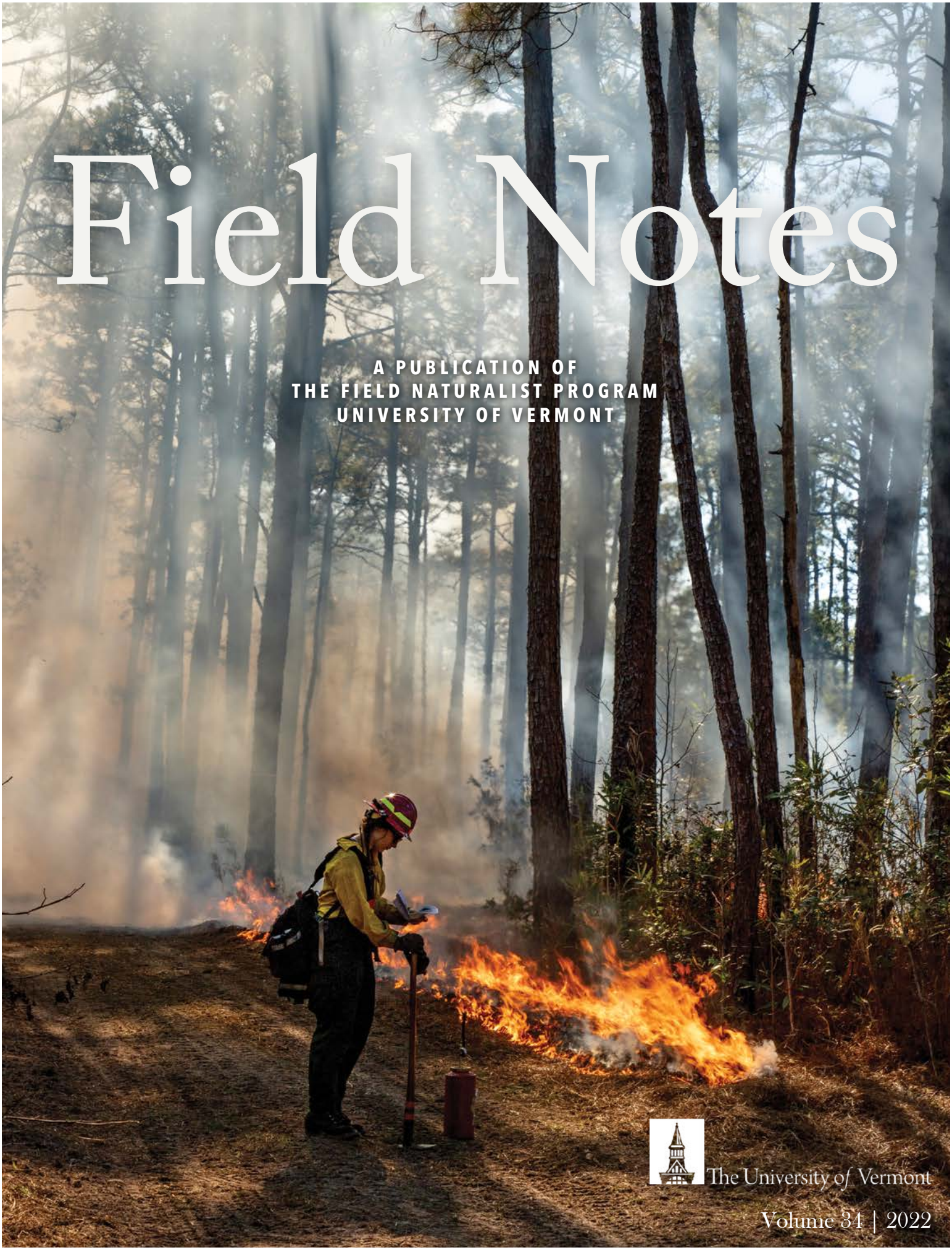

Field Notes

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Publisher:
Sonya Kaufmann

Production Editor:
Charlotte Cadow

Content Editor:
Hayley Kolding

Design and Layout:
Erica Hample

Design Lead:
Kelly Finan
www.kellyfinan.com

Website Design:
Dylan O'Leary

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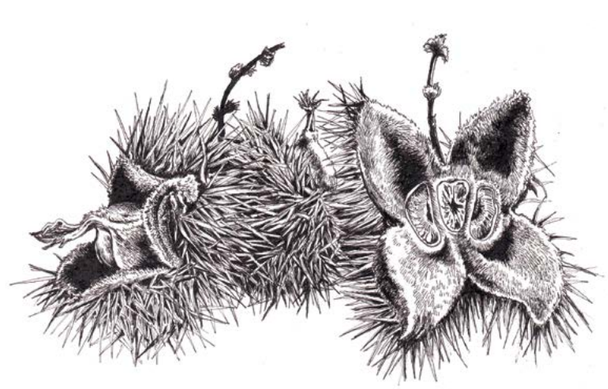


This issue is also available online at www.uvm.edu/cals/plantbiology/field-notes.

DEDICATION

This issue of Field Notes *is*
dedicated to Lillian "Porky" Reade
November 1, 1944 - January 27, 2022

WALTER POLEMAN, CATHY PARIS, ALICIA DANIEL, SARAH GOODRICH

Image: Bryan Pfieffer

"'Nothing beats kindness,' said the horse. 'It sits quietly beyond all things.'"

—The Boy, the Mole, the Fox and The Horse, Charlie Mackesy, 2019.

For 30 years, walking into the Botany Office meant you would be greeted by name and if you were lucky—and most of us were—with a hug from Lillian "Porky" Reade. This is where she spent nearly half her life, her hair slowly turning silver, doling out dog biscuits to canine visitors and handing out van keys from behind a desk garnished with a bowl of chocolates and smelling of flowers. An orphan herself, Porky became den mother to the world, nurturing in particular the Field Naturalist Program. In 1990, she asked department chair and FN Program founder Hub Vogelmann if she could lend her hand to the initial chaos of the FN Program. He wisely agreed.

Once Porky took us under her wing, she never looked back and loved us unconditionally for the rest of her life. Department faculty members entrusted their now-grown children to Porky as their first babysitter, and later, as someone to embrace them when they were feeling dejected; she loved them as her own. When Porky wasn't tending the plants at Holy Cross Church and those in her own beautiful yard, she practiced the old-fashioned art of doing good in the modern, stress-filled halls of UVM. To know Porky was to bask in the warmth of our better natures as humans—from her kindness and her willingness to see the best in all of us to her deep love of nature.

She listened to our sorrows and rejoiced in our successes. Our old letters contain stories about her impact on our lives, from tracking down misplaced applications in the Biology Office to the times she talked more than one of us off a cliff, suggesting that perhaps we did belong here after all. In addition to providing invaluable logistical and emotional support, Porky also played a key role in implementing the sponsored master's research project model that has become so integral to the program experience.

Whether we met her in the elevator ferrying a trolley of food up to Prospective Students' Day or through her duties in the front office, she always made time to see how we were doing, and we always felt a little higher after engaging with her. Then she'd share something from her world: the latest pictures she'd discovered of meerkats (creatures so important they warranted a place on her computer as figurines) or fun stories from the lives of her lovely granddaughters.

Porky's deep love for nature was expressed through her gardening and through many interactions with wild animals, one of the first being her "pet" baby porcupine she had as a child at the orphanage (where she was first called "Porky…with her porcupine"). She often fed many animals who showed up at her back porch in Colchester, VT including a pair of skinny fox kits, a raccoon family (to whom she provided a bowl of water along with the spaghetti as they preferred to rinse their food before eating it), and a murder of crows who came around regularly. Around 2010, Porky became inexplicably drawn to rocks. The gardens at her home and office at UVM slowly filled up with cairns built from her rock treasures. She was a person who followed her heart, not needing a reason why. When she retired in 2018, her friend and colleague Sarah Goodrich suggested everyone pitch in and buy a large, handsome Green Mountain rock for Porky's garden. What better gift for someone who was our rock for so long? We all knew we would never forget her.

In 2013, Porky and Alicia Daniel visited Hub Vogelmann several times during his final days as he lay dozing on the couch at his farm on Schillhammer Road in Jericho. He shared stories of his environmental exploits and their FN days together. She was a friend, loyal to the end.

Her final days were full of visits from human and animal friends, personal cards, shared memories, and recorded and live performances of her favorite songs. Amazing Grace, All God's Critters (Got a Place in the Choir) and The Rainbow Connection were performed by members of the hastily assembled and sometimes off-key FN alumni band called "Porky and the Snow Leopards." Friends lovingly prepared meals for her, like beef barley soup, her favorite, and she always insisted on sending them home with goodies like fresh-baked apple crisp. Porky would bestow quotes from her favorite book, The Boy, the Mole, the Fox and the Horse, on each of us like a blessing. She even regaled us with stories about memorable evenings spent laughing with neighbors and friends. She chose life.

Porky was looking forward to getting a cat and visiting Disney World and maybe an African safari with her dear friend Walter Poleman. Then, despite her strong will and our fervent wishes, she died at the UVM Medical Center in the company of her soulmate Ron and their three sons.

Whether you saw Porky recently or were with her in spirit, she knew that you, you Field Naturalists and Ecological Planners, loved her. The Friday after Porky died, some of us went to Rock Point to light a candle for her. The bay was full of round ice floes that looked just like the spots on a snow leopard. We were shining a light in her honor, but in the end, she shone a brighter one back on us.

Image: Bryan Pfieffer

CHARLOTTE CADOW & HAYLEY KOLDING

What's Burning for You?

Image: Walter Poleman

April — boxelders dangle yellow-green tassels over wet woods. The last stragglers of the amphibian migration (often with help from their human allies) cross rainy roads to find their mates; peregrine falcons swoop above Lone Rock Point, guarding their nests. Queen bumblebees, miner bees, and cellophane bees are on the wing.

We of Field Naturalist Cohort AL have been as busy as those early bees. From preparing conservation tools and site assessments for local organizations and municipal agencies, to teaching, TAing, and leading public workshops, to preparing for field work in sites ranging from the city of Montpelier to the sagebrush sea, we've learned what FNEP alums mean when they talk about needing moxie in this field. As a team of five and as members of the much larger naturalist community, it sometimes feels as if we never sit still.

It was just 20ºF one December morning when the five of us, ensconced in our sleeping bags, gathered around a table to choose the theme for this issue. Our writing instructor, Josh Brown, supplied the front porch — and the coffee. As a light snow fell on the streets of Burlington, we put forth ideas: identity, hope, rewilding, ritual, release. A lot to cover, as usual. We needed one element to merge these early thoughts together.

Having all experienced the ecological grief, as well as the joy, that can come with being a naturalist, we realized that as readers we often craved something tangible to put the fire back into us. It was around our need to see and do the work of conservation that all of our curiosities coalesced. We had found our theme: **Hope through Agency and Action.**

Each of the pieces in this year's edition approaches this theme through a different lens. If despair looms, maybe it's time to try your hand at constructing a bat box. If the theme of extinction weighs heavy, consider planting a native tree in your yard. We hope you find reasons to crawl along the ground, scour the bottoms of vernal pools, stare into tree tops, and ultimately find actions that make a meaningful difference in your life and for the future of the planet.

