definite highlight and an insight into what she intends to do with all this new information. She also intends to throw a Frisbee on every continent. One more to go! (And it's not Antarctica.)



Experiential Dynamics

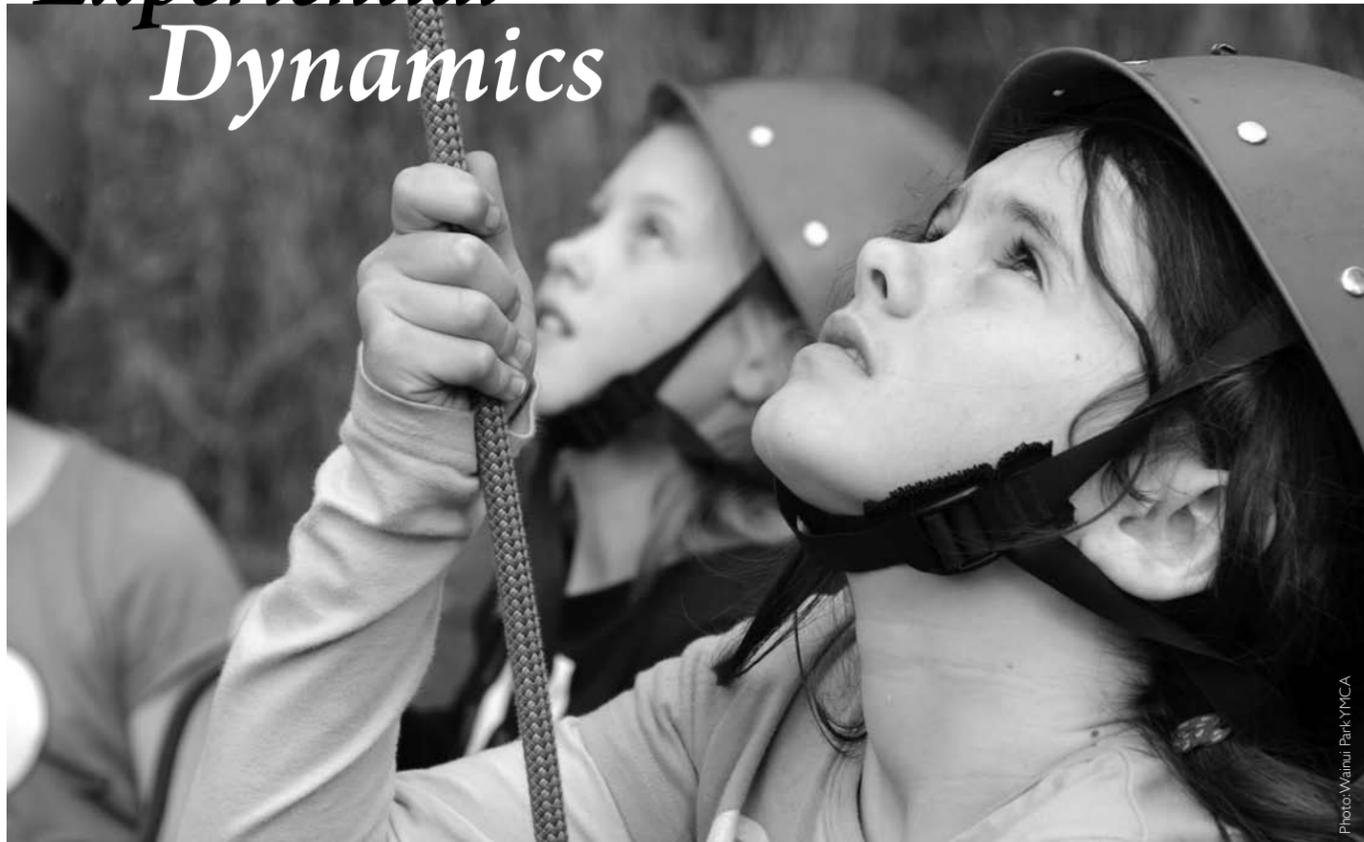


Photo: Waimui Park YMCA

LAURA YAYAC

KIERAN, JOSH, AND THE REST OF THE “AWESOME CHOCOLATE CHIPS” CONGREGATE LOOSELY, eyeing the rubber chicken, bean bag puppy, and tennis ball at my feet as we stand in an open field. The cacophonous sounds of a dozen twelve year-olds surround me. Kieran climbs the side of a soccer net while Josh pegs a tree with a stray tennis ball. The rest of the group chatters away, frustrated by the lack of progress. I’m facilitating their group at the ropes course, and it’s evident that we have room to grow.

The students are here for teambuilding, a word that has joined the ranks of sustainability as a catchall term that makes me cringe. It conjures up the feel-good aura of cheerful motivational posters, but its substance and true meaning are much messier than that. The outcomes, too, are more specific than “working together” or “collaboration”, other words on my overuse list.

I guide the Awesome Chocolate Chips in talking directly to one another. We discuss how their individual actions impact the group. Slowly the Chips come together, persuading Josh to join the circle, and motivating each other toward quiet. It’s not the fastest means to the end, but already the sense of responsibility and accomplishment is growing.

At the ropes course, my goal is not to get the students quiet and orderly, but to engage them in developing skills that will last long past this day. A key component of the ropes course is connecting what we talk about and model on the course to everyday life. The link to school, to work, to personal awareness, and to relationships with friends and family is a constant theme. Ultimately, these skills join people, enabling us to communicate across fields of study and careers, to strengthen our connections.

Back in the field, the group’s frustration returns. Their progress is wavering, with Kieran spinning in circles and a group of girls in close discussion about Justin Bieber. Unexpectedly, Josh takes responsibility and gathers the group’s focus. Under his leadership, the middle-schoolers give each other feedback about their creative solutions to our opening activity. They set a specific goal to improve the transition time during our first climbing activity, and we move into the woods.

Steel cables, pulled taut between trees and ranging from a few to 60 feet in the air, form the infrastructure of the ropes course. I guide groups through the problems in a systematic way, intending the challenges to test our assumptions about what people can do individually and together. Our starting el-

ement has a few ropes hanging down like vines, forcing climbers to balance as they move between the jungle handholds. But the challenge is not about balance. Members of the group encourage each person to push past his or her perceived limits, whether stepping off the ground or reaching the second tree.

There are physical challenges and adventure at the ropes course, but the focus is on social and emotional intelligence. It’s not just about play, but a practice to improve our listening and communication, to recognize our strengths and weaknesses, to ask for help and to value success in many forms. It is practicing the art of connecting people, protecting nature, and building strong communities.

