

# Taking Wildness in Hand: Rescuing Species

by Michelle Nijhuis

TORREYA STATE PARK perches on the steep, sandy banks of the Apalachicola, where the river twists slowly through the Florida Panhandle toward the Gulf of Mexico. This is one of the most isolated spots in Florida, rich only in plant life and prisons, stupefyingly hot in summer and eerily quiet nearly all year round. Most park visitors are on their way somewhere else, and when Connie Barlow stopped here on a winter day in 1999, she was no exception.

Barlow, trim and now in her fifties, is a writer and naturalist with cropped hair and a childlike air of enthusiasm. She's given to wandering, and back then she shuttled between a trailer in southern New Mexico and an apartment in New York City. That winter, during a detour to Florida, she paused at the park for a look at its *raison d'être*—an ancient tree species called *Torreya taxifolia*, familiarly known as the Florida torreyia or, less romantically, stinking cedar. The park lies at the heart of the tree's tiny range, which stretches little more than twenty miles from the Georgia state line toward the mouth of the Apalachicola. But even at Torreya State Park, Barlow discovered, the Florida torreyia is hard to find.

*Torreya taxifolia* was once a common sight along the Apalachicola, plentiful enough to be cut for Christmas trees, its rot-resistant wood perfect for fence posts. But at some point in the middle of the last century—no one is quite sure when—the trees began to die. Beset by a mysterious disease, overabundant deer, feral hogs, drought, and perhaps a stressful climate, the adult trees were reduced to a handful of mossy trunks, rotting in riverside ravines.

The species persists in Florida as less than a thousand gangly survivors, most only a few feet tall, their trunks no thicker than a child's wrist, none known to reproduce. Much like the American chestnut, these trees are frozen in preadolescence, knocked back by disease or other adversaries before they grow large enough to set seed. To see their grape-sized seeds, Barlow had to visit the state park offices, where two sit preserved in a jam jar.

Barlow continued her travels that winter but returned to the park a few years later. She tracked down some of the few remaining trees and, in a quiet moment, sat under one of the largest specimens, perhaps ten feet tall. The Florida torreyia, even at its healthiest, isn't an obviously charismatic tree. Its flat needles are scanty; its trunk lacks the grandeur of a redwood or an old-growth fir; when it does manage to produce seeds, the rotting results smell like vomit. In its diminished state, it inspires more pity than awe; to call its spindly limbs a canopy is a sorry joke.

But when Barlow looked up at the branches of the Florida torreyia, she made an impulsive commitment to the species. She'd spent years thinking and writing about evolution and ecology, and was aware of the implications of climate change. She decided the species needed to move north, to cooler, less diseased climes. And since it couldn't move fast enough alone, Barlow would move it herself.

CLIMATE CHANGE IS BEGINNING to make good on its threats, and news of its work is now hard to avoid. Escalating average global temperatures? Check. Rising seas? Check. Plants and animals scampering uphill and toward the poles? Check. Dozens of birds and butterfly species are shifting their ranges to cooler terrain or migrating earlier in the year, each species reacting somewhat differently. Ecological communities, never as stable as we might like to think, are disarticulating in new ways.

Conservationists, in response, have offered more ambitious versions of familiar strategies. Bigger nature reserves. More protected corridors for wildlife migration and movement. More regulations, incentives, and ingenuity in service of greenhouse-gas reductions. But even the most expedient tactics could leave some species—especially those as tightly circumscribed as the Florida torreya—marooned in habitat too hot, dry, wet, or stormy.

What then? Captive breeding without hope of reintroduction is an expensive and indefinite custodial project, an ark with no gangplank. The next option sounds either laughable or desperate: pick up the plants and animals, and carry them to better habitat. Jason McLachlan, an ecologist at the University of Notre Dame, remembers giving a talk in North Carolina about forest responses to climate change. “Someone in the audience said, ‘Why is this a problem? You can just move them,’” he says. “I thought he was just being a smartass.”

It’s an easy idea to caricature. FedEx the polar bears to Antarctica! Airlift the pikas and the orchids! But some scientists take the concept very seriously. Camille Parmesan, a professor at the University of Texas at Austin and an authority on the ecological effects of climate change, remembers broaching the subject at an international conservation conference nearly a decade ago. “I said, ‘Look, we need to start thinking about transplanting organisms around these barriers of agricultural land or urban land, and getting them to the next possible suitable habitat as the climate changes,’ and people were horrified—just horrified,” she says. “They said, ‘You can’t do that!’”