We would like to end this note by appreciating the constant inspiration of our community. When surrounded by field naturalists, curiosity, wonder, determination, and optimism reign. It is this community that brings us the daily, weekly, monthly, and annual doses of hope that sustain us.

Happy reading,
Charlotte Cadow ('23) & Hayley Kolding ('23)

WALTER POLEMAN

How do we honor the rich history of the Field Naturalist Program while continuing to evolve? This question has been in the forefront of my thinking in my new role as program director. I have no doubt that our program's signature blend of integrated field science and compelling communication – first espoused by Hub Vogelmann forty years ago – is a keeper. We fill a unique niche in the higher education world. Cultivating conservation leaders who have what it takes to translate high-quality scientific inquiries into action, we attract bright problem-solvers. Our students and alumni are the key to our vitality. Each August a new cohort assembles in Burlington with fresh energy and ideas for applying the program's vision to the latest challenges and opportunities of our changing world; our faculty, inspired, continuously reshapes and hones the curriculum. Right from the start, the new FNs get out in the field with faculty and alumni representing organizations and real-world projects at the cutting-edge of conservation science and sustainability thinking. The deepening relationships among students, alumni, and faculty are central to the program's past success and essential to our future. What new "containers for emergence" can we create to propel the program forward?

Why not think globally as well as locally?

One such container we'd like to bring to fruition builds on one that Deane Wang and Jeffrey Hughes conceived of twenty years ago: Ecological Planning. Through a partnership with the Rubenstein School of Environment and Natural Resources, many graduate students joined the Field Naturalist family each year as Ecological Planners, a program model that flourished by focusing on the needs of local communities. Although UVM no longer offers a formal graduate track in ecological planning, we plan to build on its legacy by launching a new community outreach initiative: the Ecological Planning Laboratory. Offered in collaboration with UVM Extension, the EPL would function as an "ecological extension service," providing tangible opportunities for FN alumni to solve real-world conservation problems while helping to fulfill UVM's land grant mission. We're imagining that the EPL could be staffed in part by recent graduates of the program and provide ecological consulting services to range of organizations, municipalities, and agencies. While biodiversity conservation and ecosystem restoration would be central to the work of the EPL, a strong partnership with UVM Extension would also mean working closely with communities to build long-term resiliency in the face of climate change. With an emphasis on cultivating healthy social-ecological systems at the watershed scale, this FN-Extension partnership could promote solutions that simultaneously address issues of local food production, water quality, and biodiversity conservation.

And why not think globally as well as locally? A powerful opportunity to address the global biodiversity crisis would be involve our program more deeply in the United Nations' global biosphere reserve network. Burlington lies at the center of the Champlain-Adirondack Biosphere Reserve (CABR), which promotes solutions reconciling the conservation of biodiversity with its sustainable use. Since CABR is part of a global network of over 700 biosphere reserves (56 nationally), opportunities for collaborative, cross-cultural biodiversity research abound. In fact, our partners in Puerto Rico, Hawaii, and New Zealand have all voiced enthusiasm about collaborating with the FN Program. How about you? Please be in touch with your ideas to help us move together down this path of agency and action!

An FN graduate himself, **Walter Poleman** is the program director and teaches Landscape Inventory & Assessment. He is the founding director of the PLACE Program and co-coordinator of the Greater Burlington Sustainability Education Network. He also coordinates the Rubenstein School's dual master's degree program with Vermont Law School and teaches ecology there each summer.

Cultivating an Idea

Image: Jason Mazurowski

JASON MAZUROWSKI

Wind howls through the hardwoods and somewhere high up in a basswood tree a cluster of seeds becomes unmoored. Spiraling down from the canopy, it skitters across a snowy ravine. Meanwhile, I break trail up a nearby logging road, enjoying the heightened awareness that comes with traveling alone at night in the north woods.

In the relative silence of winter every sound is amplified – the styrofoam squeak of snow, distant trees creaking and popping, marcescent leaves rustling in a young beech – and I try to imagine how it must have felt mere months ago when these woods were so glaringly alive. I try to recall the sounds of frogs and warblers and the constant buzz of bumblebees as they flit among jewelweed and Joe Pye. A gust of wind tosses debris in my direction, and I spot something tumbling toward me in the moonlight. Funneled into the remnants of my old tracks, the cluster of basswood seeds comes to rest between the tips of my skis.

I pick them up to examine five perfectly round fruits dangling from a petiole attached to a sail. As I inspect the seeds, I reflect on the chain reaction of biological processes, involving innumerable individual organisms, that gave rise to the genetic material I hold in my mitten.

I imagine the humid summer afternoon when it was all set into motion, when five little white flowers hung from the canopy, their pollen and nectar beckoning a host of flying insects and teeming with yeast and bacteria. A stray pollen grain was dislodged from the scopa of a bee, the antenna of a wasp, or the leg of a fly, adhering to just the right part of a stigma – an improbable process repeated hundreds of thousands of times each season among the branches of a basswood.

I slip the cluster into my pocket, and another gust brings a wave of basswood fruits surfing down the ravine. I switch on my headlamp to reveal hundreds of seeds lying in the tracks ahead of me, tumbling further down the hill with every gust. I plod forward, collecting handfuls as I go. Some bear only one fruit, others as many as eight, but still, I grab any that I can find. When my pockets are bulging and my fingers are numb, I ski back down the hill.

Back at my apartment, I empty my pockets into a mixing bowl. There must be hundreds of seeds, each with the potential to someday tower over the canopy, provide food and habitat for countless creatures, and sustain life for decades – though it's unlikely that any of them will. Of the millions of seeds a basswood will produce in its lifetime, perhaps a handful will survive to maturity. Every year, they are cast off into the wind, gliding across snow, funneled into hollows where they lie in wait for the right conditions. For now, their enormous potential exists only as an idea.

My interest in the cultivation of living things began as a form of chronic procrastination. As a graduate student, I would often abandon my writing to bake sourdough bread or make a batch of sauerkraut. After a while, my procrastination habits became more of a ritual, and I'd find myself staring at the ingredients sprawled out on the countertop, each brimming with microorganisms that – given the right conditions – would transform the food into something beautiful, complex, full of life, and greater than the sum of its parts. Something that could sustain me, and that I could share with others.

Before long, I was baking four loaves per week, and I started brewing beer with wild yeast, too. I grew fungi from tissue cultures. I reared ant queens and bumblebee colonies. I cultivated koji. I found myself returning from every run with pockets full of cuttings or seeds. But plant propagation was a strange new alchemy for me, and while I'd grown comfortable with the world of microbes and microfauna, I had yet to grasp the scale of working with shrubs and trees.

I was a student in Bernd Heinrich's winter ecology class when he first introduced me to two thriving American chestnut trees in the clearing near his cabin. He had purchased a dozen seedlings in 1982 on a whim, never anticipating that any would survive. Planted in western Maine just north of their historic range, and derived from a population of relict trees, four survived to maturity, reliably producing fruit every year. Each fall, squirrels and blue jays descended on the mast crop, caching nuts in the surrounding forest, inadvertently seeding an expanding wild population.

"How many do you think are out there?" I asked Bernd.

"Want to find out?"

One October weekend we assembled a team to scour the hillsides surrounding the clearing, measuring and flagging every seedling we could find. At the outset, we suspected that there might be dozens, perhaps even hundreds, but we never imagined that there would be more than 1,300 chestnut trees growing wild in the Maine woods. It had all started as just an idea, a long shot at best, yet almost forty years later there we were, surrounded by trees that had once been on the brink of extinction, sitting around the fire and feasting on roasted chestnuts. As a parting gift, Bernd sent each of us home with a bucket of seeds.

I immediately went to work extracting the nuts from their spiny husks and packing them into sand. I tucked them away in the back of my fridge to stratify, and late that February, I popped open the lid to discover that every single nut had produced a radical. I now had hundreds of chestnut trees living in my refrigerator, each with the potential to fill a niche that had been absent from eastern forests for over a century.

That summer, as I reared each of the nuts into seedlings, I was beginning to make some connections. Just as I had provided the proper conditions for yeast and bacteria to thrive and transform flour and water into beautiful, nutritious loaves, I had also provided the correct conditions to rear trees that could one day sustain an ecosystem.

We have the ability to transform the human environment into something new, different, and full of life. Our natural communities contain all the ingredients we need to restore wetlands, enhance buffers, sequester carbon, support pollinators, and create a functional ecology among our towns and cities.

All those utopian solutions exist now, but mostly as ideas – nothing more than seeds and cuttings. But just as a head of cabbage cannot spontaneously assemble into a jar of kraut or kimchi, an abstract idea needs something – or someone – to set it into motion, to mix the ingredients and provide the proper conditions for all those organisms to multiply, thrive, and create something entirely new to the natural world, but full of life nonetheless.

Illustration: Erica Hample

For American basswood fruits to germinate, their thick pericarp must be weakened. In the wild, this is accomplished through several years' worth of freeze, thaw, and flood, but more efficiently by passing through the stomach of an inquisitive forager. My scarification technique involves hot water and a cheese grater. I stare at my pile of seeds. It's an impressive haul, but only twenty to thirty percent will germinate. What I have here is not nearly enough.

The next morning, I ski back up the road through last night's tracks. I gather basswood seeds while I climb. At the top of the hill my pack is full; I turn back home. I ski down again with the wind at my back. Sailing through the trees atop a bed of crystalline water, I feel like a basswood seed myself, and I'm struck by a thought that perhaps I might be giving myself too much credit.

My intent is to prepare these seeds for a better shot at success, to ultimately move the needle toward some version of Leopold's imagined world of biological integrity, but from the tree's perspective I am merely a dispersal mechanism. Like the squirrels and jays who inadvertently seeded Bernd's forest of chestnuts, I am at the bidding of basswoods.

A basswood tree has its own agency, scattering its seeds to the wind, bypassing its seed banking strategy by laying them at the at the feet of fauna. I imagine some Pleistocene beast lumbering along a game trail, scooping up mouthfuls of seeds that have collected in its tracks, digesting, scarifying, and planting as it goes. Today the basswood casts its seeds into the tracks of a great ape, who floats along on wooden sticks attached to his feet, gathering them merely out of curiosity, setting an abstract idea into motion.