In a recent session of my applied wildlife management and field ecology class, I was struck by a comment made by Jens Hilke, a graduate of the Field Naturalist Program and a state conservation planning biologist. Though science is key to his work, Hilke identified his most valuable skill as working with town conservation boards to agree on plans and recommendations. Through his abilities as a communicator, referee, mediator, and listener, Hilke furthers the science and environmental objectives to which Vermont aspires.

Effective communication is essential for work, school, and play, and whether twelve, thirty, or eighty-five years-old we all have room to grow. At the end of their day, the Awesome Chocolate Chips have grasped a few more tools to achieving this. Their last challenge is the Boson Chairs, a set of six swings at different levels. The

Through his abilities as a communicator, referee, mediator, and listener, Hilke furthers the science and environmental objectives to which Vermont aspires.

progression from the morning is evident. The Chips organize themselves, choosing an order with little arguing, and stand ready to start the activity. The goal is to traverse the space between trees using the swings. It’s a physically demanding element, and as the first climber struggles from swing to swing, I watch the others move and sway on the ground, mimicking the motion of the swings as

though willing their energy to their teammate. We use the Boson Chairs to practice asking for help when you need it, and offering help without assuming it’s wanted. At times, Kieran is still apart from the group, and squabbles occur as patience lessens. Teambuilding isn’t a one-day event. Developing skills like these takes practice and continued reinforcement. It was Josh who said it best, at the last debrief of the day. “I learned what I do affects other people. I’m thinking about how I can do better talking to people and helping my friends. Even though sometimes I won’t get it right.”



Photo: Waimui Park YMCA

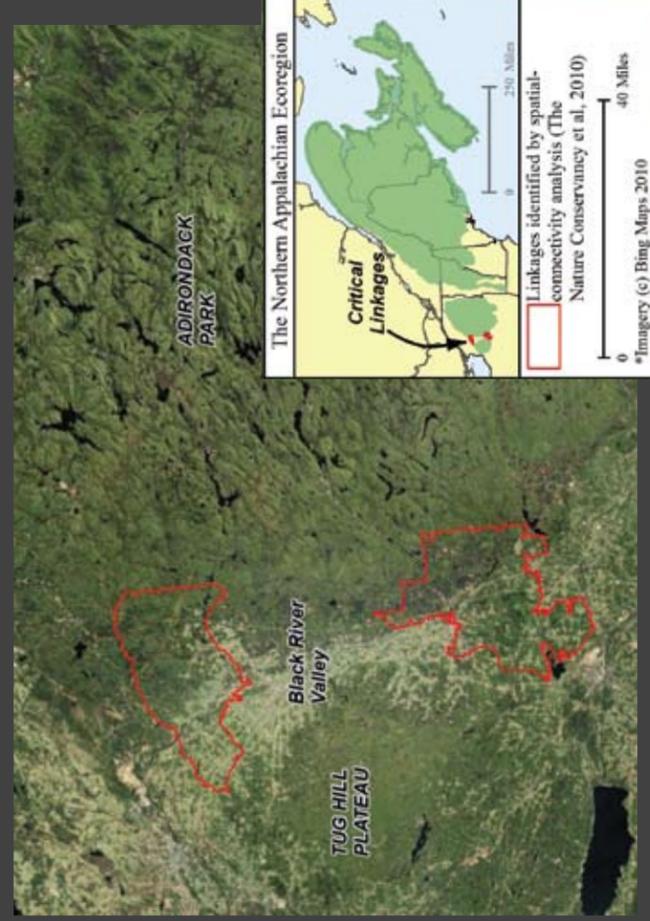
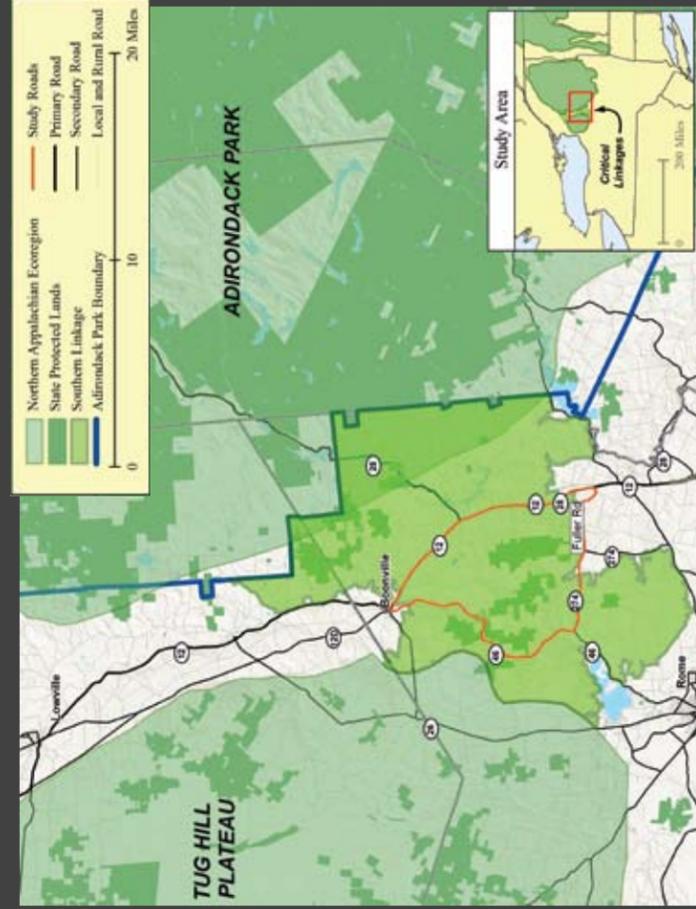
Charting Connectivity for Wildlife in The Black River Valley

GUS GOODWIN

THE NORTHERN APPALACHIAN PLATEAU IS ONE OF THE LARGEST AND MOST-INTACT ECOREGIONS OF ITS TYPE ON THE PLANET. It supports wide ranging-wildlife, including bear, moose, and lynx, that in the last century have shown signs of rebounding following near extirpation. For populations of these species to remain viable in the long term, they need large blocks of core habitat and the ability to move freely between them.

Across the ecoregion, development threatens to sever critical connections and prevent wildlife from traveling between forest blocks. This is especially true in the Black River Valley (right). Conservationists have identified this 650,000-acre region in New York as an ecoregionally important area for wildlife movement and a conservation priority.