But discussion continued among scientists—if mostly in whispers—and in 2004, a graduate student named Brian Keel quietly coined a term for the idea: assisted migration. Not long afterward, Connie Barlow and the Florida torreya shoved the debate into the open.

THE APALACHICOLA RIVER is bordered by a thick layer of sand, in places more than one hundred feet deep, left when the sea retreated some two million years ago. Rain—which fell generously here, exceeding sixty inches each year, until the recent drought—hits the loose, sandy soil and keeps going, seeping downward until layers of clay and limestone stop its vertical progress. The moisture then turns toward the main stem of the river, each trickle pulling a few grains of sand with it, a sabotage from below known as sapping erosion.

Over millennia, sapping erosion has created nearly sheer-walled ravines known as steepheads, their sandy banks held in place by magnolias, pines, and muscular beeches. Found in only a handful of other spots throughout the world, steepheads and the shady forests they cradle now define this stretch of the Apalachicola. To step from the sunny, logging-scarred Apalachicola

uplands into a steephead is to enter a darker, wetter, more complicated world, ignored by chainsaws and seemingly hidden from time.

On a humid fall day near the end of hurricane season, David Printiss leads the way over the edge of a steephead, pointing out the faint, narrow path that hairpins down the wall. A few moments after beginning the descent, he crouches in the leaf litter, then turns with a grin. “Introducing *Torreya taxifolia*!”

The tree is a bundle of pencil-thin stems, the tallest two feet high, ridiculously small in comparison to the mature trees surrounding it, dwarfed even by a single leaf of a nearby needle palm.

Printiss is the manager of this preserve—The Nature Conservancy Apalachicola Bluffs and Ravines Preserve, just south of Torreya State Park—and he’s proud that the Florida torreya survives in these ravines, even in this almost symbolic state. But he spends most of his time thinking not about the fewer than one hundred *Torreya taxifolia* on the preserve, but about the landscape surrounding them. Restoring that, he says, is the best way to solve the “Torreya puzzle” and give the tree a chance to thrive.

Printiss has a salt-and-pepper beard, a discreet earring, and a serious demeanor, and he lives here on the preserve with his wife and young daughter. He wears Carhartt work trousers and heavy leather fire boots to the office, and uses both. Each year, he serves as “burn boss” on about twenty prescribed fires, some as large as five hundred acres.

“If I can get fire across the landscape acting in its natural role, I’ve done my job; I’m home,” says Printiss as he drives the soft, sandy roads on the flat preserve uplands. “I’m not saying fire is the answer, but I suspect it’s a large part of the answer.” Restoring fire to the uplands, he says, thins out the overgrown hardwood trees, makes room for the restoration of longleaf pine stands and native grasslands, and brings some filtered sunlight back to the steep ravines where the Florida torreya once grew.

Printiss acknowledges that even if the species were to be revived by these efforts, it could still face the perplexing blight, which attacks the trees by killing the stems and leaving the trees to resprout from their bases. Most surviving *Torreya taxifolia*, like the one at Printiss’s feet, have withstood multiple onslaughts and are now clusters of genetically identical stems; since the 1960s, only a single tree is known to have set seed. Despite years of study, no researcher has conclusively identified the disease or its source, and some speculate it may even be a suite of diseases.

Since *T. taxifolia* has separate male and female plants, any trees that managed to persist through adolescence would need the added good fortune of growing near a mate. Only then could the pollen ride the wind to a female tree and produce the species’ distinctively hefty seeds. On top of those difficulties is the Southeast’s record-breaking drought, which shrank water supplies to dangerously low levels last fall, making the oncoming stresses of climate change difficult to ignore.

Yet the suggestion of assisted migration, of planting *Torreya taxifolia* trees outside these Panhandle steepheads, makes Printiss’s face tighten. Such efforts, he says, threaten to take

attention and funding away from the work in the preserve, and make an already bad situation even worse.

“A lot of people just want to let it go up there [in Appalachia] and let it rip,” he says, his voice rising. “They say it’ll act a lot like the northern hemlock, this, that, and the other thing. Yeah, maybe. When it comes to introducing non-native species, we have such overwhelming evidence of good ideas gone bad . . . and this isn’t just the Conservancy’s policy, it’s my personal policy . . . it’s very dangerous tinkering.”

THIS IS THE LONGSTANDING conservation credo: With enough space, money, and knowledge, we can protect natural places and, in many cases, restore them by stitching them back together. But while we’re welcome to restore, redesign is frowned upon; that sort of tinkering crosses an invisible line between humans and capital-N Nature, and risks making things much worse. We’ve good reason to distrust ourselves, after all. Until the 1950s, we thought planting kudzu was a good idea.