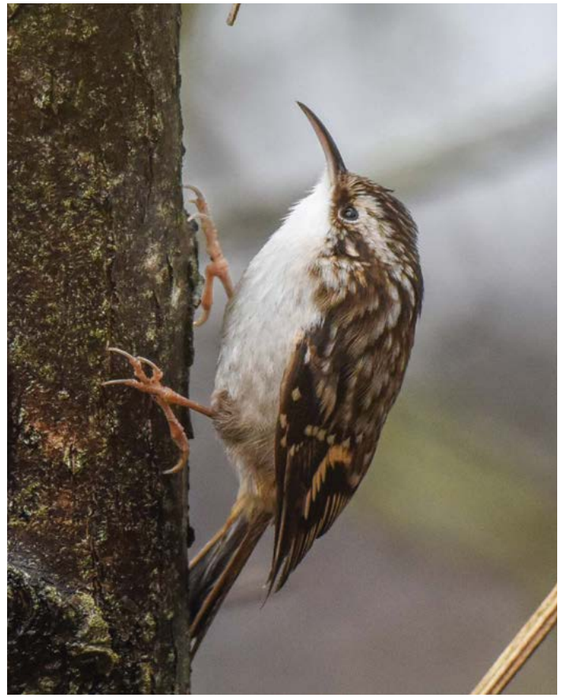
Many of our best ideas will never even germinate, but we should plant them anyway. Those that do may very well dampen off, or suffer root rot, or shrivel up during a drought. We may over-fertilize some and under-fertilize others. Most ideas fail, but some undoubtedly will wind up succeeding, even those that we consider long shots. If we move through life with arms outstretched, we will be ready to gather up any that we find. Under the right conditions, these ideas can break through to the canopy, and decades from now, we may find that the most improbable ones have indeed come to fruition.

Jason Mazurowski is an ecologist, naturalist, and adjunct instructor at the University of Vermont where he teaches courses in field ecology and pollinator conservation. Since graduating from the Field Naturalist program in 2019, Jason has been working with UVM's Gund Institute to study native bee populations.

Good Earth Stewardship

An Interview with Doug Tallamy

CHARLOTTE CADOW



Images: Doug Tallamy

Doug Tallamy is an entomologist. He's been at the University of Delaware for forty-one years, where he teaches, does research, and talks to the public (a lot). Doug has turned his passion for restoring native ecosystems in our yards into a series of books including Bringing Nature Home, The Nature of Oaks, and Nature's Best Hope. After reading Bringing Nature Home in 2018, I've been following Doug's growing contributions to the conservation of biodiversity. On a snowy afternoon in February, I called Doug and asked him about his roots, his work, and what he was seeing outside his window.

CC: Do you have any early memories of connecting to nature?

DT: When I was a child in New Jersey, our neighborhood was a new circular development called "Oak Park." At the other end of the loop, there was a little pond. In the spring, toads came and started to sing, mated, laid eggs, and the eggs hatched into little pollywogs. The day the little guys started to hop out onto the ground, I watched a bulldozer come and bury the pond and all the toads. It impacted me. This was the death of an entire aquatic ecosystem - buried forever so that my next-door neighbor could have a lawn in their backyard. Right then and there, I decided there were too many humans on the planet. But I made the same mistake that almost all of us have made - thinking that we've got to save the places that aren't destroyed yet. I never once thought about putting life back into the places we do live.

CC: That sounds devastating.

DT: I spent most of my life despairing that we were wrecking everything.

CC: What changed?

DT: In July of 2000, we bought a ten-acre lot in southeastern Pennsylvania. Our goal was to restore biodiversity to a really wrecked piece of land. Shortly after we moved in, I was walking around the property looking for insects by finding feeding scars on leaves. There were invasive plants everywhere: autumn olive, multiflora rose, Japanese honeysuckle, Amur honeysuckle, and oriental bittersweet. These plants had little to no feeding damage on them. By comparison, the black cherry, black oak, and walnut were supporting good insect populations. I looked in the literature for a study comparing insect use on native and nonnative plants, and I couldn't find anything. So, I wrote an NSF grant and I wrote a USDA grant proposing to study insect use of natives and nonnatives, and I got both the grants. When the public found out about this work, they were interested because my message is doable: by choosing native plants, they can reduce biodiversity losses and be involved in a solution. That's what changed my despair into action, by realizing that we've got eight billion people who can start to work on the solution - it is a global crisis, but with a grassroots solution that involves everybody.

CC: Wow! That's a lot of people to empower - how can they get involved?

DT: You can satisfy some of the needs of the natural world almost anywhere by choosing the right plants, even if it's just a potted plant on your balcony, in the middle of a city, or in a rural area. We can reverse the modern biodiversity crisis. For years I have been talking about "Homegrown National Park." If we cut the area of lawn in the United States in half, that would give us 20 million acres to put towards conservation. That would create a new national park bigger than all the major national parks added up. As of today, over 14,000 people have registered their properties on the Homegrown National Park website, encompassing forty-some thousand acres. It's a drop in the bucket, but an important drop because it will help change the culture, and send the message that everybody's an important part of the future of conservation.

CC: Okay, so people can re-landscape their lawns, and plant native species that increase biodiversity on their properties. What changes have you observed on your property?

DT: We're doing this on our ten-acre lot. I'm sitting here now, looking out the window at brown creepers hopping up our trees that are seventy, eighty feet tall - I planted them from seed. It wasn't that long ago that gray tree frogs came to our yard. We've recorded sixty species of birds that have bred on our property. I'm also photographing all of the moths that I have found on our property, and I'm up to 1,140 species so far. They're here because we put the plants back.

CC: How does your conservation approach fit in with Wilson's Half Earth theory?

DT: In Half-Earth, E.O. Wilson said that to save life on planet Earth, we have to save functional ecosystems (Mother Nature) on half of the earth. But half of terrestrial earth is in some form of agriculture, much of the other half is covered by airports, roadways, nearly eight billion people, and our detritus. We don't have a third half to set aside for nature. The only option that's left is to learn how to coexist with nature everywhere, on all the private land, all the industrial land, within all of our infrastructure. The problem is not extinction; it's defaunation. Even though there are lots of animals and plants that are not extinct, their populations are just a fraction of what they used to be, so they're not performing their ecological roles anymore. I don't care if they're still in the Great Smoky Mountains. Count the number of species in your yard, and then figure out how many species should be in your yard, and you'll see what I'm talking about.

CC: So, when landscaping for biodiversity, what should people be thinking about?

DT: There are four goals that every landowner can pursue - four ecological goals that every landscape has to accomplish if it's going to be sustainable.

It has to support pollinators.
It has to support a viable food web.
It has to sequester carbon.
It has to manage the watershed.

You meet these goals by cutting the area of your lawn in half, planting in a pollinator garden, turning out your lights at night to help stop insect declines, avoiding insecticides, choosing keystone plants, and removing invasive species.

CC: What about diseases, and non-natives? There are so many obstacles.

DT: We keep introducing diseases and invasive insects that make this really hard. But they are just one more hurdle that we can jump. By finding resistance in our native trees, we can have forests despite imported diseases. We're working on resistance to the chestnut blight, and making good progress. There are a few ash trees that are resistant to the Emerald Ash Borer. There is already resistance to oak wilt and bacterial leaf scorch in some of our oaks. I see it right in our yard. That's a reason to plant more oaks than ever, so that resistance will become obvious.

CC: Do you have any additional thoughts to share with the Field Notes audience?

DT: The biggest message that I want to convey is that everybody has a role. You either own property, or you can help somebody who owns property: a land conservancy, a park, or preserve. Everybody should bear the responsibility of good earth stewardship, and nobody has the ethical right to maintain that four-acre lawn anymore. Such places are destroying the watershed, they are not supporting the pollinators, they're not supporting the food web, and they're not sequestering carbon. So, it's our responsibility to start to fix that, to share a sense of responsibility, a sense of urgency, and also give a sense of hope. I think this message is starting to go viral. You know, not like a Facebook thing would, but faster than I can keep up with.

Visit https://homegrownnationalpark.org to register your property, and help light up the map.

Charlotte Cadow is a native plants enthusiast, long-distance runner, and a current Field Naturalist (Cohort AL)

Images: Erica Hample

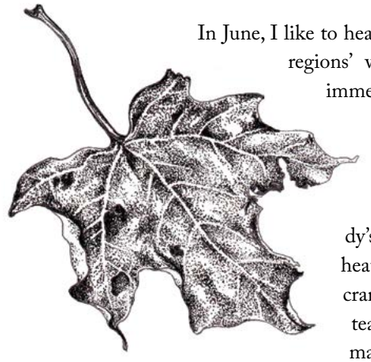
Self-Organization:

A Scientific Model for Community Resiliency

TOM WESSELS

Life has been on this planet for 3.8 billion years. To get a sense for how long that is, imagine the thickness of a sheet of paper equaling one century. How tall a stack—each sheet representing a century—would we need to equal 3.8 billion years? It would be a bit over three miles in height. That's a lot of centuries, and during that time life not only sustained itself; it thrived!

The key to this remarkable feat is that all living systems self-organize, meaning that as they grow bigger, they become more complex. System parts—cells in a body, species in an ecosystem—become ever more specialized through time, developing tightly integrated webs of interrelationships. Through their integration, individual cells or species—doing what they need to for their own purposes—create conditions that make the whole system increasingly energy efficient, stable, and resilient.



In June, I like to head out to one of our regions' wonderful bogs to immerse myself in its flowering. Orchids like grass pink, rose pogonia, and showy lady's slipper, along with heaths such as small cranberry, Labrador tea, and bog rosemary, make up the beautiful, delicate array. Seeing them together, I'm reminded that none of these species could grow in a bog were it not for self-organization.

The bog mat is so acidic that nutrients quickly leach out of it, making it similar to a nutrient desert. Mycorrhizal fungi change all that by quickly absorbing nutrients as they become available and shunting them to the orchids and heaths. In return, these flowering plants give their fungal partners energy for their survival. Neither group could exist outside of this tight network of mutually beneficial interactions.

In late April, I wander among the bitternut hickory, white ash and sugar maple of our nutrient-enriched forest communities. Before the trees leaf out, wild leeks, trout lilies, Dutchman's breeches, and squirrel corn carpet the forest understory in emerald green. These species are vernal ephemerals that do all their photosynthesis during a few weeks in April and early May. Then they make way for plants like blue cohosh, maidenhair fern, baneberries, and plantain-leaved sedge. In this way, these two groups of plants have specialized their temporal niches to coexist without competing for sunlight—another example of self-organization.

Self-organization is also a process that, through specialization, decentralizes critical functional roles. In ecosystems, thousands of species take on the work of photosynthesis, decomposition, and pollination, each in their own specific way. This is why ecosystems are so resilient. If, for example, one decomposer goes extinct, many others will carry on this critical functional role. But whenever we centralize or concentrate critical functional roles, we move a system toward instability and a lack of resiliency. Market-based societies have consistently defied the principle of self-organization by centralizing critical functional roles, and as a result, have greatly reduced the resiliency of their socioeconomic systems.

While out on a woodland exploration yesterday with a number of my former grad students—one of whom is the Bee Inspector of Vermont—I was amazed to hear that there are at least 275 native species of bees in that state. If we add them to all the other insect pollinators, such as wasps, flies, butterflies, moths, beetles, and ants, we find well over a thousand species of pollinators—each pollinating at a different time of day or season or in a slightly different manner. The decentralization of this critical functional role means that if one species of pollinator goes extinct, the system is not without backups. Contrast this with the Central Valley of California. There, where heavy insecticide use has greatly reduced native pollinator diversity and abundance, farmers must bring in millions of honey bees each year to pollinate their fruits, vegetables, and nuts. This is a precarious situation: a critical functional role has been centralized in just one species! If honey bee colonies collapse, the Central Valley agricultural sector will follow.