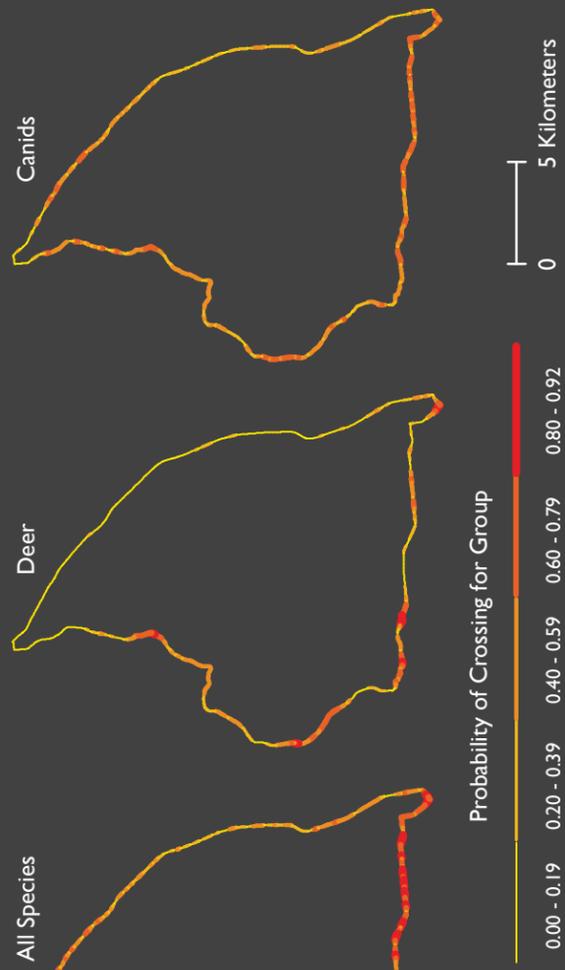
In 2010, The Nature Conservancy (TNC) and other members of The Adirondack-Tug Hill Linkage Project completed a mapping and connectivity-modeling project that identified where to focus connectivity work and what that work should entail. The models identified two existing linkages—stepping stone like arrangements of habitat blocks—that support movement of important wildlife species in the Black River Valley.



Securing connectivity in the Black River Valley requires protecting important habitat blocks and minimizing the barriers between them. Roads, even lightly traveled ones, can be a source of mortality, habitat discontinuity, and other disturbances, making them a serious barrier for wildlife.

To guide efforts addressing this threat, TNC and the New York State Department of Transportation investigated the permeability of the road network in the southern linkage of the Black River Valley. Thirty-six miles of high-priority roads were surveyed for wildlife crossings and variables (e.g. land cover) that might influence crossing probabilities. The priority roads include busy roads that bisect the linkage and quieter roads that pass through residential, agricultural, and conservation lands (left). Wildlife crossing locations were determined by weekly tracking surveys from January 2011 until March 2011. Data describing land cover, road infrastructure, terrain, and landform were collected in the field and developed remotely in GIS.

Technicians observed over 1,100 trails of tracks and observed nearly 800 instances of wildlife crossing roads. Rarely, some species (deer and mink) used culverts and bridges for safe passage under the road.



The data collected in this study were used to develop a set of models that used land cover, infrastructure, and terrain to predict crossing probabilities for individual road segments across the study site (above, right). Two groups of species, deer and canids (red fox and coyote), had sufficient data to model independently. Species of greater concern (e.g. fisher or otter) were too rare to justify separate models.

The most important variable in determining the crossing probability for any species was land cover adjacent to the road (above, left). Proximity to residential areas was the strongest deterrent to wildlife crossings, especially for canids. The map call-out (above, left) illustrates this sensitivity: crossing probability drops from 0.75 to 0.5 within 100m of a house. Although not surprising, this finding is important for towns and conservation organizations to consider when using zoning and habitat protection to maintain connectivity.



Conservationists are using the data generated from this modeling project to identify priority areas and opportunities to enhance connectivity in the Black River Valley. In addition to informing zoning and habitat protection efforts, the models support efforts to minimize the effects of roadways. One low-cost strategy is retro-fitting existing road infrastructure such as drainage culverts (left) or cattle crossings (below) to serve as wildlife underpasses in areas with high probabilities of wildlife crossing. With appropriate vegetation, fencing, and elevated walkways (if needed), these structures can provide wildlife with safe passage under dangerous roadways.

Small steps like this, when coupled with habitat protection, should allow wildlife to move freely between the Adirondacks and Tug-Hill. This connectivity is critical for the region and the ecoregion, and should ensure that wide ranging species continue to thrive in this area, and that other species, such as pine marten and moose, can return to their historic range.

The Buzz on Insect Collections



MATT PIERLE

IF YOU'RE ANYTHING LIKE MOST FNEPs, AT LEAST ONE AREA OF YOUR HOME OR OFFICE LOOKS A LOT LIKE A WÜNDERKAMMER – A “CABINET OF WONDERS” – CONTAINING BIOLOGICAL PEARLS FROM A LIFETIME OF EXPLORATION. Interspersed with our favorite rocks and reference books, we preserve fragments and full specimens of animal, vegetable and fungal origin. Our collections allow us to see, feel and examine, repeatedly and at close range, the life we otherwise work to keep wild. They remind and inform us of the many expressions of life in our landscape, the many shimmering leaves on the tree of life. For FNEPs, the Age of Discovery is no sterile event of history. It is our daily bread.

Unlike many a slapdash home assortment, museum and university collections are systematically labeled, climate-controlled, and buffered from sunlight, dust and other aspiring dangers. They are effectively our “Community Supported Wunderkammers” – a population of specimens that recall our past and help predict our future. The more we use them, the more valuable they become.

UVM's Carl T. Parsons Entomological Collection, at the Zadock Thompson Natural History Collection, is located beneath the Pringle Herbarium in Torrey Hall. Entering the collection, you notice dozens of glass-topped Cornell drawers stacked on top of cabinets already packed with more specimens. A chest freezer hums, ready to receive specimens and dispatch any cannibalistic, collection-destroying dermestid beetles. Dissecting microscopes are dispersed throughout the room. The collection houses three-quarters of a million preserved insects, more than one per Vermonter, each neatly pinned and labeled. Each an expression of life.

Few things excite and interest nature-curious people as much as the diversity and bizarre adaptations of insects.



Photo: Matt Pierle

Magic happens when you put an insect under the microscope. Fantastically, a pinned specimen on cork emerges in a new dimension, complete with the micro-texture of featherlike leg bristles or the incredible strength and sail-like quality of membranous wings. Driving the (7-45X) dissecting scope is like shifting through the gears of a souped-up, drop-top with a six-speed manual transmission. The closer you get, the more your jaw drops. Who could even dream up the Johnston's Organ on the second proximal antennal segment of a fruit fly or the gyroscopic halteres of the true flies?

