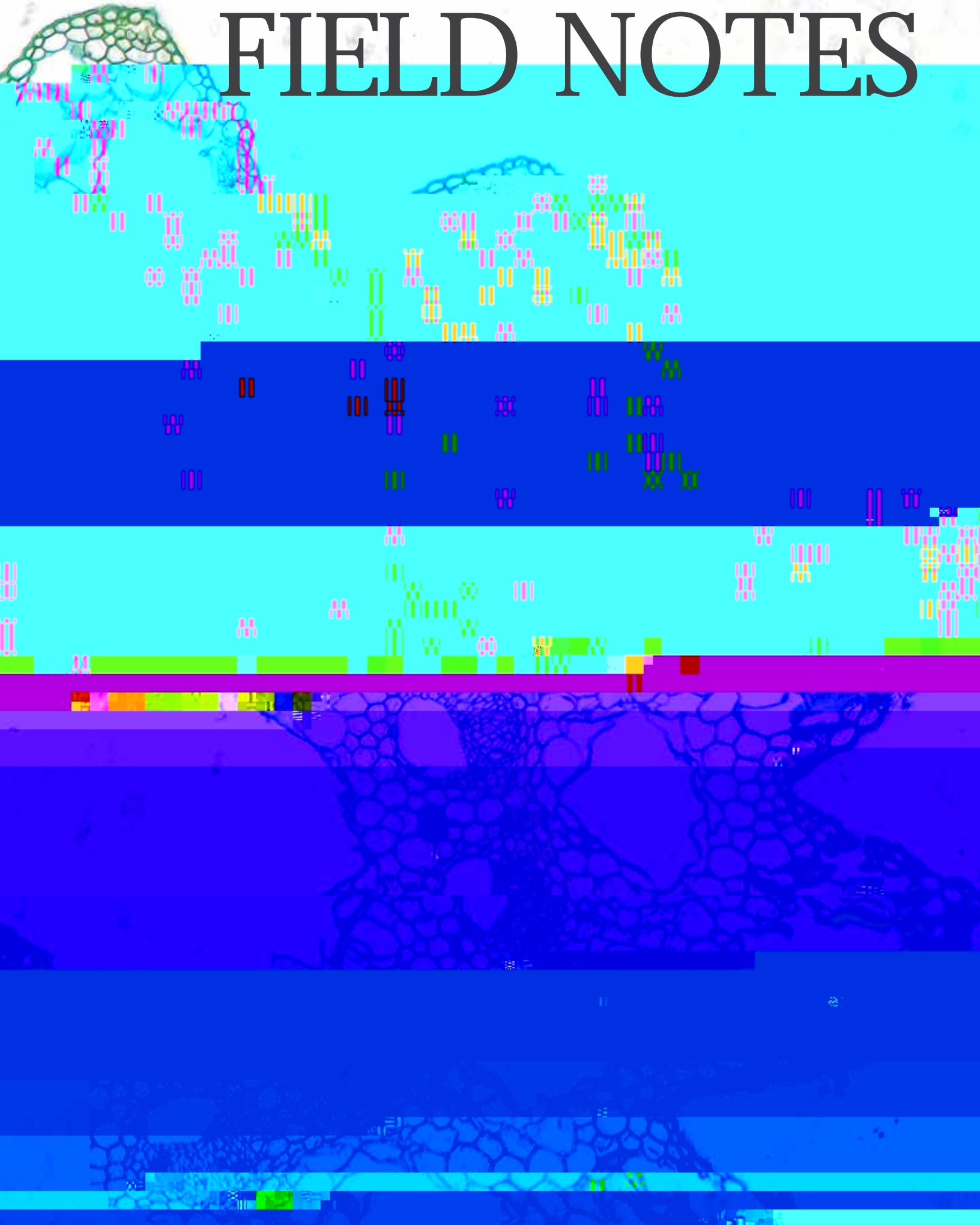
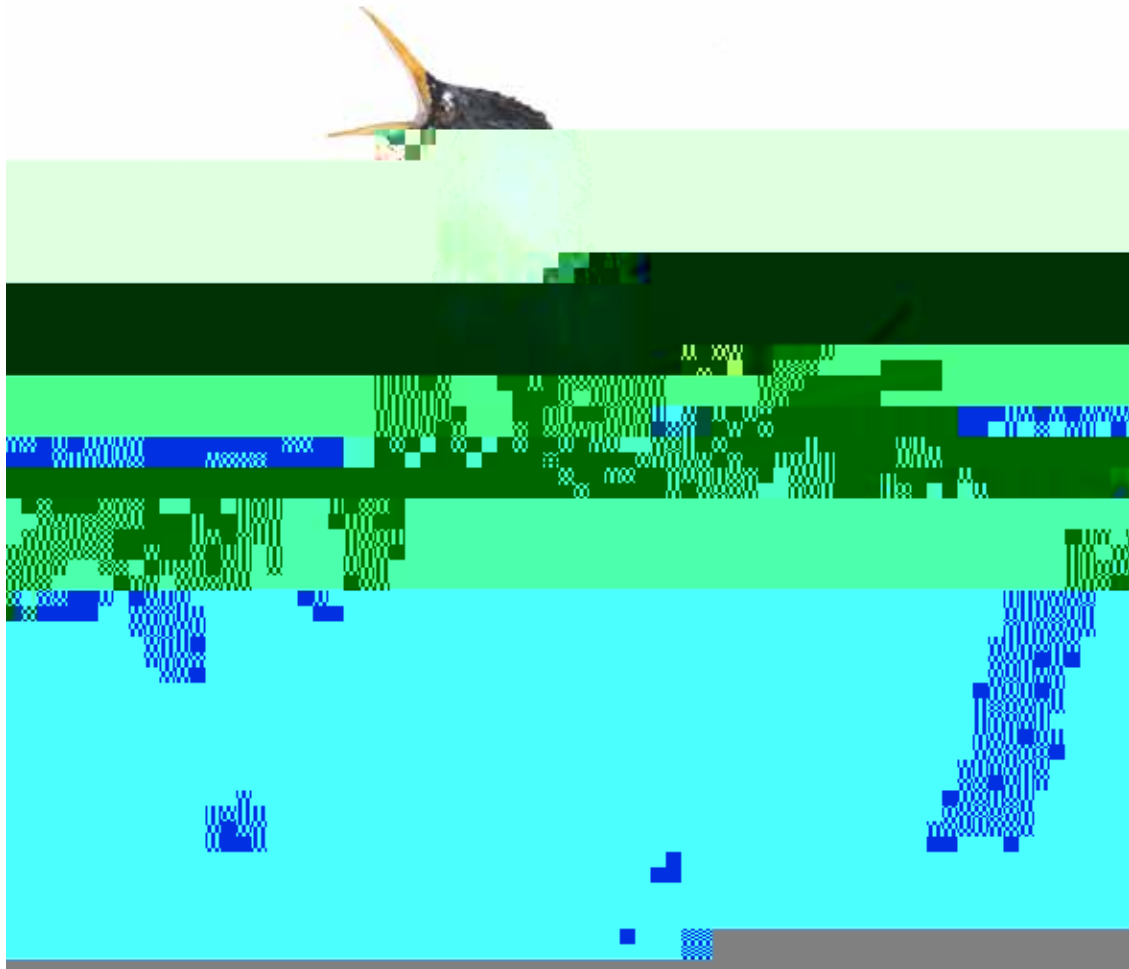