Twenty-two years ago, as we entered the twenty-first century and a new millennium, the future in this country looked bright. We were not involved in any wars. The federal budget was running a surplus. There was talk of a peace dividend to tackle serious social issues. It is a shock to see how much has changed in just two decades! I can't imagine many people seeing the future as bright these days with the effects of climate change growing ever more impactive, a political climate that is so divisive that it paralyzes the government from tackling tough problems, and an economic system that lacks resiliency since it has concentrated capital in so few entities. Given all this, what are we to do?

In complex systems, all large scale change bubbles up from the bottom through positive or self-reinforcing feedback loops. This means we shouldn't expect major change to come from the top down. Instead, it will be the work of citizens to chart a path to a brighter future by using self-organization as our model. Just as species do in ecosystems, we need to create complex webs of interrelationships in our communities. This is how we can develop resilient local—and/or regional—socioeconomic systems that support all individuals.

A number of years ago one of my graduate students developed a Timebank in her community. The idea is simple. People who enjoy practicing a specific skill volunteer their time to the Timebank. Their skill represents their specialized niche. If they get picked by someone to work for three hours, they can then tap someone else in the Timebank for three hours of that other person's skill. With no exchange of money, community members are building capacity by helping each other out. Not only that, individuals who might not have crossed paths now create mutually beneficial interactions. For individuals with very different political views, these kinds of beneficial relationships offer a way to see each other as valued community members rather than pariah.

Humans have existed on this planet for at least 200,000 years and for more than 95% of that time, all human culture was gathering hunting culture; resources were given and shared, not bought and sold. Robin Wall Kimmerer describes Indigenous economies as gift economies where "The essence of the gift is that it creates a set of relationships. The currency of a gift economy is, at its root, reciprocity." If one hunter or gatherer had good luck, that food was shared with others knowing that in the future the sharing would be reciprocated. As such, community wellbeing was more important than any individuals. Kimmerer describes ways that Native people continue to practice gift economies. How sad that a rugged individualism, where people focus solely on their own wants, has taken such a hold in mainstream American society. The individualist approach runs counter to the self-organization evident in gift economies, breaking down relationships and dramatically increasing environmental degradation along the way. It's an anathema to healthy communities,

"From Consumption to Connection" is the title of the epilogue in my book The Myth of Progress. I believe we are hard wired to need meaningful connections with nature and within our communities. For more than a century, people in market-based cultures, including America's, have increasingly replaced those valuable connections with consumption as a means to find fulfillment. Sadly, consumption may give ephemeral pleasure, but not lasting fulfillment, as do the connections with nature and community.

Just as complex ecosystems thrive on webs of interrelationships, and just as humans have sustained themselves through giving and reciprocity for thousands of years, we can double down and self-organize. As the future becomes more and more challenging, our real security will be found in healthy, tightly integrated, resilient communities. That is the work in which we need to truly engage.

Tom Wessels is a terrestrial ecologist and professor emeritus at Antioch University, where he founded the master's degree program in Conservation Biology. He is the author of numerous books, including his most recent, New England's Roadside Ecology: Explore 30 of the Region's Unique Natural Areas.

Way Up Ditch Creek Road

Images: Naomi Heindel

NAOMI HEINDEL

Teton Science Schools, March 2020

Big Water, the lake-sized low spot in the driveway, was delightfully icy when we first headed outside each morning. By afternoon, our two-year-old, Asa, found out it was slushy, and even more fun. Asa was the one who named Big Water; he also helped us name Pocatello Hill after the foundry where the manhole cover on the trail was made. One day, exploring that hill, we got close enough to the ground to realize that wild strawberries grew there. Then there was Moose Poop Hill, great for strider bike laps any time of day, especially when the sun was setting over the Tetons and Dad's afternoon Zoom was not quite over. But the real star of our little corner of Kelly, Wyoming was Big Tree, an enormous, leaning, fire-scarred Douglas fir that needed a hug each time we visited.

Asa named everything on those long days as we waited for spring to come to the sagebrush flats, aspen groves, and cottonwood-lined creeks around our house. We crawled under trees and ate our snacks underneath, sitting on cone chairs. We found every access point to Ditch Creek, differentiating them by the best throwing materials: rocks, sticks, cones, bark. When the snow finally started to melt, we were out in the drips, saying hi to the first robin and waiting for the earliest sagebrush buttercups to bloom. As the road dried out, Asa wondered what lived in the cracks in the pavement and inspected each one, lying down on his stomach, eyes a centimeter from the road surface. I joined him, realizing I had never even noticed the cracks themselves, let alone contemplated their contents. We marked our first pandemic Passover by biking down Ditch Creek Road in the sunshine, a celebration of spring and freedom that felt more fitting than the matzoh balls we had made between Zoom meetings because it was outside in this landscape that had become so central to our lives.

As an experienced place-based educator and Head of Field Education at Teton Science Schools, I had been exploring and teaching in the cobbled hills behind the Kelly Campus for five years at this point. I certainly thought I knew it well, so I was surprised that spring to learn that I didn't know it toddler well, let alone pandemic toddler well. Maybe this deepening sense of place - the naming, the mapping, the intense familiarity - is a common process for all parents as they see everyday places through the eyes of their kids. For me, I know it'll always be linked to the feelings of family and intimacy, the weird combination of hunkering and hope, of those early pandemic days. Would we even know Big Tree without the months stuck at home? Maybe Asa would, but I am not sure I would have slowed down enough, or repeated that trail enough, or let him lead the way enough. I easily could have missed out on a whole lot of tree hugs had I stuck to my regular, adult, large-scale perspectives. Maybe I would now be leaving the Tetons knowing the landscape in broad strokes, but I would not know its details nearly as well. And, most importantly, I would not know Asa nearly as well either.

Naomi Heindel is the Executive Director of North Branch Nature Center in Montpelier, Vermont, a role she took on in March 2022 after seven years coordinating Field Education programs at Teton Science Schools. She and her husband and two young kids have just relocated back to Vermont, her home state; they are excited to explore a very different landscape together.

Image: Stefan Grey

Tree Skirt Moss

JANICE HARRINGTON

The trail: silent and still and white.

We stomp our way past
snow-blasted barks, cold
sheathing itself under our skin,
until we tremble and beat
our sides for heat.

On a flood plain
beside the Sangamon,
we find cottonwoods, slanting
towers of sycamores, oaks,
a dying ash, slags, slabs,
plaques of ice, snags
and wrack, ice-drowned
driftwood. And

beneath the snow,
gloved fingers uncover
this puzzle—green,
impossibly green,

not winter-seared or rotted black,
not shriveled, but a verdant mat.

Always some green, you said,
always some.

And I could only wonder
how it grew
beneath the burdens of snow,
this fierce enduring,
despite the flensing cold.

Janice N. Harrington's latest book of poetry is *Primitive: The Art and Life of Horace H. Pippin* (BOA Editions). She teaches creative writing at the University of Illinois.

Fire in the Pines

Images: Kelly Norris

SONYA KAUFMAN

We gather in a semi-circle around a white box trailer, ready for a pre-burn briefing. The trailer, two pick-up trucks, two small fire engines, an ATV and a UTV (think heavy-duty golf cart) are parked on the side of a sandy road in rural South Carolina. The UTV is fully loaded with a 100-gallon tank of water, 40 gallons of torch mix (3:1 ratio of diesel to gas), drip torches, a chainsaw, a first aid kit, and an overly full snack bag. Weather observations are written on the side of the trailer: 58ºF, 62% relative humidity, winds 3-5mph out of the NE with gusts to 7mph, probability of ignition 40%. It's 10 a.m. on January 29, 2021. The sun shines through a stand of longleaf pine trees. Brilliant green pine needles contrast with a piercing blue sky, and rolling sand hills are coated in reddish-brown needles. Devin draws a map of the burn unit next to a chart with assignments for the day: Yeatman, Burn Boss. McCann, Firing Boss. Kaufman, Holding Boss. Tyler passes around a box of Wheat Thins, a can of smoked trout, and a bottle of sriracha, grinning quietly as Devin starts the briefing.

As a Prescribed Burn Crew Lead with The Nature Conservancy (TNC) of South Carolina, I'm getting ready to burn 115 acres of longleaf pine savannah with a team of eight people. We're in the E Compartment of Cheraw State Park in northeastern South Carolina. Devin stands in front of the box trailer, indicating on the map his plan for the day. As Burn Boss, Devin is responsible for planning and coordinating the burn. Our aim is to reintroduce fire to this longleaf pine ecosystem. We want to encourage proliferation of longleaf, reduce hardwood competition, and improve nesting habitat for the federally endangered red-cockaded woodpecker. Besides the ecological objectives of the burn, the most important goal is for everyone to make it safely through the day.

We pile into the back of a pick-up truck and drive to the southwest corner of the unit. "We'll have a test fire at the edge of the wet area along the dozer line," Devin instructs as crew members grab a drip torch in one hand and hoe or rake in the other. Everyone gathers to watch as a crewmember tilts a drip torch so diesel and gas pour onto its flaming wick. Liquid fire spills onto the ground. The igniter draws a dot, pauses, adds a 20-foot-long strip, and observes the surface fuels' response. Today, it's slow and easy, and the carpet of pine needles burns readily. Flame lengths are 1-3 inches, backing into the wind.

Devin gives the go-ahead to continue. The igniters move east, dropping dots of fire every 50 feet. It's my job as Holding Boss to patrol the fireline, keeping an eye on the "green," the forested area outside the burn unit that we don't want to catch on fire today. I drive the UTV, watching embers and smoke billow up and over the road. Fire crawls 3 feet up the bark of a large longleaf pine on the edge of the unit. These trees have been shaped by evolutionary pressures exerted by frequent, low-severity fires. Their thick bark insulates living tissue from heat and flakes off to disperse flames. Fires clear areas to bare mineral soil, allowing longleaf pine's large seeds to germinate. Left alone, fire would crawl up this tree, scorch the trunk, and eventually dissipate. I decide to speed up the process. I fire up the pump, scramble up the steep bank, and spray water until the tree is extinguished.

Most of the prescribed burning in the Southeast focuses on restoring longleaf pine forests, which once covered nearly 100 million acres of the southeastern coastal plain. Home to 800 plant and 200 vertebrate species, these forests are some of the most diverse in the world. Today, after decades of logging, fire suppression, and development, less than 5 million acres remain.

As the lighting pattern continues along the southern edge of the unit, Devin zooms around on the ATV. "I want to get some more fire into those hardwoods," he calls. "Take the Very pistol and fire a few rounds." A Very pistol, also known as a flare gun, is a small silver pistol with an orange handle that launches flares several hundred feet into areas that are thick or hard to access by foot. It's a practical tool—and any crew member gets a thrill from the opportunity to yell "Firing!", shoot a gun, and watch the hillside catch fire.

I continue to patrol the fireline, hearing occasional shouts of "Firing!" and gunshots in the hardwood swamp. A call comes for me on the radio: the drip torches need a refill. Two hours have passed. Shawna already has a black streak of soot across her nose, and everyone's cheeks are flushed with exertion. The excitement of an early-season burn is palpable. "How's it going?" I ask. "Anyone want a snack?" Big grins precede the response. While I fill up torches, the firing team reaches into the snack bag, a cloth tote speckled with ember holes and duct tape patches that is a trademark of the crew. We never travel without it stocked full, and the UTV driver ensures snack access when everyone is working hard.