But climate change calls all this into question. If rising temperatures and changing weather patterns make restoration difficult or impossible, new brands of meddling may sometimes be the only alternative to extinction. Connie Barlow believes *Torreya taxifolia*, with its almost absurdly gloomy prospects in its current range, already requires a new strategy—and she welcomes the chance to provide it.

Barlow describes herself as “more interventionist” than many of the scientists and conservationists she encounters, explaining that her background in ecology and evolutionary biology have immersed her in the long time-scales of evolution. “I don’t have a sense of what’s normal,” she says. “I do have a sense of species moving a lot through time.”

Following her first visits to Torreya State Park, Barlow started an e-mail correspondence with botanists, conservationists, and others about the future of the tree. Some, such as paleoecologist Paul Martin, loved the idea of moving *T. taxifolia* north. The Florida *torreya* is widely believed to be an ice age relict, “left behind” after the last glacial retreat and very possibly better suited for cooler climates, with or without global warming. So why not return it to the southern Appalachians, where it grew during the Pleistocene? These arguments were countered by an ecologist named Mark Schwartz, who has studied the Florida *torreya* at the Apalachicola Bluffs preserve since the late 1980s, and remains one of the scant handful of scientists with in-depth knowledge of the species. Schwartz defended the chances for restoration in the species’ present-day range. Before long, the discussion reached an impasse, and the disagreement found an audience.

In a 2004 forum in the now-defunct journal *Wild Earth*, Barlow and Martin made what might be the first public case for assisted migration. Moving even federally endangered plants like the Florida *torreya* to more favorable climates, they wrote, was “easy, legal, and cheap,” and *Torreya taxifolia*, prevented by highways, topography, and its own biology from moving quickly on its own, needed immediate help.

While horticulturists at the Atlanta Botanical Garden have spent years raising *Torreya taxifolia* in greenhouses and seminatural “potted orchards” in northern Georgia, Barlow and Martin dismissed these efforts, saying that “potted is the botanical equivalent of caged.” They proposed that *T. taxifolia* be planted on privately owned forest lands in southern Appalachia, easily four

hundred miles from the Florida Panhandle. The risk of the slow-growing, problem-prone Florida *torreya* becoming an invasive weed is vanishingly small, they argued, and in the Appalachian forests, the tree might even take the place of the eastern hemlock, another subcanopy conifer in precipitous decline.

Schwartz, now a professor at the University of California, Davis, responded by acknowledging both the critical situation of the Florida *torreya* and the possibility of healthier habitat in Appalachia. But he balked at assisted migration for much the same reasons that David Printiss—and many conservationists of all stripes—meet the idea with almost visceral hostility. The Florida *torreya* is unlikely to become the next kudzu, but the next species on the poleward wagon might very well prove a nasty invasive. And since scientists don't know precisely what climate change will mean for *Torreya taxifolia* and other species, conservationists can only make rough predictions about future habitats and future relationships among species. The unknowns are staggering.

If the theory of assisted migration isn't controversial enough, Schwartz points out, the reality is sure to be even more contentious: while people may be willing to export familiar species to safer habitats, they're less likely to open their home ecosystems to exotic refugees. "Here in northern California, if we were to ask people whether we can move a salamander that's going extinct because of climate change into Oregon, people would probably say yes," Schwartz says. "But if we ask people whether we can introduce a southern California species into a redwood grove for the same reason, they would uniformly say, No way!"

Perhaps the most disturbing implication of assisted migration is that the traditional conservation notion—call it an illusion if you like—of a place to get back to will disappear for good. Yet with or without assisted migration, that pristine place is already slipping out of reach. The demarcation between managed and wild has always been tenuous, defined more by emotion than data, and weakened over decades by the global reach of humankind: acid rain, DDT, PCBs, the traces of Prozac in rivers and streams. Climate change is the most dramatic transgression yet, for its effects range from pole to pole and can't be fenced in, mopped up, or halted by a National Park Service boundary.

Climate change is altering the wilderness peak, the backyard nature preserve, the wild-and-scenic desert river—all the longstanding conservation victories, the places that not only lend inspiration and solace to the conservation movement, but also prove the wisdom of its tactics. In transforming places once thought protected, in violating hard-fought boundaries, climate change is busting the limits of conservation itself.