# FIELD NOTES





# 2015

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# Editor's Note

SONIA DEYOUNG

ature is in peril. Biodiversity is plummeting. Species are going extinct 100 to 1000 times faster than normal.

How many times have you read an introduction beginning that way? It's depressing because it's true. The ensuing article or book usually offers plenty of advice on what actions we must take to stem the tide of extinction and climate change and how to convince the uninformed public to care about it. But what about us—conservationists who already care about the deterioration of the natural world as we know it and who struggle with it emotionally? How can we find solace?

Last fall I stumbled on Bill McKibben's *The End of Nature* in the library and read the last 30 pages right there in the stacks. One passage concludes with the words, "There is no future in loving nature." I found myself thinking

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# *From the Program Directors*

In its Global Trends 2025 report, the National Intelligence Council warns of a “transformed world” that will provide both opportunities and challenges for humanity. This top U.S. intelligence organization has the mission to integrate intelligence information at the national and global scale in order to protect the country’s security. In a globalizing economy—with population growth, water and food scarcity, climate change, peak oil, Middle East nuclear proliferation, and terrorism being the top concerns—the rising importance of the environment as a national security risk marks a dramatic change for environmental issues in national policy debates. In 2012, then-Defense Secretary Leon E. Panetta stated that “climate change has a dramatic impact on national security.”