Most specimens in the Parsons Collection are adult-stage insects. Other life stages: larvae, eggs, pupae, and aquatic nymphs float in screw-top vials. The oldest acquisitions date to the 1880s when the Vermont landscape was one great clear-cut speckled with merino sheep. About 100,000 specimens are “DNA-grade,” capable of providing reliable genetic amplification. While there are exotic interlopers, 80 to 90 percent of the specimens in the UVM collection came from right here in Vermont, including one of the world's best collections of ground beetles, in the family Carabidae, thanks to Professor Emeritus Ross Bell and wife, Joyce. On these pins, in those vials, are innumerable stories, both natural and cultural.

A few years ago ecologists mining the Parsons Collection

for data on bees noticed something odd. A once-common member of Vermont's insect fauna, the rusty-patched bumblebee, *Bombus affinis*, while historically well represented, suddenly blipped out around 1995. UVM students were still collecting in the areas this species had been reliably netted. And insects notoriously blip out and back again. But *B. affinis* never blipped back. It became a conspicuous example of a larger and disastrous phenomenon of steep declines among some bumblebee species. Without the Parsons collection the disappearance might have gone unnoticed. The cascading ramifications of the loss of pollinators and other insects are yet to be entirely realized. Such is also the case of specimens teetering on the institutional edge.

In 2011, Tropical Storm Irene walloped the state offices in Waterbury with a meter of water. It wiped out the state's collections of invertebrates.

In 2011, Tropical Storm Irene walloped the state offices in Waterbury with a meter of water. It wiped out the state's collections of invertebrates. Trish Hanson, State Forest Entomologist lamented of the state collection that, “of our representative set of the approximately 2,000 Lepidoptera species in Vermont, only a small fraction survived. Most hymenopterans, along with grasshoppers and crickets, were lost. The cases... that contained specimens in vials – ticks, bark beetles and many other Coleoptera – were covered with silt and broke apart.” Less than five percent of the terrestrial specimens were rescued. “Looking at the water-logged, smelly specimens, and reading the labels, with such a variety of collectors, locations and dates, was heartbreaking,” Hanson said. In this sad turn of events, the Parsons collection at UVM has become the de facto state reference collection.



Taxonomists and naturalists aren't the collection's only beneficiaries. Public health labs researching the spread and virulence of insect-transmitted diseases, agricultural investigators studying pest invasions, and natural resource departments monitoring invasive species all gain from reference specimens maintained in institutional collections. Historic collections also provide genetic material for amplification. If you ever see a drawer full of insects with only five legs, this is why. Those sixth legs have been removed for genetic barcoding, serving to confirm if classic Linnaean morphological classifications are consistent with genetic determi-

nations. *Bombus* (bumblebee) specimens over a hundred years old have been successfully amplified from the U.S. Pollinating Insects Collection in Utah.

Pinned insects can't speak for themselves. Collections elsewhere are under threat. At a time when some institutions literally landfill their treasures to save money and make space for other priorities, the Parsons Collection survives with help from a dedicated crew of allies who know the value of more than a century's worth of Vermont's insect fauna. Only now we must maintain and expand that value. The more we call on and showcase it, the more valuable it becomes.

Insects are found just about everywhere and function at all levels of food webs. Ecologically they are predator, prey, grazer, parasitoid, parasite, and host. By virtue of their wide-ranging lifestyles, insects make for excellent bio-indicators. The signature of their absence or presence and abundance on the land over time reflects responses to variation in climatic conditions, waves of disease, and shifts in land use.

Whether it inspires the next generation of scientists or helps us monitor the health of our landscapes, the Parsons Collection is an asset to Vermont. Insect collections countrywide have the potential to illuminate problems and offer solutions for another century. By maintaining and accessing these Wunderkammers, we maintain connection to our environmental past and insight into the possibilities of the future.



Photo: Matt Pierle

Of Zebra Snacks and Raccoon Shacks:

An Interview with Thor Hanson,
FNEP Alum and John Burroughs Medal Winner

JOANNE GARTON



Photo: Thor Hanson

IF THERE WAS EVER A REASON TO QUIT EARLY FOR THE DAY, THOR HANSON MUST HAVE FOUND IT when his arms were elbow-deep in the bloated stomach of a fetid zebra carcass lying in the Kenyan sun. Covered in a surging goo, he instead finished the task at hand: to supply vulture bait for the afternoon's fieldwork. If dedication was to become a theme in his ensuing career, Hanson was already walking the talk. A less ardent researcher would have left the scene at first smell.

In *Feathers: The Evolution of a Natural Miracle*, Hanson tells a tale of "Fluff, Flight, Fancy, and Function" in the bird world, describing the wide range of purposes and disciplines attached to this lightweight object. From the disputed discovery of feathers on dinosaurs to the reason a falcon feather still rests on the moon, Hanson, author, biologist, and 1999 graduate of the FNEP Program, connects the reader to this beautiful and unassuming piece of the natural world. While sharing his adventures with an eclectic diversity of feather-lovers, Hansen weaves in the technical details previously confined to ornithologists. For his efforts, Hanson won the 2013 Burroughs Medal awarded for distinguished books on natural history.

Hanson's research of his beloved feathers takes him around the world, from a costume designer for showgirls in Las Vegas to a paleontologist in China. However, he is most frequently found studying feathers in the Raccoon Shack, the remodeled shed in his backyard that serves as home base for his unconventional investigations. Here, Hanson meticulously plucks a winter wren kept on reserve in his freezer to log the number of different kinds of feathers necessary for bird survival. He climbs to the roof to drop a hammer and feather in unison, confirming that the lone feather is its own perfect airfoil. He blow-dries the guts of bullfrogs from a nearby pond onto feathers of his deceased chickens to discover why vultures have naked heads. Through these Raccoon Shack experiments, Hanson fascinates the reader with both the spectacular and the mundane.

"Part of it, I think, for many of us is just eliminating some inhibition," says Hanson. "You know what? It's okay to be really, really stoked about a moth. People connect with that immediately."

While advanced research drives many scientists into increasingly focused disciplines, Hanson has made a point to seek out opportunities that are general and interdisciplinary. Though his graduate and professional work took him from Uganda to Alaska, Hanson chose to land back home in the Pacific Northwest. To make a living, he has embraced his profession as an author along with roles as a radio personality for nature lovers, an ornithologist for bird watchers, a public speaker for writers, an ecological consultant for NATO, and a husband and father to his family.

Wearing many hats, Hanson accepts the responsibility of being someone who now knows nature. "What's interesting," Hanson said, "is that people really are eager to believe in things, and they're eager to believe that there are experts who know everything." Having the tools to research answers and the personality to spread his excitement, Hanson is making space for others to join him, pursuing their own scientific curiosities about the natural world. From the Raccoon Shack to the publishing table, Hanson brings the reader along for the flight, telling his study of science while connecting people to nature.