As we round the southeastern corner of the burn unit, Devin sends three people to ignite the interior. "Get some more fire into those hardwoods," he requests, "and once you're finished, head over to the RCW trees. Give me a shout on the radio when you get there."

RCW stands for red-cockaded woodpecker, the only woodpecker to nest in living trees. Old growth longleaf is its primary nesting habitat. The tree produces more resin than other pines in the southeastern coastal plain, and the woodpecker uses this to its advantage, drilling and pecking resin wells to release a physical and chemical barrier against rat snakes and other tree-climbing predators. Earlier today, I navigated through the forest with Avenza Maps, looking for tree trunks banded with white paint and frosted with dried sap. Because the resin is highly flammable, describing frosted trees as "candle-like" in appearance has multiple meanings. A cloud of pine needles and dirt followed me and the crew this morning as we ran leaf blowers, clearing a 20-foot diameter around the fourteen RCW trees in the unit.

Responding to Devin's call, I join the team hiking in to burn around the woodpecker trees. We crash through crunchy pine needles and stride through a patch of young longleaf. "Here we go again, hiking extra miles to protect a couple of birds." It's 3 p.m., our faces are coated in sweat and soot, and I feel my feet starting to ache. I adjust the straps on my pack to give my shoulders a break and drop three dots of fire around the cleared perimeter of a tree.

Burn crews feel pressure from wildlife biologists to protect every woodpecker nest tree. Even with shared goals of longleaf and woodpecker protection, tensions arise when healthy trees are killed in controlled burns. "Let's pick up the pace!" I call. The main fire is getting closer. I make my way to the next tree.

My experiences on burn crews tell me that in the long-term, more fire on the ground will result in healthier, more resilient forests. And there's evidence to support that. In the longleaf forest of Sandy Island Preserve, a TNC property in eastern South Carolina, frequent fire is the only forest management tool employed. Burning within the longleaf forest occurs on a three-year rotation. Last year's Sandy Island Preserve woodpecker survey revealed a thriving population of more than 500 nest trees on 5,500 acres of longleaf pine forest, the largest single red-cockaded woodpecker population that TNC manages.

Our interior ignition mission complete, we join the rest of the team monitoring the burn from the northern line. Flames back down the hill above and smoke glows pink in the setting sun. Smells of diesel, gas, and wood smoke carry across the unit. Devin's voice comes across the radio: "Alright, got tonight's dinner menu from River's Edge. We got surf and turf: ribeye steak with coconut shrimp, two sides. And finally, the catfish platter on its own. So, as she told me, it's a seafood medley kind of night." I can hear him smiling. Before the end of the burn, we have an order ready so our hungry team can pack up their tools and eat.

The last drops of fire close the burn perimeter, bringing our operation to an end. This is our second burn of the year, and by the end of April we will have applied fire to more than 5,000 acres across South Carolina. The crew stands together, watching fire spread across the land. In the quiet, I feel deep appreciation— for endorphins from a hard day of work, for my dedicated fellow coworkers, and for fire that glows and crackles, restoring health to the southern pines.

Sonya Kaufman (Cohort AL, '23) is a fire practitioner, contra dancer, and current Field Naturalist student.

Image: Judy Dow

A Grandmother's Discussion for Hope with Her Granddaughter

JUDY DOW & JUNIPER DOW MURRAY

As the Executive Director of Gedakina, a Native organization that works with women and their families to self-determine a good path in life, I often talk about the importance of understanding our climate crisis and how we got here. I spend even more time screaming about how to get out of it. For most people, memories are short; they have forgotten the values we need to care for our Mother the Earth: Relationship, Respect, Reciprocity, Responsibilities and Reverence. My hopes are with those who understand and practice these values.

My granddaughters are among those who give me hope. Ten-year-old Juniper reads about climate change, loves Greta Thunberg, is curious about the impacts of climate change on her life—she recycles, gardens, reuses and considers herself a minimalist. She and her sister, Prudence, are not trapped by the same wants that confine others. As they have grown up, they have been taught to limit their toys and to use what is around them to make what they need and value. They've been taught that their imagination is the most important thing in their life, and that with this they can find balance in their lives.

Juniper and Prudence are why I fight for a future for all beings. When I struggle to find balance in the crosswinds of hope and doom, they are my compass, rudder and sail.

I turned to Juniper to help me think about what it means to communicate effectively about the climate crisis. She knows that my outlook sometimes turns bleak. I've seen a loss of hope in so many adults; I've seen one excuse after another as to why they don't need to worry. They feel someone else has that job, someone else will figure out the answer. Juniper knows how I feel about these patterns of denial. But she reminds me, "It's important to always have hope in your presentations." She says that without hope, people will just turn miserable.

"Take one little step at a time," she says. "Like you compost one banana skin today, and one tomorrow, and one every day—after a year it will be a lot, and you will make a difference. You can't give up."

She has so much wisdom for a youth.

The students I work with are mostly around Juniper's age, third, fourth, and fifth grade. They want to know what's happening to the planet; they read, see and hear about it. But we live in a "give me" world now, and they struggle to learn what is a "want" versus a "need," for the most part because they've not been taught the difference.

Juniper has an answer to this. She wants people to understand, "You don't need new stuff all the time. If you go outside, something similar enough to what you want will be there. If you want a doll house to play with, you can make one with bark, sticks and leaves. The dolls can be the acorns. You don't have to want a doll house—you can just make it with what you find outside."

The students I work with don't need a phone, a tablet, a TV, or multiple computers, but they want them. They don't understand that the process of making these things includes harvesting toxic and rare materials; they don't know that some of these items expel harmful radiation. The good thing is that they want to learn—they want to know more. Like Juniper with her analogy of the dollhouse, I need to find the right words to teach them what is happening and what they can do about it. This is my Responsibility.

So, I teach them, you may want a TV in every room in your house, but you don't need a TV in every room in your house. There is nothing wrong with slowing down to smell the roses. Walking outside together, we learn to read the story the land has to tell us. We take the time to form a relationship. We continue to practice the difference between wants and needs.

Juniper could probably tell you the names and uses of fifty plants in her yard. Now that's a need that we can use as we steer into the future. Those computers and phones won't be any good when we're deep into the climate crisis. Our teaching needs to reflect the changing times: what is useful today and what will be in the future.

Some see technology as our savior, but this is not what I teach. Depending upon Hydro Quebec to electrify our vehicles has already taken harvesting and hunting grounds from eleven Indigenous Nations. To continue expanding our "clean" electricity production by damming rivers will take land from another five nations. How can this be equitable to the folks that have been and are the care takers of all this biodiversity?

What we need for hope is community and Traditional Ecological Knowledge and reduction. We need to work together with a one-mind, one-heart way of thinking. Juniper understands this. "Why," she said to me once, "would you want to cut down a tree to control nature? Nature knows better than us. We should let the trees guide us."

Those children who've gotten outside more during the pandemic have begun to notice plants, birdsongs, tracks on the ground. They are discovering that there are different kinds of learning and that these ways of learning must be braided together. Traditional Ecological Knowledge is the path to survival. I hope the youth of today continue to learn to braid different knowledges together just as Indigenous people of the past and present have done. As they continue to explore, experience, and observe the outside world, their growing connection to the Earth will control the fears that children often develop when natural lands become an unknown.

We are born knowing how to be in Relations with the earth. We need to engage in Equity once again, seeing the land as our equal, developing the relationship with Mother Earth that will help her. If we continue down this burnt path we are on, Mother Earth will be fine, she will recover—but we won't be here to see it.

Relationship. Respect. Reciprocity. Responsibilities. Reverence. Take those five values of caring for our Mother and embrace them. Use them. Teach them to our youth. Convince your elders that think otherwise how important they are. We have the skill sets. We can do this with a one-mind, one-heart way of thinking.

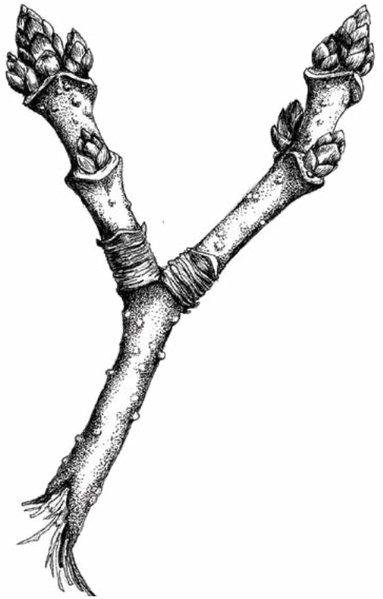


Illustration: Erica Hample

Judy Dow is a Vermont Native and has lived here her entire life; she currently resides in Essex, Vermont with her husband Steve and with her daughter and granddaughters next door. Judy is the Executive Director of Gedakina.

Image: Dylan O'Leary

For the Bats

DYLAN O'LEARY

In 2001, I moved to a house in Granville, NY with a pool in the backyard that attracted dozens of bats. I was eleven and had dressed up as Batman for the last six Halloweens. Things were looking up. At dusk, my sister and I would poke our eyes out of the water and watch the dark shapes wheel and swoop over the surface, chasing balls we threw up into the air. In 2006, a tiny fungus called *Pseudogymnoascus destructans* started killing bats in upstate New York. Less than ten years later, the death toll soared into the millions. The affliction called white-nose syndrome had spread to caves across twenty-seven states and two Canadian provinces. Genetic research revealed the fungus originated in Europe, suggesting that this entire tragedy might be the work of one unsuspecting transatlantic human boot.

I didn't know any of this in 2015, but only two bats visited the pool that summer. In other bad news, I was twenty-five, success in my career as a conservationist was feeling more elusive than student loan forgiveness, and I had just started listening to podcasts about climate change. Then I tore a ligament in my left knee. Despair was imminent, but I decided to shake my fists at the throes of prescribed inactivity and endeavor to build things. Two things, in fact: a woodshed, and a bat box. The woodshed was something that my family had wanted for years, but the bat box was for me. I needed to feel like I could still contribute to the world, even if it was just for two bats in my own backyard.

I found schematics on the Bat Conservation International website and built two maternity roost boxes, each designed for two hundred little brown bats, *Myotis lucifugus*. They housed nothing but dust in my garage for a year and a half. Then a bridge in Cornwall, VT burned down.

The bridge was a maternity roost for one hundred and fifty little brown bats who fed from the largest and most biologically diverse wetland complexes in New England, called the Otter Creek Swamps, which are conserved by The Nature Conservancy and Vermont Fish and Wildlife. Data for this population stretches back to 2006, before the onset of white-nose syndrome, making this a particularly significant site. I started serving with The Nature Conservancy as an Americorps member shortly after the bridge met its doom. I remember being graciously invited to participate in conservation planning meetings, but pangs of self-induced inadequacy quashing my contributions. My voice always felt like a quail fart in a dust storm—until the night when I learned about the ill-fated bats at Cornwall.