Humans have always been part of nature, but the relationship has changed such that our shared fate is even more inexorably linked. In order to avoid changes at the scale of the dinosaur extinctions, humans and nature must coevolve from their parasitic character into a more mutualistic relationship. Nature is now colored by the people who have become as integral to nature as mitochondria to a cell. While we can’t kill the host, we can certainly damage its health—and thus our own.

In fact we are already changing. While biodiversity is declining (and must recover), genetic diversity is increasing.

his baseline; he doesn't grieve until his special place—the park—ceases to be.

There's no denying that much of what we love about nature may not exist in the future, at least not in the way we're used to. But passively letting it disappear—allowing incremental loss of nature—can't be our response. We must fight to keep our baseline of places—old-growth or otherwise—as forests rather than manicured city parks.

# I H I E

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Instead of a

③ *Overus* - ac. green, entire leaf  
- clustered buds at shoot  
drought, w/ epiphyte load, fr  
high with flwr



proximately one in 25,000 that I would instantly recognize one of the first plants we encountered. Yet there, half a world away from Vermont in the high-altitude oak forest, stood a giant version of a plant

I know well—*Smilacina racemosa*, false Solomon's seal! I had grown fond of that little plant while observing one last fall as a homework assignment. For hours I had watched its bare stalk bob in the wind and sketched its crinkled fallen leaves. I would recognize *Smilacina racemosa* anywhere.

Dave told us that the genus for this giant tropical version of my plant was *Maianthemum*, the same genus as false Solomon's seal. His statement gave me pause: the same genus, but wasn't the genus *Smilacina*? I remember rhythmically chanting "*SmilaCIna raceMOsa!*"

with my classmates in preparation for an exam. I could visualize the label

three very different plants, all of which are dear to me and which I first encountered in the North Country, inform my understanding of the natural world.

One is the alpine azalea (*Harimanella hypnoides*). The first time I saw this plant was up above Tuckerman Ravine in the White Mountains, more than 40 years ago. We clambered up the steep trail, passing droves of skiers still plummeting

down the slope of the cirque. At the top, in the bright light and calm of a June day, bloomed the azalea, with its soft, moss-like shoots and tiny, salmon-pink flowers.

The second plant I encountered on a now legendary 1984 trip to Mt. Albert, the great serpentine mountain in the heart of Quebec's Gaspé Peninsula, home to so many Arctic plants and its own caribou herd. Along the banks of the fabled Ruisseau du Diable, which empties the mountain's great interior ravine complex, I first encountered the club spikemoss (*Selaginella selaginoides*). Looking like it can't quite make up its mind whether

to be a clubmoss or a spikemoss, this *Selaginella* is a denizen of springs and seeps across the far north.

The third plant, the northern white mountain-avens (*Dryas integrifolia*), I had wanted to find for years.

Not until we were out in the Alaskan tundra two years ago, deep in Denali National Park, did I lay eyes on these low-growing, primrose-like Arctic roses for the first time. Seeing *Dryas*, so emblematic of the flora of the High Arctic that the brief reversal of global warming at the end of the Pleistocene is called the "lower Dryas," was a huge treat.

So what do these three plants have in common? They have all been found in Vermont—not as living plants, but as fossils from the beginning of the Holocene, 10,000 years ago. As the climate warmed with the melting of the glaciers, these cold-climate characters, among many others, moved into the newly open lands

across Vermont to establish tundra communities like those in the far north today. With continued warming, the plants now in our forests arrived one by one from refugia on the southeastern coastal plain and in the Mississippi Valley. My trio of favorites continued their northern migration, eventually abandoning Vermont altogether.