"You know, there are far too many fascinating and important discoveries and ideas that never seem to make it beyond the relatively limited audience of peer reviewed scientific journals," said Hanson. "But, in many cases, it's really important for us to take those stories farther."

The question remains perhaps not who is an FNEP, but who is this FNEP? A generalist, a fanatic, a communicator, and an interpreter – those qualities he shares with Field Naturalists who have not yet earned a Burroughs medal. But Hanson is also an experimenter, an instigator, a public speaker, and a tenacious researcher. He can make a coherent statement from months of painstaking fact-finding while retaining the thrill of the first day of fieldwork. If birds of a feather do flock together, other FNEP graduates will continue in Hanson's tradition, sharing the excitement and growing wisdom from the Raccoon Shacks in their own backyards.

Agriculturally Productive Buffers:

A New Option for Vermont's River Lands

LIZ BROWNLEE AND CONNOR STEDMAN

STAN WARD SPRINGS INTO HIS GREENHOUSE FULL OF EXCITEMENT, eager to show off elderberry cuttings. In May, he'll plant them into one of three riparian buffer plantings along the Mad River in central Vermont. The elderberry will keep farm field runoff out of the river, absorb floodwaters, and prevent erosion. And they will generate income as an agricultural enterprise.

The river's edge can be tense territory, where conservation and agriculture seem permanently in conflict. Farmers, working with razor-thin profit margins, want the rich soils in production. Conservationists want floodplains to grow native ecosystems absorbing floodwaters, remediating pollution, and providing wildlife habitat. At the same time, the river's edge can also be a place of great collaboration. Stan's plantings are innovative, in part, because he's establishing them in partnership with his local watershed group and the local conservation district.

Planting elderberry in the buffer creates what Stan calls a "win-win-win" for watershed health, wildlife conservation, and the local farm economy. Stan isn't the only one interested, either. A small but growing number of farmers, conservationists, and land managers in Vermont are beginning to add productive buffers to their toolboxes. By directly integrating agriculture and conservation, these working buffers could help farms and watersheds alike adapt to the "new normal" of the 21st century.

RIVERS, FLOODING, AND TROPICAL STORM IRENE

River channels support an extraordinary abundance of life. Water continually shifts and meanders, carving banks and



Elderberry cuttings at Stan Ward's farm will soon grow on the banks of the Mad River as part of a riparian buffer. The elderberry will provide ecosystem services and produce a marketable crop.

Photo: Liz Brownlee

revealing new land. On any summer evening turtles bask on gravel bars while swallows and kingfishers nest in steep exposed banks. These features are found nowhere else in the wider landscape, and are constantly changing as the river moves. When rivers flood from snowmelt or storms, they deposit rich silt and sand in their floodplains, supporting riparian forests and riverbank meadows. These in turn provide habitat for countless wildlife species.

For farmers, rivers are a blessing and curse. They provide extremely fertile and easily plowed agricultural soils, but the threat of damaging floods is ever-present and increasing. In August 2011, Tropical Storm Irene dumped 12 inches of rain on the state in a single day. Flooding eroded entire fields, carried away barns, livestock, and greenhouses, and buried crops in sand and gravel. Almost 15,000 acres of farmland sustained damage; farmers lost at least \$20 million in one day.

Intact riparian ecosystems can mitigate the impacts of flooding. In Rutland county, Irene impacted 92 farmers by flooding Otter Creek. Thirty miles downstream, in Middlebury, only 41 farmers reported damage. While the damage to crops was similar in both places, in Middlebury the land itself remained intact: only 60 acres of land were damaged compared to over 4,000 acres in Rutland. The difference lies, in part, in a system of intact swamps, wetlands, and buffers along Otter Creek between Rutland and Middlebury. The complex absorbed and attenuated the floodwater. Intact riparian ecosystems prevented extensive damage in Middlebury, while Rutland, lacking these systems, incurred drastically more severe impacts from the storm.

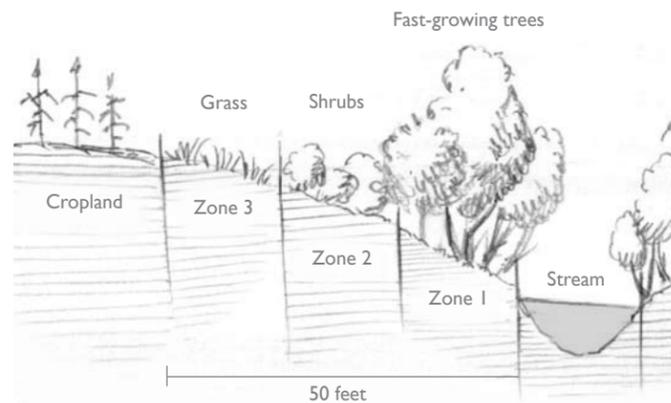
Riparian buffers retain strips of natural vegetation along riverbanks, generally 20 to 50 feet wide. They allow natural river processes and communities of life adapted to floodplains to continue within agricultural landscapes. Buffers improve water quality, in particular, by filtering high levels of nitrogen and phosphorus in agricultural runoff that can cause algae blooms and disrupt river food webs. The trees, shrubs, and perennial herbs and grasses in riparian buffers slow overland water movement, allowing sediments and nutrients to settle into the soil and keeping pollutants out of waterways. The root systems of these riparian plants, adapted to frequent flooding, rapidly absorb excess nutrients and make use of what would otherwise be waste. Buffers are essential for swimming, migratory fish breeding, and other river functions that depend on water quality.

A host of programs encourage farmers to plant riparian buffers, but many farmers choose not to participate. Some farmers simply can't afford to take any land out of production. Others don't want to see productive land sit "idle". Often, farmers don't want to sign the government's dotted line, regardless of the reasons to do so. They want to manage their land as they see fit, and planting programs often require contracts and include restrictions. Local programs can work with a handshake agreement, but even so, planting the river's edge with trees restricts the farmer's options. Some farmers don't like the aesthetic of a brambly, messy forest hiding the river from view. They enjoy seeing the river, and neat rows of crops or mowed hayfields. For these reasons and many others, farmers often avoid or flatly reject planting riparian buffers on their land.

But a new idea is showing up on Vermont river banks, a system that brings farmers back to the table. Growing agriculturally productive buffers (APBs) is a strategy that can make sense for both farmers and conservationists.