After a serendipitous chain of emails, I found myself shivering outside of a mine entrance next to Alyssa Bennett, the Small Mammals Biologist for Vermont Fish and Wildlife, who was surveying bats on a chilly October evening. Our headlamps barely illuminated the tiny vertical strings of a harp trap which were invisible to sex-crazed bats zipping around the glistening stone entrance of the mine looking for a mate. They would collide with the sneaky barrier and tumble unceremoniously into a canvas sack. As Alyssa stretched their wings out for a quick examination, scars of white nose past appeared as small, opaque blotches where their skin had grown to fill holes made by the fungus. It looked like bread dough stretched too thin. Seeing the affliction firsthand like this was a call to action. I asked Alyssa where my two bat boxes might make a difference. That's when she told me the story of a fire, the demise of an old wooden bridge full of bats, and the state's plan to install a bat box of their own creation in the adjacent marsh. "The more the merrier," she said.

With the help of the Vermont Department of Transportation and Vermont Fish and Wildlife, we installed all three bat boxes

Image: The Nature Conservancy

Scale alone doesn't always predict outcome: in three years, this small effort facilitated the reproductive potential of over eight hundred bats.
Visit www.batcon.org to find the same bat box plans I used. You never know when hope might take wing from a whim.

at Otter Creek Swamp during the fall of 2016 and made plans to monitor them in the summers to follow. While winter hibernacula counts were historically considered the most reliable population assessments, ecologists now realize that cave fidelity isn't guaranteed, and that an unknown number of bats overwinter in hibernacula that aren't easily monitored, such as talus slopes, tree boles, and buildings. And while harp traps present an excellent opportunity to see bats up close and personal during the fall mating season, revealing useful information about their condition, these traps tell almost nothing about population trend. Summer emergence data helps complete the annual cycle assessment. In the summer, females gather at roosting sites called maternity colonies where they each give birth to one precious pup per year. If four or five summer counts are staggered carefully, biologists and other volunteers can observe maternity colony numbers increase over the course of three to four weeks as pups are weaned and join their moms to feast among fireflies and woodcock by the safety of nightfall.

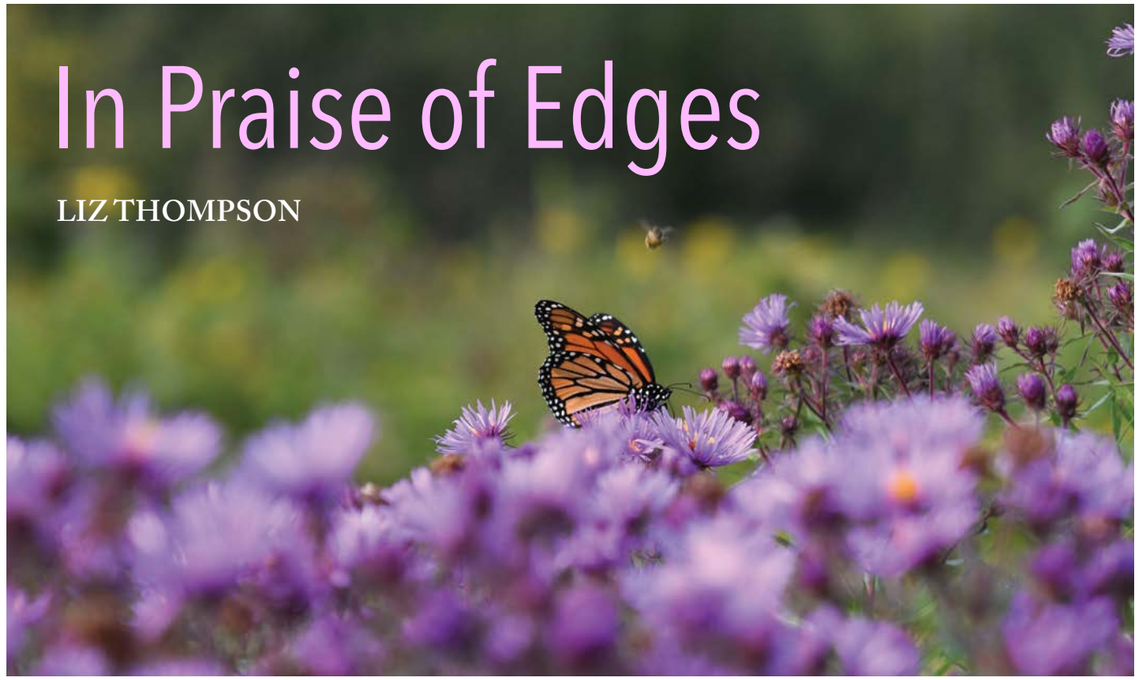
This was motivation enough for me and the local volunteers who had been counting the bats at Otter Creek Swamps since 2006 to brave the buggy swamp at dusk and search for survivors. We counted 181 bats emerging from the bat boxes in 2017, 272 in 2018, and 362 in 2019. Of course, summer housing is no solution to a bat killing fungus to which there is no known cure, but at least the burden of finding a suitable summer roost where mothers could rear their pups was lifted.

If you google the word "incommensurate," the sentence that appears below the definition is this: "Man's influence on the earth's surface seems incommensurate with his scale." Indeed, so many human scales seem tipped towards a negative outcome. Individual action can seem hopeless in the face of climate change, the Anthropocene, the pandemic, or even the accidental fungal outbreak that has killed ninety percent of the 6.5 million little brown bats that once squeaked across North America. But consider these two little bat boxes, born from my own struggle to find purpose, planted in a marsh along Otter Creek, housing some percentage of a state endangered bat species. All of it was small. But I'll be damned if anything has made me feel more useful in the nine years I've worked in conservation than watching those beautiful little brown bats cast themselves into the mosquito laden air each summer night.

Dylan O'Leary no longer dresses up like Batman, but he maintains a passion for wildlife conservation. He is a current Field Naturalist student (Cohort AL).

In Praise of Edges

LIZ THOMPSON



Images: Liz Thompson

When from the curve of the wood's edge does grow
Power, and that spreads to envelope me –
Wrapped up in sense of meeting tree and plough
I feel tiny song stir tremblingly…

—Ivor Gurney

I am fascinated by edges. Soft edges, hard edges, clear edges, fuzzy edges. As time goes on, and as I explore more landscapes enriched by human history, the edges in the world are coming alive to me, showing themselves for the diverse and interesting places that they are.

Rachel Carson's The Edge of the Sea might be one of the loveliest expressions of the rich life at an ecological edge. Having spent much of my younger life at exploring salt marshes, ocean beaches, and rocky tide pools, I can attest to Carson's assertion that the threshold where sea meets land is fascinating, diverse, and filled with life. Anyone who has spent time at the shore knows this, whether from unwittingly stepping on a man-of-war stranded on a beach, eating mussels harvested on a rocky coast, or naming and counting all the species of seaweed in the intertidal zone, as I did while an undergraduate botany student in Maine.

Life brought me inland by and by, and other edges found their way into my psyche and my professional life.

And I confess that the edges I encountered inland were, well, less appealing, at least at first.

In the Champlain Valley of Vermont, forest edges are often impenetrable thickets of non-native honeysuckles and buckthorns or native prickly ash. Time and time again I have had to push through these shrubby walls to get to the "real" forest, the interior forest, the forest that is relatively free of non-native species, the forest where native wildflowers flourish and wood thrushes sing melodiously.

Many species thrive in forest interiors, and we treasure and value those species. We plan for them; we design conservation areas around them. We strive to make sure that they and their habitats persist, protected from the forest fragmentation that is so increasingly common.

Wood thrushes do best in forests that are free of predators like raccoons. They need shade, a source of water such as a clean stream, and plenty of leaf litter. On the forest floor they forage for caterpillars, beetles, and millepedes to feed to their young, who perch sequestered in nests well above the reach of predators. Forest fragmentation has been implicated in the reduction in population of wood thrush and numerous other forest-interior songbirds.

Bobcats need good hiding places and cozy nooks, like caves or hollow logs, in which to build their dens and raise young. We think of them as somewhat secretive wild cats.

But what about the fragmented habitat of the Champlain Valley? It turns out that bobcats do live there, finding denning habitat in ledges within small forest patches, and hunting in and near those patches. Like many wild animals, they feel safest when they have vegetative cover.

Edges actually provide that cover, in a fascinating and beneficial way. A study undertaken by Vermont Fish and Wildlife a few years back, in which bobcats were fitted with radio collars and tracked over a number of months, found that the hedgerows in the Champlain Valley provided critical pathways for bobcats to move around, to get from forest patch to forest patch, and to find and catch prey. They didn't seem to want to cross open fields, but moving along hedgerows gave them a real advantage.

…Once again I see
These hedgerows, hardly hedgerows, little lines
Of sportive wood run wild…

—William Wordsworth

In a recent statewide conservation planning exercise, a group of scientists sat around a virtual table gazing at maps of the Champlain Valley. Focusing on the "intact forest blocks," as we had been in the habit of doing, and dismissing the edge and hedgerow habitat as less useful for wildlife, gave me pause. Remembering the bobcat story made me think we should highlight those scrubby edges and hedges, and love them.

As a botanist, I can't help but noticing that the edges have rich plant life, too. Especially the soft edges, the less defined edges. OK, put the non-native shrubs aside for a moment. Let's look at a forest edge in, say, Charlotte. An edge between a hay field and a forest. Perhaps the border of the field was wavy at one time, following the curve of the tree line, when every bit of hay was needed and tended and cut. But over time, with bigger machines, edges have gotten straighter. The great benefit to this straightening is that there are some "leftover" areas, former little bits of hayland that are reverting to wild meadow, then shrubland, and perhaps ultimately forest.

These soft edges, these places between, hold the native goldenrods, the New England asters, the milkweeds, the monarch butterflies. As shrubs come in, they support golden-winged warblers and other shrubland birds.

I love these soft edges. I go out of my way to find them.

And in my own backyard, my little three acres in Jericho, my husband and I have let our former lawn go soft. Our adjoining neighbors have done the same. We let the wild things grow and thrive. We watch the bluebirds, monarchs, tiger swallowtails, native bees, and all kinds of other birds and insects come and go. Author Douglas W. Tallamy offers that this kind of softening could be nature's best hope. It may be, and meanwhile it sure gives us hope, and joy, and immense pleasure.

Liz Thompson is an ecologist who has been in love with the natural world since childhood. She studied and has worked in conservation in Maine and Vermont, and has taught botany in the FNEP program.

Learning to Listen

ERICA HAMPLE

Image: Erica Hample

January 17, 2021—Joshua Tree National Park, CA

I crawl out of my sleeping bag and curse to myself. My core and lower back are in spasm. It feels like my sacroiliac joint has slipped again. I drag my foam pad out to do my physical therapy among the sharp, yet bulbous granite spires that characterize Joshua Tree National Park. As my students wake up around the campsite, the hustle and bustle of last-minute packing fills the air.

Once everyone is fed and packed, we load up the bus and head for the trailhead. Despite my having the lightest gear in the group, my co-instructor, Quinn, has taken even more weight out of my backpack to decrease my discomfort. Pain is shooting down both of my legs and filling my abdomen. I concentrate on placing one foot in front of the other, trying to be okay with being not okay.