The reality is that the flora, and thucr5D[(-17(h)15c)-com -

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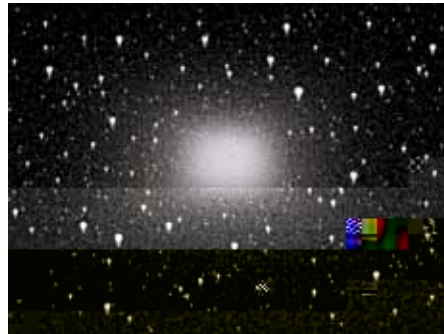
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When I was a senior in high school, math subversively changed my life. In my environmental science class, we used math to figure out the cumulative effects of small, common behaviors in the United States. The numbers were powerful: If the

Some people argue that small actions don't make enough of a difference, that collectively they are trivial when stacked against global warming, the biodiversity crisis, or even one airplane flight. While I agree that we need large-scale policy changes to address global and regional issues, the magnitude of one problem should not invalidate the actions that tackle another. If we use fewer straws and thus improve air quality, someone will breathe more easily. Eliminating even one asthma attack matters: for the individual, for her family, and for their medical bills. People feel these impacts, whether they are global or local. Often they feel the local impacts more.

Let's consider a classic Vermont example: local, sustainably grown food. According to Steven Hopp in *Animal, Vegetable, Miracle*, a book he co-authored with Barbara Kingsolver, it takes an average of 400 gallons of oil to feed a North American for a year. The trip from the farm to the plate uses most of the oil, and some agricultural practices use more fossil fuels than others. Given these different carbon footprints, Hopp argues that if every U.S. citizen ate a single organic, locally produced meal just once, the country would reduce its oil use by 46 million gallons. If everyone did this once a week for a year, we would save over 2.4 billion gallons of oil. Think about it for a minute. That's equivalent to keeping 18.3 million tons of carbon dioxide out

of the atmosphere, the same as the annual emissions from 3.9 million cars—just by purchasing some different food. It's so simple that it feels empowering. That's one meal, and it doesn't have to be complicated.



Light Bulbs (2008) by Chris Jordan, actual size 72x96".

The power of collective action has now entered the national conversation, backed by more than high-school-level math. *The New York Times* recently published an article entitled



"How Idealism, Expressed in Concrete Steps, Can Fight Climate Change," which describes the rise of economic theories that show how small actions

are critical to slowing climate change. Inspired by the fact that half the commuters in Copenhagen travel by bicycle, Harvard economist Martin L. Weitzman and Gernot Wagner of the Environmental Defense Fund say leaders should be "asking people to volunteer to save our climate by taking many small, individual actions." And they are. Elinor Ostrom, who won a Nobel Prize in economics in 2009, called for people to slow global warming at every scale, including at the individual level. Yale economist William D. Nordhaus promotes the creation of "climate clubs," international diplomacy efforts that create incentives for individuals to reduce climate emissions. Economists have confirmed that our choices do add up and that communities such as Copenhagen drastically reduce emissions by bicycling, one day at a time.

So what keeps me going when the strife and degradation of the world are staring me in the face? Partly, it is faith—faith that comes from the math I did in high school, which others continue to explore. This math led me to trust that our small actions do add up and that we can make a difference. Some days, I have to distance myself mentally from the tragedies of our times. But other days, I have a little faith and drink straight from the glass. ♦

To learn more about Chris Jordan and the Running the Numbers series, visit [www.chrisjordan.com](http://www.chrisjordan.com)



TOP IMAGE DEPICTS **320,000** LIGHT BULBS, THE NUMBER OF KILOWATT HOURS OF ELEC-



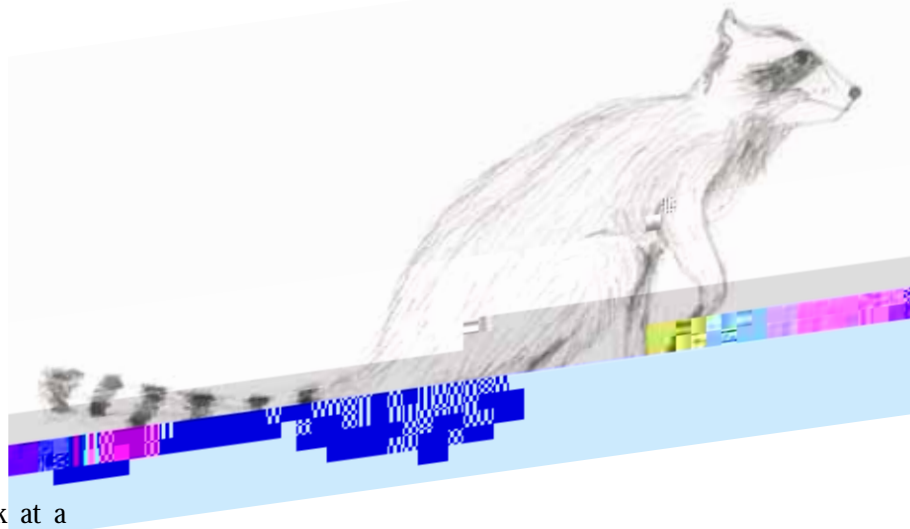
TRICITY WASTED IN THE UNITED STATES **EVERY MINUTE** FROM INEFFICIENT RESIDENTIAL