AGRICULTURALLY PRODUCTIVE BUFFERS: AN EMERGING OPTION

APB's are a form of agroforestry, integrating forest management with agricultural production. They incorporate the essential elements of traditional riparian buffers, but differ by including perennial crop systems as components. Typically, the portion of the APB nearest to the riverbank, Zone 1 (see diagram), is restored as natural riparian forest, sometimes including understory crops such as ostrich fern fiddleheads. Zone 2 is an alley of flood tolerant shrub or small tree crops, such as elderberries, hazelnuts, or black locusts coppiced for fence posts. Finally, the innermost Zone 3 grows late cut hay, keeping perennial grass cover during the spring and late fall



- Zone 1: Native riparian buffer. Flood tolerant species. Little or no harvest.
- Zone 2: Flood tolerant trees or shrubs grown for fruit, nut, floral, timber, or other crops.
- Zone 3: Perennial grasses grown for hay, livestock bedding, or biomass.

flooding season. Productive buffers provide flood resistant agricultural enterprises while incorporating natural river processes into farmland: flood tolerance, deeply taprooted trees, year round plant cover, and room for a meandering river.

Agriculturally productive buffers may overcome the obstacles preventing farmers from participating in the current planting programs. These buffers keep farmland in production and help farmers take care of both their land and their bottom line. There are no government contracts and no paperwork, though many groups are working to establish best management practices. Agriculturally productive buffers still block views, and they are certainly not the way a farmer's father grew crops. In a changing climate, though, flexibility may prove critical.

Nonprofits are helping farmers with logistics and some are finding funding for planting strips of native floodplain trees in APB's. With collaboration, farmers are growing much needed riparian buffers, increasing flood resilience, improving water quality, creating wildlife habitat, and growing crops, all with a single land management strategy. Crops currently planted as components of productive buffers in Vermont include nuts (hazelnuts, butternuts) fruit (pears, currants, highbush cranberries), fenceposts (black locust), forage (late cut hay), and, of course, Stan Ward's elderberries.

The Friends of the Mad River, a local conservation organization, partnered with Stan to establish his elderberry buffers. They are cautiously optimistic about the potential for productive riparian buffers to become more widely used on Vermont farms. "Working with Stan to create working buffers definitely requires more flexibility," said Caitrin Noel, FMR's Executive Director. "However, if managed properly, I think the model could represent the best of both worlds."



Notes from the Field

Every summer, Field Naturalists and Ecological Planners collaborate with a community partner for their Master's projects. Here are the project summaries from team *Accipiter cooperii* (FNEP '13).



BECKY CUSHING

From the top of Mount Mansfield to a classic kettlehole bog, the University of Vermont owns some of the state's most treasured landscapes. But these natural gems are in the crosshairs of development, recreation, climate change, and other forces. How do we ensure that UVM's nine Natural Areas are conserved for future generations? Can I convince the University that we need a new approach?

Wrestling with these questions, I slogged, jogged, crawled, and trekked through nearly 2,000 acres in the Natural Areas system to witness challenges like degrading trails, encroaching suburbs, or the odd trash heap. Each field visit, interview, or report offered a piece of the Natural Areas puzzle. Slowly, I fit the pieces together, and here's what I came up with.

Protecting UVM's Natural Areas requires an integrated model—science-based management carried out by students through fellowships, internships, and courses. Each Natural Area should have an adaptive management plan that responds to dynamic natural and human processes. With this vision in place, how to put it into place?

Already Field Naturalists and Natural Resource graduate students are piloting one aspect of the plan. They are conducting

an inventory and assessment of the H. Lawrence Achilles (Shelburne Pond) Natural Area to guide development of a management plan. This summer we'll work with LANDS undergraduates to continue this work and other Natural Area projects.

As these pilot projects end, the question remains: Will UVM adopt my model for the long haul? For the sake of the Natural Areas, I sure hope so.



CLAIRE POLFUS

Public land may be meant for the public good, but it was also good for my soul as I tromped around three state land parcels in the Northeast Kingdom last summer. During my deliberate adventures through northern forests and wetlands, I collected ecological inventory data for a long range management plan. In the fall, I compiled and analyzed the ecological data, combined it with public input from a scoping meeting in October, and developed management goals and recommendations. For every management area, I strove to find the sweet spot between prioritizing conservation, wildlife habitat management, economic sustainability, recreational opportunities, and the mission of my sponsoring organization, District 5 of the Vermont Agency of Natural Resources based in St. Johnsbury. In one area, for example, the benefits of conserving a northern conifer floodplain outweighed the economic gain from a timber harvest. On the other hand, along a lakeshore

I strove to manage public access while ensuring riparian health. Following commenting and review, the Agency of Natural Resources will implement my plan to manage the properties into the future. As I tie up the last bits of my project and send it on to its future as a full-fledged management plan, I finally have time to reflect on my greatest discoveries: a 44-inch diameter yellow birch, the satisfaction of a dip in the lake at the end of a day in the field, and a desire to pursue creative problem solving in public land management.



CONNOR STEDMAN

Agroforestry, or multi-layer agriculture, is widely practiced around the world but is rare in the Northeast. That's beginning to change as farmers and homesteaders around the region have begun experimenting with agroforestry systems. One farmer in the Adirondacks thins his woodlot to establish pasture beneath the trees. Another farmer in Massachusetts grows fruit and nut trees in widely spaced rows through a hayfield. A gardener in the Hudson Valley produces mushrooms and medicinal plants from a two-acre forest fragment surrounded by fields and roads. Farms in Vermont are experimenting with tree crops as components of riparian buffers. Small agroforestry plots (forest gardens) are being planted in backyards, community gardens, college campuses, and unused urban lots throughout the Northeast.

The benefits of these systems include intensified and diversified production, wildlife habitat, carbon sequestration, and many other ecosystem services. Agroforestry can help to create win-win solutions in the working landscape that meet both economic and ecological needs. The agroforestry field is in its infancy in the Northeast, however, and few resources specific to the region are available to practitioners.

With the support of the Northeastern States Research Cooperative (NSRC), a competitive grant program funded by the USDA Forest Service, I researched and wrote an introductory Northeastern agroforestry manual. The manual is intended to support early adopters and contribute to the region's growing knowledge of these practices. My hope is for more farmers, land managers, and conservationists to add agroforestry strategies to their toolboxes, and use them to create more productive, multi-functional, sustainable landscapes around the Northeast and beyond.



LIZ BROWNLEE

The river's edge can be tense territory. Conservationists push for more riparian buffers to improve water quality, build flood resilience, and provide wildlife habitat. Along those same shores, farmers work hard to provide food for our communities. Conversations between the two groups too often end in finger pointing and anger. My project brought Vermont farmers and conservationists together in collaboration rather than conflict.