After seven years as an outdoor educator, I'm calling this my last season. In June, I was diagnosed with a connective tissue disorder called Ehlers-Danlos Syndrome that impacts my body's ability to produce collagen, resulting in hypermobility and chronic pain. As a kid, I impressed the other kids by jump-roping my own arms and licking my elbow. The pain started when I hit puberty, and as I've gotten older, my body parts seem increasingly prone to falling apart. The diagnosis is a formality that provides validation for the change in life path ahead of me.

My students run from Joshua tree to Seussian Joshua tree, trying to determine which one best represents each person's "inner essence," posing to mimic its shape. Joshua trees are thought to have spanned from southern California and Arizona as far as Northern Mexico during the Pleistocene. Yet in the small reserves that comprise the majority of America's protected lands, just a few isolated populations remain. This park has the largest population. Nonetheless, it is most likely too small and too isolated to allow the species to migrate north in pace with climate change. I scan the landscape and picture the extinct Pleistocene ground sloth, once one of the plant's primary long-distance seed dispersers, amongst the trees. My pack weighs on my back and brings me back to the present. Today, seed dispersal and migration of the Joshua tree rests on the much tinier shoulders of the antelope ground squirrel.

February 28, 2021—Lee's Ferry, AZ

High-pitched squeals echo off crumbling tan walls of Navajo sandstone. My students and I plunge into the placid, unnaturally clear, water of the Colorado River; the air temperature is 51 degrees. Naturally mercurial in its flow, the Colorado River used to scour the land from the headwaters in the Rocky Mountains down to its delta at the Gulf of California, building enough kinetic energy through the Grand Canyon to transport car-sized boulders downstream. Now that the raging river has been stopped by the imposing Glen Canyon Dam, built in 1966 and located upstream of our polar plunge site, a tame river flows obediently out of a timed release valve. The sediment that was once transported from miles upstream and colored the river an opaque brown settles to the bottom of the reservoir, trapping critical nutrients. Downstream, the Grand Canyon's unique environmental conditions were once home to eight endemic fish species. Today, three of these species have been extirpated, and the remaining five are endangered.

The completion of the Hoover Dam downstream of Glen Canyon in 1936 spurred a frenzy of dam building across the western

Image: Erica Hample

United States. The Colorado River, once a great nutrient highway from the mountaintops to the ocean, is now interrupted by fifteen dams on its main channel and hundreds more on its tributaries. Contemplating a new tingling sensation in my elbow down to my pinky and ring finger as I towel off, I assume that I've pinched my ulnar nerve again. As I look out across the river, I think I understand how it feels to be disconnected.

May 16, 2021—Gila Wilderness, NM

Image: Quinn Harper

Quinn and I wake before the sun and tiptoe around our students who, looking for a flat place to sleep under the stars, settled on the only flat spot around – the trail. Suppressing our laughter, we hike past. This is the last day of the expedition, and the students are traveling independently from us, freeing us to take advantage of the natural hot spring down the trail. It's my last expedition as an outdoor educator, and the pain shooting down my right leg with every step affirms this choice.

Just before sunrise, we arrive at the trailside hotspring. Steam announces the location. 147 degree water bubbles out of the ground and trickles into a basin enclosed by a crescent of stacked rocks before it spills into the Gila River. Stripping down to our underwear, we submerge ourselves. I feel the tension in my spine slowly release. When the line of the sun reaches us, we don our packs and resume our hike. As we crest a hill outside of the valley, the wind shifts, and the smell of smoke fills the air. What was originally a clear blue morning starts to take on an orange tint. Wildfire season is early this year.

In 1910, after an extremely dry year, thousands of fires blazed throughout the Northwest, ignited by coal-powered locomotives and electrical storms, destroying towns and taking lives. In response, the Forest service doubled down on fire suppression, mandating that every wildfire be put out by 10 a.m. of the day after it was detected, intending to eradicate fire from the landscape. But interrupting natural fire intervals allowed fuel to build up, resulting in larger, hotter, more devastating fires. In the absence of its natural decadal regime of low-intensity fires, thick vegetation choked the Gila Wilderness and creeks stopped flowing. In 1970, noticing this troubling pattern, firefighters in the Gila began to experiment with letting low-risk fires burn during the wetter part of the season. Almost immediately, the water started flowing again, and native grasses re-vegetated the burned areas. In 1978, the Forest Service revoked the 10 a.m. policy. By listening to the needs of the land, a change in practice was possible, improving ecological function.

May 26, 2021—Elbow Pond, Andover, NH

The campfire has burned down, and it's nearly midnight. Embers flicker, mimicking the stars reflecting off the still pond. I can barely see my students' faces underlit in red as they take turns recalling their adventures and how they've been changed by them. I shift my weight trying to find a position that hurts less. An acute pain

has settled in my spine, and I'm worried that I've herniated another disc. With some effort, I refocus on the words my students are sharing.

None of our lives after this trip will look the same as they did before, but mine especially so. My last season of outdoor education has been tempered constantly by pain and the fear of pain. Pain is a body's alert mechanism, signaling a need for change. It has taken my whole life, but I'm beginning to listen. Although leaving the outdoor industry won't be easy, I have to believe that change can foster growth. After all, that's what I've been teaching my students.

May 1, 2022—Burlington, VT

I sit on my couch, angled just right to catch the sliver of sunshine streaming through my window. It's been nearly a year since I lived nomadically, but it's still weird to be separated from the outdoors by walls and a roof. I'll need to get up soon. Squishy surfaces tend to be a problem for my bones, but I want just a few more moments of sunshine, a rare occurrence in the Champlain Valley.

I've learned so much from struggling with and learning to accept this disability. Still, if I could choose to be healthy and ignorant, I would. This disability sucks. It's complicated. It's unrelenting. But since I have wrestled some learnings from my experience, I might as well use them to inform the way that I approach problem-solving. Many of the problems nature faces are similarly all-consuming, complicated, and unrelenting. If we could choose not to have to deal with them, we would. But we can't.

Just as listening to the pain in my body led me to make fundamental changes to my life, so should we notice the effects of fragmentation, isolation, and disconnection on the land to make fundamental changes to our management. As a naturalist, it's my job to interpret the signals the natural world is sending. I'm learning to listen.

Erica Hample (Cohort AL '23) is an artist, outdoor enthusiast, and current Field Naturalist Student.

On Mutual Aid

SAM BLISS

In 1862, a twenty-year-old son of Russian nobility went to Siberia to serve in the Tsarist army. His trip turned the world's understanding of evolution on its head.

The Origin of Species had been published just three years before. Scientists at that time tended to interpret Darwin's theory to mean that individuals, by competing against each other for resources, made their species stronger as the fittest survived each generation.

But on geographical expeditions across the Siberian tundra, the renounced prince Pyotr Kropotkin saw abundant collaboration, not competition, among birds, insects, and mammals. Animals defended each other against predation, huddled together for warmth, hunted cooperatively, and cared for the sick, weak, and wounded rather than letting them die. Socialites like ants and humans, noted Kropotkin, also communally farmed and built public works.

The reindeer and the termites and the cranes and even the peasant villages of Siberia all cooperated without anybody being formally in charge. Kropotkin became an anarchist, an advocate for human societies without rulers. He is best known today for his political theory and activism.

But his naturalism in the field changed biology forever. He called the teamwork and altruism he witnessed "the great principle of Mutual Aid, which grants the best chances of survival to those who best support each other in the struggle for life." His 1902 book Mutual Aid: A Factor of Evolution made the case that cooperation drives animal evolution. Now, one hundred and twenty years on, there's evidence that plants, fungi, and microorganisms practice mutual aid as well, even across species.

Kropotkin's principle of mutual aid was a precursor to multi-level selection theory, the idea that nature selects not just the fittest individuals but also the fittest families, groups, and even interspecies relations. The herds and flocks that work together best are most likely to pass on their genes. Who is the fittest within the group often matters little in comparison. Scientists today accept this conception of evolution. Humans, weak and wimpy as we are, have always survived and thrived by cooperating in bands. Language and culture emerged to coordinate people's actions and join their fates. Mutual aid is our default behavior.

Yet today's economy makes us isolated individuals fighting for limited resources. Social Darwinism was a myth Kropotkin deconstructed, yet hypercapitalism has now brought it to fruition. Poor people live shorter, sicker lives than the well-off, especially in places like the United States where healthcare is far from universal. Study after study confirms it. These days, social evolution selects for what makes people wealthy: mostly having rich parents but also, probably, being selfish and ruthless.

Images: Mike of Food Not Cops

Sandwiches distributed by Food not Cops.

We fight back, and reclaim our humanity, by organizing our communities to care for one another. I'm part of a mutual aid project called Food Not Cops. We have been sharing lunch around a low brick wall in the corner of a downtown Burlington parking garage from 1 to 2 p.m. every day for two years, since the novel coronavirus broke out in Vermont.

Our collective is made up of precarious young activists, unhoused folks, people experiencing addiction, wannabe-punks like me, generous neighbors, and whoever else shows up to lunch. We're there with food, gear, rides, cash, or whatever else is needed when a comrade slips through holes in government safety nets and the non-profit complex. We not only give each other material support but also listen, affirm, express love, and suffer together. That solidarity is crucial.

Mutual aid has become trendy during the pandemic. Groups of neighbors helping neighbors have popped up in towns and cities all over. Communities made spreadsheets and online forms to systematize getting groceries to elderly, immunocompromised, and quarantining people. Informal organizations have been funneling resources toward those who need them. Folks keep outdoor fridges stocked with food for anyone to take. Outlets like the New York Times have covered the phenomenon.

"Mutual aid" has also come to mean sending money to people in need who post their stories and Venmo handles on social media. Giving directly works. Unlike donating to charitable organizations, it redistributes the power to choose what to do with that wealth. But there's not much mutual about unidirectional electronic cash transfers between strangers; it's just aid.

Mutual aid is taking care of each other like family. In community. As equals. It isn't necessarily reciprocal. Some have lots t give and others don't have what they need. What's reciprocated is the willingness to share what we have.

We need this sort of self-organized community care to get through the coming chaos. For Kropotkin, studying ecology in Siberia, harsh conditions drove evolution and made mutual aid essential. Harsh conditions are what's ahead; Covid-19 was a dress rehearsal at most. The newest IPCC report finds that any more delay in getting off fossil fuels "will miss a brief and rapidly closing window of opportunity to secure a livable and sustainable future for all." And we have not even started: the International Energy Agency followed with a report that in 2021 humanity emitted more carbon dioxide from fossil fuel burning than in any previous year. Much of the needed transformation feels beyond our control and politically unlikely: we need rich countries to intentionally downscale their economies and international agreements to keep coal, oil, and gas in the ground—a spirit of mutual aid among nations, if you will.

Community-scale projects like Food Not Cops make a difference, though. It's something we can do without permission or institutional power: rescuing ingredients and containers and transforming them into meals to share for free. When we eat food that would otherwise get thrown out, we're not demanding the production of additional food and all the land, water, labor, chemicals, and fuel that such production entails. When we form networks for meeting each other's basic needs, we're making ourselves resilient in the face of a future whose only certainty is that more calamities are coming.