ELECTRICITY USAGE (INEFFICIENT WIRING, COMPUTERS IN SLEEP MODE, ETC.).

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by Sonia DeYoung



In my second week of work at a wildlife refuge in south Florida, my boss handed me a .22-caliber rifle. “You know how to shoot a gun, right?” he said. “Just load the bullets here and aim between the eyes, at the back of the neck.”

Standing on the empty beach, I recalled those scant instructions as my wobbly hands tried to line up the bead in the sight. At the other end of the barrel, a young raccoon cowered inside a trap. I had fired a gun once in my life, five years earlier, at a paper target taped to a cardboard box.

I’d been warned that one of my internship responsibilities would be to “dispatch” raccoons that preyed on endangered sea turtle eggs. Though native to the region, raccoons are nonetheless an invasive species on the Gulf Shore islands. They have boomed along with humans and threaten other species, just like the more familiar non-natives that have invaded Florida more severely than any other state in the country. Without annual culls, raccoons gobble up almost all the eggs laid in the sand by loggerhead and green sea turtles.

Raccoons, with their spindly legs and beguiling masks, have always been one of my favorite animals. I

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to accept than non-native invasives. They seem to have more of a claim on the resources they share with other native species. But most ecologists understand that it is a species' potential to damage ecosystems that matters, not its native or non-native status. Most arrivals from overseas find the climate inhospitable and die immediately. Those that can survive here usually establish limited, relatively harmless populations that simply aren't worth bothering about. Only around 10 percent actually invade our ecosystems, and not even all of those threaten the survival of other species.

Ecologist Mark A. Davis points this out in his definitive—yet provocative—2009 book *Invasion Biology*. He heads a controversial faction of ecologists urging the North American conservation community to adopt the new “LTL” method of control for those non-natives that are changing,

but c7(h)-5(i)-15(s6(B)13(o)15(n8-10(n)13(d-9(t)-21 5(s6(B)13(o)15T33643(c)-4 )613(d-2(r)T)o)-7(s(a)-10(.)5(e )-6)-7(s(a)-10(.)5)-10(62(s)tho(-)8Td-7(n)-1-10(-109(o)16-7(s)-1[(o9(a)1)-7(a)12(t)-1212)ol 8371(1212)m (L)2(t)-1212s3-87(i)-1(i)hi12st n8-10(n)-(t)-13(e )-62(c)4(8





my most meaningful moments of nature connection came when I led them on adventures—learning to swim in the Huntington River, searching for porcupine quills in the cliffs behind our house—and explored the world through their eyes. Twenty years later, I now find myself connecting to the landscape through the eyes and experiences of my parents. As they advance in age, they can no longer easily navigate the world on their own. Just as I once facilitated my children’s explorations, I now do the same for my parents. And it is the landscapes of their childhoods that are calling them. Even as their vision fades, their yearning for the places with which they first connected intensifies.

This became clear to me when I escorted my mother on a pilgrimage to the Sonoran desert of southern Arizona, where she was born 83 years ago but had not set foot in 75

years. We managed to find the location of her first home on the eastern flank of Tumamoc Hill, the site of the desert biological laboratory where my





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Jessie majored in linguistics at Dartmouth College in order to study many subjects at once: languages, literature, and science. In New Zealand, while researching plant names in



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Ben grew up in Charlotte, North Carolina, a city that is somewhere between mountains and coast, small town and big city, old-timey and new-fangled. College took him to the Evergreen State College in Olympia, Washington. There, Ben took the notion of “broadening your horizons” as literally as possible, traveling to India, banding birds in Mexico and Oregon, and sailing the Oregon coast aboard a tall ship as part of his studies. After graduating, Ben moved to Ahmedabad, India, where he interned for a year at an arts academy that used the arts as a catalyst for social change. There he kept busy writing grants, gaining some web design know-how, and learning a bit of Hindi. Returning to Charlotte, Ben’s life took an entrepreneurial turn

**BEN LEMMOND**



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got home and uploaded the photos to my computer, I was hooked. I began to immortalize tiny moments of magic with my camera while waiting for class, hiking in the woods, or wandering through my mother's garden.