The Vermont River Conservancy (VRC), a nonprofit that conserves land along Vermont's waters, sponsored my project. The VRC promotes healthy, ecologically

and economically viable river corridors. Sustainable agriculture is an important part of that vision. My project built the VRC's capacity to collaborate with farmers. The VRC wondered how to partner landowners with thoughtful farmers looking for land. I equipped the VRC to navigate the world of farmland access by creating materials for interested landowners and connecting the VRC with organizations that match farmers with land.

The VRC also wants to take a leadership role in partnering river and watershed advocacy groups with farmers. I created a guide that helps conservationists understand agriculture, provides tips for working with farmers, and explains how to grow effective riparian buffers on farmland. Finally, would more farmers plant riparian buffers if the buffer generated income (via perennial crops like fruit and nuts) as well as providing ecosystem services? Well, some are already convinced. Several Vermont nonprofits and farmers have already partnered to plant these buffers. I investigated the ecology and economics of the idea, and worked with farmers in southern Vermont to design an agriculturally productive buffer. After graduation, I will help set up several more trials of this system to assess the idea's economic viability on a larger scale.



NANCY OLMSTEAD

Deep in Maine's Baxter State Park is a surprising forest. When I envisioned the north end of Baxter State Park, the areas way beyond Katahdin, I pictured myself walking among big, old trees and complex forest structure. But the northeastern section of BSP, where I spent my summer mapping natural communities, surprised me and reminded me of people's determined reach into even the most remote Maine valleys.

Europeans never settled this land, but logging for pine and spruce in the mid-late 1800s, combined with severe, human-caused fires in 1884 and 1903, profoundly changed it. Where I expected to find tangles of old spruce-fir forest, I found mile after mile of large aspens and paper birch.

Mapping the natural communities of this landscape-in-flux challenged me. With my sponsor from the Maine Natural Areas Program, I mapped current communities and did my best to predict the future. But in some areas, it just wasn't clear yet.

The forest is in a period of rapid change so the map is a snapshot of time, but park staff can still use my maps when considering where to site trails and campgrounds. Conservation planners can use the data to understand what is already conserved, a reference against which to compare future species distributions. And park users can learn about the history of the area and the special values of remaining pockets of older growth.



RYAN MORRA

How do you translate the phrase "Place-Based Landscape Analysis and Community Engagement" into Spanish? This question was the first of many I faced, proving an easier translation than adapting the entire framework of the Vermont-based PLACE Program to the sleepy, coffee-growing town of Adjuntas, nestled in the central mountains of Puerto Rico. Ready and willing to be the *cobayo* (that is, a guinea pig) for this new initiative, I headed down to Adjuntas to transfer the PLACE Program model to a new community in a very different ecological landscape.

PLACE, a joint project between the University of Vermont and Shelburne

Farms, partners with towns to investigate their unique natural and cultural history in order to help generate a vision for the future of their landscapes. My project was sponsored by two community non-profits—*Casa Pueblo* and the Center for Landscape Conservation—that decided to partner with PLACE in order to further their missions of protecting the cultural and natural heritage of the central *Cordillera* region of Puerto Rico.

After touching down in Puerto Rico in the summer of 2012, I hit the ground running, researching geologic history, mapping soil types, uncovering a rich and storied cultural heritage, and familiarizing myself with a myriad of palm trees and *coquis* of this subtropical montane ecosystem. In order to capture the various stories of the Adjuntas landscape, I developed the website *Adjuntas: Paisaje Natural y Social* to explore the growth and changes of the town and the surrounding countryside using interactive maps, repeat photography, and narrative storytelling. My project is just the beginning of a larger network of place-based education projects that will equip Puerto Rican communities with tools they can use to explore their home and generate a sustainable vision of their future.



SOPHIE MAZOWITA

What does a 100-acre urban park have in common with a 3000-square mile wilderness area? In my eyes, both can be a venue for fostering connection with the natural world. I traded in my old post in one of those wilderness areas and landed in urban Red Rocks Park, South Burlington, VT.

In Red Rocks I found a feeling of solitude on remote rock outcrops, on expansive shorelines overlooking Lake Champlain, and in secret quartzite caves. I heard bats

emerging from their tree roosts, spotted ravens building cliffside nests, and watched Cooper's hawks chasing squirrels—all within 90 meters of trails well-trodden by park visitors.

I spent my summer traveling every inch of the park and trying to figure out the story of this 100-acre urban forest. What are the special features of Red Rocks that you can't find anywhere else in the city? What are those unique values that should be preserved? And then, when every person has a different answer to this question, how do you balance the conflicting interests of dog-walkers, botanists, joggers, birders, neighbors, solitude-seekers, and the wildlife that calls Red Rocks home?

I wrote a management plan for Red Rocks that offered few straightforward solutions, but that will open a dialog to inform sustained community-based management of this public resource. I also led natural history walks, started a monthly nature club, and teamed up with UVM undergrads to investigate outdoor classroom opportunities. The study culminated in a community presentation and visioning process, which brought new voices to the conversation about park governance and stewardship.



CARLY BROWN

With ripe, tangy blueberries, black bears, pungent sweet fern, and towering pitch pines, the Ossipee Pine Barrens Preserve of New Hampshire, protecting one of the state's most endangered natural communities, is anything but barren. On several occasions, and without warning, my feet would tangle in a fallen stem of scrub oak leading to a face plant on the sandy, pine needle-y forest floor. Though most days I was more elegant, I still scrambled under knots of scrub oak and pulled

ticks off my body. This is how I spent my summer.

My search for seventeen conservation-targeted Lepidoptera was worth the ticks and the bruises. The Nature Conservancy (TNC) began managing the preserve by prescribed fire in 2007 to return and maintain the pitch pine-scrub oak woodland ecosystems. TNC needed to know how fire impacts the rare moths that rely on the pine barrens they are working to maintain. As this was the first intensive moth collection since the prescribed burning, my project objective was to assess this impact and to document rare moth presence in the preserve. I collected moths from April to September, mostly using black light bucket attraction traps. I identified all moths, both rare and not. In total, I collected over 5,500 moths representing 290 species. My work in the Ossipee Pine Barrens will influence the management of the preserve, especially in regards to the future monitoring of these rare species.



The Life and Times of a Desk Naturalist

A WORK OF FICTION BY RYAN MORRA.
INSPIRED BY TRUE EVENTS.

WHEN I WAS ASKED YESTERDAY IF I WOULD LEND A HAND IN BAITING WILDLIFE CAMERA TRAPS WITH CHICKEN CARCASSES AND SKUNK SCENT, I DIDN'T HESITATE. I happily threw on my bright green state-issued fleece vest and hopped into one of the Vermont Agency of Natural Resources F-350s and headed into the field. Any chance to get out from behind my desk.