It's not unlike what activist naturalists do: check up on community members—plants, mammals, bugs, birds, fungi—who cannot speak for themselves in the human political fora that often determine their fate, and do their best to make sure their needs are met, their lives are protected, or at least that the population evades extirpation.

Both among people and across species, extending solidarity to newcomers is becoming an essential part of mutual aid. Our comrade Mike has been less present at Food Not Cops recently because he's slammed at work trying to find housing and services for incoming Afghan refugees. And as reported in Seven Days, climate migrants from around the country are increasingly seeking refuge here in Vermont, where water is abundant and the weather is in some ways getting milder rather than more hostile. Many beings will head northward in the coming decades.

As we open our communities and landscapes to strangers displaced by climate change, conservationists will face some uncomfortable trade-offs, for instance between protecting today's cold-adapted maple-beech-birch assemblage and making way for the northbound oak-hickory regime. As a social scientist, my question to the naturalist community is this: how, in serving the needs of neighbors and newcomers, can we go beyond assimilation and let difference shape our collectives?

Sam Bliss is an organizer of Food Not Cops Burlington and a Gund Graduate Fellow at the Rubenstein School. He researches non-market economies, degrowth, and food that's not for sale.

NOTES FROM THE FIELD

COHORT AK: THE HOT DOTS - *Arthonia kermesina*

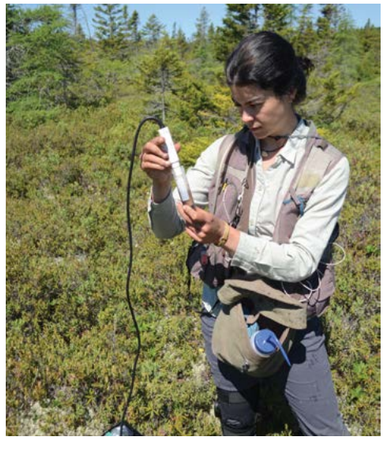
JAIME VAN LEUVAN

Jaime Van Leuven's master's project is part of the initial phase of the Eastern Band of Cherokee Indians' (EBCI) effort to restore American chestnut trees to their forests. She spent the summer of 2021 in southwest North Carolina trekking through Tribal Reserve looking for mature American chestnut trees. Jaime is currently compiling a report for the Tribe's Natural Resources Department documenting the history of the project, community outreach efforts, the layout and composition of their new American chestnut orchard, and the locations of the flowering trees she found. These reproductively mature trees may be used for cross-pollination to help breed trees with blight resistance or to indicate places within Tribal Reserve where American chestnut seedlings may thrive as part of restoration efforts. Following graduation, Jaime will continue working with the EBCI on the American chestnut project through an ORISE Fellowship in collaboration with the US Forest Service.

SARAH LINDSAY

Sarah Lindsay spent her 2021 field season surveying Lepidopteran species in the Ossipee Pine Barrens Preserve, a New Hampshire property managed by The Nature Conservancy. Pine barrens are fascinating fire-adapted ecosystems, characterized by nutrient-poor soils and pitch pine-scrub oak natural communities. To maintain this globally rare ecosystem type, TNC's silvicultural management of the preserve includes prescribed burning.

Sarah designed her Lepidopteran survey protocol to explore possible correlations between species richness and burn history. Over the course of the summer, she set traps to capture night-flying Leps in different management units within the preserve. By the end of the field season, she collected 15,101 individuals representing 513 species, and took approximately one million photos of cute moths. Sarah plans to use this data to provide presence/absence information for 19 state-listed Lepidopteran species, and to investigate patterns associated with land management within the Ossipee Pine Barrens.



LAURA HATMAKER

Last summer Laura Hatmaker was in a wetland lover's paradise, surveying two distinct properties for Maine Coast Heritage Trust. First, she completed a Natural Resource Inventory for Meserve Head, a mixed seepage forest with a fringe saltmarsh. When she wasn't entranced by the salt marsh, forming peatland, and freshwater marshes tucked away amongst archaeological remains (including a gravesite), she explored a coastal raised bog. One of the rarer ecosystems in the United States, Balch Head Heath was previously surveyed by UVM Professor, Dr. Ian Worley in 1980. Following up on his work, Laura worked to understand the factors affecting the bog, what was there currently, and what changed since Ian's survey. While completing her botanical and hydrological surveys, she also confirmed a population of rare butterflies, the Crowberry Blue, which had not been documented since the 1990s. Since returning from the field, Laura has written two site reports, developed long-term monitoring protocols for the bog, and crafted a virtual tour of Balch Head Heath, available on Maine Coast Heritage Trust's website.

CHRIS AJELLO

Chris Ajello spent last summer doing rapid ecological assessments of private and public parcels in Monkton, Vermont. He's currently compiling his findings in a report for the town's Agricultural and Natural Areas Committee.

RACHAEL MONOSSON

Rachael Monosson's project focused on developing the environmental leadership program for Mass Audubon's Wildwood Camp in Rindge, New Hampshire. An outdoor adventure camp with an ecological bent, Wildwood Camp serves youth from ages 8 to 18, and holds a leadership-based program for teens. In recent years, Wildwood aimed to redesign this leadership program to focus on inspiring interested teens to pursue leadership in the environmental field. Themes for the environmental leadership camp include team-building, communication, connection to place, and awareness of environmental problems and actions. Over time, the program led campers to become leaders and role models for younger campers at Wildwood, setting an example through service and engagement. Over the summer of 2021, Rachael designed and led activities for three sessions of the environmental leadership program, then evaluated the program and wrote a report making recommendations for the project's future.

MEET COHORT AL:

THE LUNA MOTHS - *Actias luna*

CHARLOTTE CADOW

Charlotte grew up along the fertile river bottoms and rocky ridges of Vermont's Upper Valley. Pursuing a growing passion for unraveling the mysteries of the natural world, she studied Environmental Science at Colorado College. Since graduation, she has sought out opportunities to encourage an environmental ethic that connects people to landscapes.

Charlotte is proudly distracted by all things (a)bioblitzing: birds, flowers, rocks, water/snow, and, more recently, bees. Observing and imagining the transformation of landscapes during timespans, from minutes to millennia, is a favorite activity.

ERICA HAMPLE

As a child, Erica could be found turning over rocks in her Atlanta backyard to look for roly-polies and toads. She collected sand-grain ruby fragments on the shores of the Upper Tallulah River in north Georgia and amassed a feather collection that filled her closet. In college, Erica studied canopy ecology, outdoor education, and visual art. Since then, Erica has spent her time traveling around the country working as an outdoor and environmental educator.

DYLAN O'LEARY

Dylan grew up shuffling his feet through highways of sting rays in the Gulf of Mexico and moved to upstate New York at the age of ten. He earned a B.S. in biology at Ithaca College in 2012 with a focus on animal behavior. Over the last decade, he worked as a research biologist, field crew leader, and environmental educator for the National Marine Life Center, Brookhaven National Laboratory, and universities across the country. Whether he is tracking snowshoe hare in the Poconos or monitoring the sage grouse populations of California, Dylan falls in love with every opportunity to use his passion as a naturalist to solve environmental problems. Most recently, he worked as a land steward for The Nature Conservancy and the Bureau of Land Management where he especially enjoyed the challenge of connecting science with conservation action. He likes to take his friends sailing, observe the Krumholtz by ski, and has a marked propensity for embracing the path of most resistance.

HAYLEY KOLDING

Hayley is a naturalist, educator, and president of the Connecticut Botanical Society. Storytelling and community involvement are central to her environmental ethic: a teacher even outside of the classroom, she is equally at home leading a plant walk or testifying at a public meeting on behalf of CBS. Hayley has collaborated with the Native Plant Trust, the Appalachian Trail Conservancy, the Association to Preserve Cape Cod, and local land trusts on land stewardship, public engagement, and conservation research projects. Her botanical avatars are the red cedars that cling to southern New England's traprock cliffs.

SONYA KAUFMAN

Whether Sonya is applying prescribed fire to restore South Carolina longleaf pine savannahs, calling contra dances for a large hall of dancers, or hiking up steep terrain on an early morning wildfire response in eastern Washington, you'll always find her smiling.

After graduating with a degree in Biology from Oberlin College in 2013, Sonya moved to Washington state to work in the woods for the Washington Conservation Corps. She worked on wildland firefighting crews in Washington state for five years, and she was the only woman for four of those five years. Between summers fighting fires with the Forest Service and winters lighting fires with The Nature Conservancy, Sonya has driven across the country more times than she can remember. She decided to stay on the east coast when the pandemic hit and spent the second half of 2020 working on a variety of construction projects for an organic vegetable farm and sourdough bakery in southern Vermont. She hopes to become an effective leader in climate resiliency and natural disaster response.

FIELD NATURALIST & ECOLOGICAL PLANNING

ALUMNI ASSOCIATION

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The FNEP Alumni Association provides small ($150 to $300) research grants to support alumni in pursuit of "passion projects" that advance conservation or ecology. We hope that these funds enable alumni to expand beyond the boundaries of their day-to-day jobs. Awards are based on interest and need. The fund is small, but your ideas and impacts don't need to be!

Apply at FNEPAlumni.org. Applications due by August 31, 2022. Applicants should be current members of the FNEP Alumni Association. We will continue to accept applications on a rolling basis after August 31, awarding funds based on availability. We look forward to seeing what ideas you have waiting in the wings.

LET'S GROW THE BOARD

With five years under our belts, we're ready to grow our Board of Directors. We seek alumni with a passion for telling stories, raising dollars, and connecting FNEPs. We hope to welcome new board members living outside the northeast, and from earlier cohorts.

We are looking for assistance to reach a wider, more diverse audience through our outreach channels, to improve our fundraising efforts, and to increase our administrative capacity for supporting students and alumni. These roles may include conference planning, secretary or treasurer duties, student mentorship, and alumni networking. The sky's the limit.

We meet virtually 4-6 evenings per year. Please email your interest to the FNEP Alumni Association at FNEPAlumniAssociation@gmail.com. With your help, our Board of Directors will represent Field Naturalists and Ecological Planners across generations and geographies!

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Backed by the resources of the University of Vermont, our graduate students can help your organization accomplish its mission – in the field, in the office, in our communities. We are now accepting pre-proposals for Field Naturalist partnerships during the 2023-2024 academic year.

Whether your needs are fire ecology or citizen engagement, natural community mapping or landscape restoration, application is simple: Briefly summarize your project in an email to our program director, Dr. Walter Poleman. Describe the site for any field work and what you hope to accomplish. We will work to pair you with a Field Naturalist, whose research will form the core of a master's project and provide a practical solution to your needs. The application window closes December 31, 2022.

Winning proposals call for a $6,000 partner contribution to support students during the field season. Your partnership includes:

More than a year of collaboration, beginning as soon as early 2023
Literature and other academic research to support your project
Field work extending from early spring though fall of 2023
Continued collaboration culminating in a draft by December and a final report by spring of 2024

Questions? Contact Dr. Walter Poleman by email (walter.poleman@uvm.edu) or at (802) 318-8441