Although I have taken thousands of photos, I've never sold even one—and that's okay, because for me taking pictures has been a gift rather than a vocation. Photography has taught me to be always on the lookout for the most beautiful moments in nature, no matter how small.

That gift certainly played a role in my decision to pursue conservation as a career. I spent two years inventorying and advocating for wilderness in Wyoming's Red Desert, a job that can be utterly discourag-

ing in the best of times. To watch and document the construction of new roads, pipelines, and gas wells in my precious desert devastated me. After two summers living in my truck in that desert, each new road felt like an open wound on my body. If I hadn't had the ability to look beyond the destruction, I never would have lasted the season.

Fortunately, moments of beauty were abundant in

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hum of fracking pumps provided the soundtrack to my usually silent days, and their floodlights lit up my normally dark nights. But all the while I could focus on the flowers. And mercifully, miraculously, their blooms held on until my inventories took me to less heavily impacted parts of the desert.

I've gotten so practiced at finding natural beauty anywhere that I take far fewer pictures these days—I don't need to look through a viewfinder or at a screen to see

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fter four hours on the  
frozen lake, most of  
the action remained  
hidden below my feet.  
The only wildlife I'd seen all day ar-



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the paved path for a jaunt around the golf course. Although this landscape is highly modified, towering pines and migrating birds still bring me far away from the busy road and houses that lie just beyond the hedgerow.







he new house on my street was a jarring reminder of how quickly familiar terrain can go rogue. It towered above all the other houses, its double-decker porches rising higher than any nearby rooftop, replacing the simple charm of a southern veranda with an eerie Neighborhood Watch vibe. Showy and extravagant up front, the house abandoned all sense of panache in its sides, where only a window or two broke the monotony of a few thousand square feet of vinyl. From a distance, its form seemed to grate against the adjacent houses, interrupting the subtle language of bungalows with a sudden, loud belch of architectural excess.

To my great satisfaction, the house sat empty for more than a year. Occasionally the developer would come by and leave the lights on: a ploy to make the house look more inviting, perhaps. It seemed like a wistful, defeated gesture—who looks for real estate at midnight? I kept my fingers crossed.

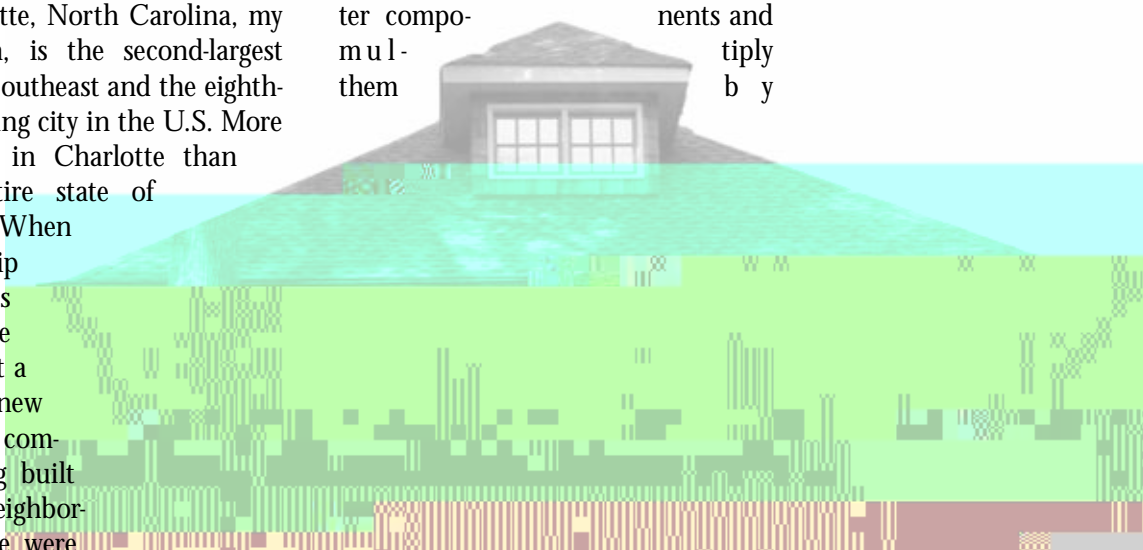
But then it sold. How could it not? Charlotte, North Carolina, my home town, is the second-largest city in the Southeast and the eighth-fastest-growing city in the U.S. More people live in Charlotte than in the entire state of Vermont. When I took a trip home this year, there were at least a half dozen new apartment complexes being built in my neighborhood. There were