You see, the irony is that over the last three years, as I've grown more competent in my job, taking time "off" to go outside has become a luxury I can't afford. Sure, if I added up the time I spend waiting for ArcGIS to process a new layer, or when I have to redo the map background because the color scheme doesn't work, or when the program crashes and I have to start all over again, I could be out in the woods for hours each week. But it doesn't work like that. Instead, I squirm in my chair, write my management plans, make phone calls, attend webinars, meet with bureaucrats, send e-mails, and re-send e-mails because I forgot to attach the attachment I said I attached.

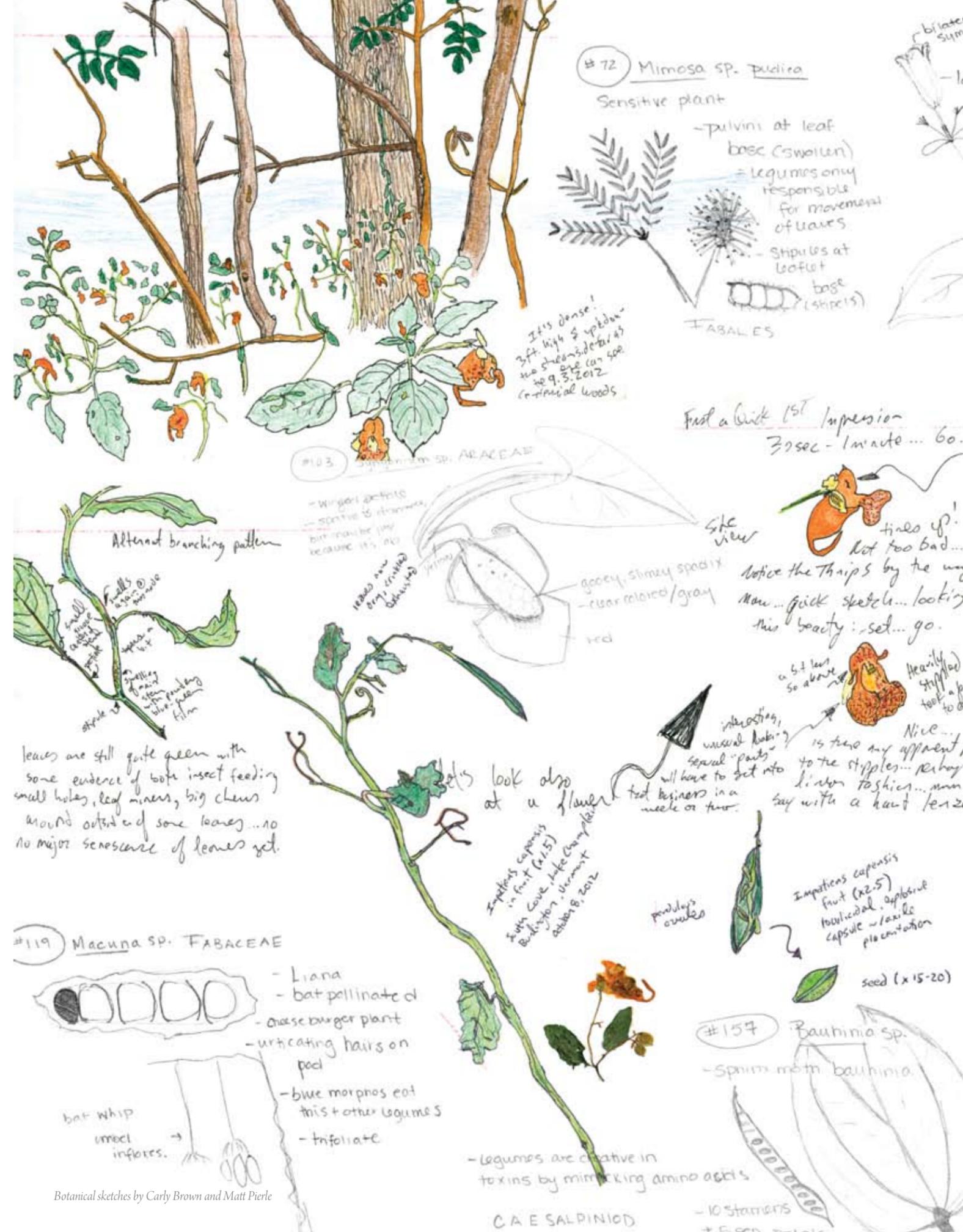
Enter the yoga balls. Yes, yoga balls. Amidst a sea of plaid shirts and Carhartt pants, grown men and women sit – no, bounce – atop large, inflatable rubber exercise balls colored blue, yellow, orange, pink, chartreuse, and magenta. The latest custom is racing them down the hallway to the conference room for our weekly staff meetings! My friend Paul, who has been with the Agency for over twenty years, asked me if we should combine orders to save on shipping, because he is about to get one. But I still can't wrap my head around this. Apparently it's better for your back and it helps keep you occupied and

more alert. What ever happened to just going outside? I yearn for the chicken carcasses and skunk scent.

I always thought my biggest job hazard would be wearing out my knees hiking with a large pack, getting my finger bitten off by a snapping turtle, being charged by a moose in heat, or dying from a tree falling on me at a logging site. I am a Field Naturalist, after all. Now, in the life and times of a desk naturalist, I worry about carpal tunnel syndrome and impaired vision from staring at a backlit computer screen all day. But someone has to do this coordination, right? All this ecological planning? Someone has to write the management plans, make the maps, facilitate seminars, and meet with irate citizens? It's all in the name of conservation!

The reality, I have learned, is that land management is as much about managing people as it is about managing the land. It's an inescapable reality. So I will continue to write the e-mails, make the phone calls, prepare the reports, facilitate the meetings. Someone does have to do it, and I am a someone! However... tomorrow is supposed to be a bluebird sky day. And truth be told, those GIS layers on vernal pools just really aren't up to snuff. I think I need to do some ground-truthing on them. Sounds like I have my workplan.

In the meantime, I've put in an order on Amazon. My yoga ball arrives next week. Orange. I picked orange.



Botanical sketches by Carly Brown and Matt Pierle

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In return for the services provided, we ask sponsors to contribute \$5,000 to our Sponsored Master's Research Project Fund. This contribution is used in its entirety to help defray tuition expenses of the student.

We plan to match students with projects by January 2014 so that students can work with sponsors during the spring (2014) semester to plan for the summer field season. Data analysis and report writing continue into the fall semester, with products delivered to sponsors between December 2014 and May 2015. If you are interested in having an FN or EP work with your organization, please contact:

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