plenty of new houses, too. I walked around one night to check them out; their dramatically uplit, landscaped profiles looked back at me, spooky and hollow, like the face of someone holding a flashlight under his chin to add atmosphere to a ghost story.

As a student of ecology now and environmental health as an undergraduate, I felt I had plenty of tools at my disposal to legitimize my distaste for these new developments and to separate critique from nostalgia. I began to look up statistics on new single-family housing units, intending to build a convincing environmental case against the kind of new house spreading clonally throughout my neighborhood. Should I look at energy use, or the chemical rap sheet of contemporary building materials, or the ecological consequences of replacing every vestigial wild element in yards with ChemLawn? In 2014 alone, the U.S. gained 620,000 new homes averaging 2500 square feet apiece, a third of them wrapped in vinyl siding and nearly all chilled to the bone with air conditioning. It would be easy to take any number of their ecologically sinister components and multiply them by

620,000, proving a point millions of times larger than what was happening in this one house on my street.

But I kept getting hung up on a hunch that I didn't want to turn these real places into abstractions, to impose statistics on my gut reaction to the changing landscape of my home town. There is a lot more power in the experiences we live through than the experiences we read about in journals or add up in Excel spreadsheets, and I wonder how ecology can stay connected to that power even as



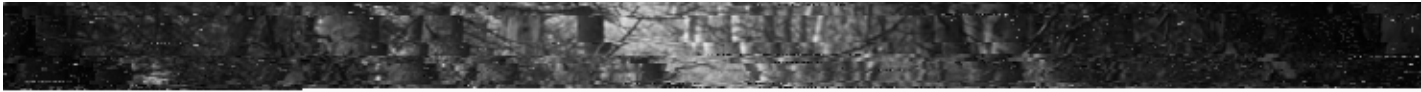
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a bear cannot really, truly, be a bear without a genetically diverse population of its kin roaming around in a bear-sized habitat. A part of every living thing is stored in the space around it, in the structures as well as in the possibilities.

Our houses, similarly, are more than just a habitat: they carry a part of our existence for us. They're the superhero phone booths where we don and shed the identities we walk around in each day. For some of us, a house holds the memory of where we come from, our personal origin story woven into physical space. I feel this vividly whenever I come back to my old neighborhood, this sense of remembering and authenticating some consistent idea of who I am. This is no small matter for someone like me who habitually explores new story lines in his life: novice chef, graphic designer, ballet dancer, field ecologist. The ability to occupy many roles and stories is uniquely human; however, our dependence on actual places to keep that narrative intact bespeaks our creaturehood and links us with something common to all living things.

But I don't believe that our houses are the full story of the space we need in order to keep our identities intact. In fact, this is exactly the problem with the way the houses in my neighborhood have been built. It's as if they're trying to enclose an entire world within their walls. Of all the ways that new buildings are inefficient, the demand placed on them to be consummately entertaining and inspirational and transformative is one of the most needless wastes of resources I can think of.

In the summer of 2011, five families in my neighborhood designed and built an outdoor pizza oven in a backyard playground at the center of the block, adorned it with mosaic and christened it the "Château Dough." A long oak table crafted around the posts of an old swing set now seats at least 20. Most of these families have been living there for my entire life and have kids my age whom I played with in that playground growing up. As I see it, building the oven was the manifestation of a sentiment that was already there. I wish that new houses could be designed this way: as expressions of the places they inhabit rather than impositions on them. It's more efficient, after all, to negotiate with the world around us for what we need than to try to find everything in one place. Any ecologist can tell you that.



# Seeing the Forest in the Trees

by Alicia Daniel

patches were left by chance, a few by design. The old-growth forest a(i)-7(n)-8(6T)-78(b)2(yn)13(d)15(P)-11(S)-77(u)-2(f)14(o)1 n(h)1[32

and I haven't been there in 20 years. Today I am meeting fellow naturalist Brian in Underhill Center, beneath Saint Thomas Church, which looms over the village green. We are setting out on this June morning to search for something much harder to find in Vermont than a church. We're hiking up into Daniel's Notch to look for old-growth forest, armed only with a 1994 Field Naturalist report and a GPS unit Brian's sister loaned him.

To find an old-growth forest in Vermont requires a hunt. Very little forest escaped logging in the 1800s; the few stands that remain often grow on steep escarpments or mountainsides. Some old-growth forest

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In the summer of 2014, the New Hampshire

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Bolton Backcountry in Bolton, Vermont, is an 1140-acre cross-country ski paradise. Its first ski trails date from the 1920s. But in 2011, the prop-

ing, we run into our first big, old trees. Here the yellow birches are squat and twisted by the wind. The steep slope faces southwest, so it is no doubt drier than the notch. We find a clearing and stop to eat nuts and gulp down water. Warblers sing above our heads. We hear the wheezy *I am so la-zee* song of the black-throated blue. I left home without my binoculars, which is just as well—we are short of the notch and short on time. Brian decides to climb up over a knoll, which the GPS unit suggests we do.

I follow him into a dog-hair thicket of spruce but soon lose his trail. In the meadow he left big muddy prints, but here his trail is faint. Tracking him slows to a crawl. The black flies are worse up here. I decide to drop back down the mountain and enjoy the big trees below us.

As the sun peaks, I settle back against an old yellow birch tree to write in my journal. Writing and swatting at black flies, I continue to peek upslope for Brian's return. He surprises me by arriving from below. I feel ridiculously glad to see him—experienced hikers can still get hurt on a mountain.

"Thanks for waiting," he says, as if my sitting here were a favor to him. "Turns out the best trees are over here on a trail. I want to show you an old birch with a big cancer-like growth on it." I calculate the ground he has covered since I lost sight of him and realize how much I'm slowing him down. I try to pick up the pace.

We discover a trail practically paved with moose scat. Suddenly, we cross effortlessly into the notch. During our morning hike upward in elevation, the season has rolled back to early spring. The trail is awash in trout lily. I stoop to examine a dwarf ginseng, with its tiny ball of white flowers and delicate leaves. I peer at the pink flowers hanging from the

stem of a plant aptly called rosybells.

An old-growth forests pulses with magic: the diversity and texture of the flora, the presence of dead wood, the absence of cut stumps, and something more intangible, a deep energetic hum. The forest has grown up attuned to its environment. Things just seem to be at home and in place.

Cutting a forest, or, in the case of Vermont, practically the whole forested landscape, destroys the natural patterns that once existed there. Forest communities naturally respond to their environment: their bedrock, aspect, slope, topography, hydrology, and soils. Once that forest is removed, generalist species take hold. Then the forest no longer shows a long-term faithfulness to its site. In Vermont, trees like red maple become more abundant while yellow birch decline. The whole landscape becomes more homogeneous. Throughout New England, the forests have regrown in the last century, giving the Northeast a closer approximation to its wild character. However, almost all of these forests, public and private, are cut as part of their management. Vermonters are just not growing old trees. In fact, forestry data indicates that each year our forests are getting younger. Are we working our "working forests" too hard?

I rise from admiring flowers to see that the towering old trees around us are just beginning to leaf out. The hardwoods have a bright halo of green as the sun lights up the tiny new leaves. Red spruces rocket up into the sky, taller than any we've seen before. Tucked in the notch, they grow to amazing heights as they reach for the sun.

"Wow. I thought that had to be a hemlock," says Brian, craning his neck at a huge red spruce. His recent encounter with this same species growing in the dog-hair thicket on the knoll gives him a true appreciation of this giant tree. The spruces are intermixed with yellow birches and statuesque maples. One old birch has

toppled, and its scaly bark snakes along the forest floor like a giant serpent. The warblers sing in the canopy; the sun dapples the forest floor. Beauty surrounds us. We have walked up into heaven.

Enlightenment—and I confess this is second-hand knowledge—creates