THE PASSIONATE CRITICS of assisted migration didn't stop Connie Barlow, who moved briskly ahead with her plans for the Florida *torreya*. She created a website called the *Torreya* Guardians, where she and a handful of amateur horticulturists began to trade information about *Torreya taxifolia* cultivation in other habitats.

Their vision of the Florida *torreya*'s future begins in the mountains of north Georgia, where the roads narrow and twist, and travel is measured in time instead of distance. Here Jack Johnston, a sleepy-eyed emergency-room nurse and amateur horticulturist, started growing Florida *torreya* after meeting Connie Barlow at a dinner in North Carolina. On the steep ground behind

his house, on terraces that legend has it were used for growing corn for white lightning in the 1930s, Johnston is cultivating a half-dozen *Torreya taxifolia* seedlings he bought, legally, from a nursery in South Carolina. Each is about two feet high, five years old, and healthy.

Johnston, whose isolated property is full of other rare plants (“I’m moving all sorts of things north,” he jokes) is pleased by the apparent flexibility of his charges, and nonchalant about the implications of assisted migration. “People have been moving plants around for a long time,” he says. “This idea that we should be territorial about our plants, well, that’s just kind of a provincial attitude.”

The next day, during a long-awaited rainstorm in western North Carolina, Lee Barnes, the de facto lieutenant of the *Torreya* Guardians, is eager to talk *Torreya*. “I’m a horticulturist,” he says. “I’m a professional tinkerer.” Barnes, who is no stranger to *T. taxifolia*—he wrote his doctoral dissertation on the cultivation of the Florida *torreya* and two other endangered Florida species in the 1980s—has so far collected and distributed about 120 seeds to about a dozen people and gardens north of Georgia, including amateur gardeners in Ohio, New York, England, Switzerland, and elsewhere. Some recipients have reported their successes and failures; some have not.

Barnes’s seed supply comes from a single grove of *Torreya taxifolia*, which grows not in Florida but about thirty miles from his home in North Carolina. In the 1930s and 1940s, on the grounds of George Vanderbilt’s grand Biltmore Estate, an enterprising head gardener planted seeds he and his botanical accomplices (known as the Azalea Hunters) collected from throughout the Southeast. Today, lines of tourists snake through the vast gardens, but few notice the unassuming, thin-limbed conifers that stand, unmarked, among magnolias, pines, oaks, and redwoods.

Bill Alexander, forest historian for the estate, has lived on these grounds for twenty years, and he walks along the curving path through this cultivated forest, pointing out each Florida *torreya* in turn. These trees, all apparently free of the disease that scourges the Panhandle populations, were likely planted in the 1930s or 1940s—though perhaps as early as the 1890s—and some graze fifty feet, a height now unimaginable in Florida. Despite freezes and hurricanes, the Florida *torreya* has done itself proud in North Carolina: one of the trees at Biltmore, Alexander believes, is the second-largest of the species. The largest stands on a farm in northeastern North Carolina, surrounded by rusting farm equipment.

Alexander, who traces his family back to some of the first European settlers in the Biltmore area, is no ecosaboteur, but he likes the democratic, do-it-yourself approach of the *Torreya* Guardians, and he wants to see the species survive, no matter its longitude and latitude. He says he’ll happily supply seeds to the group as long as the Biltmore trees continue to produce. And if the resulting seedlings establish themselves outside gardens and the manicured grounds of the Biltmore estate? Alexander looks pleased. “Well,” he says, “then I’ll think, ‘By God, we’ve been successful.’”

IN 2007, ecologist Mark Schwartz and two colleagues, Jessica Hellmann and Jason McLachlan, published a paper that modestly proposes a “framework for debate” on assisted migration. While they criticized “maverick, unsupervised translocation efforts,” such as the *Torreya* Guardians’, for their potential to undermine conservation work and create conflict, they directed their harshest criticism at “the far more ubiquitous ‘business as usual’ scenario that is

the current de facto policy.” The three scientists take different stands on the notion of assisted migration. All are cautious, but McLachlan is usually the most skeptical, and Hellmann, a University of Notre Dame ecologist who studies butterflies on the northern end of their range in British Columbia, is the most open to the concept. “It’s incredibly exciting to think that we could come up with a strategy that might help mitigate the impacts of climate change,” she says.

Last fall, to initiate a broader discussion, the three scientists organized a meeting in Davis, California, with other researchers, land managers, environmental groups, and even an environmental ethicist. The Florida torreyia isn’t the only species that might benefit from immediate assisted migration. The Quino checkerspot butterfly has blinked out on the southern end of its range, in the Mexican state of Baja California, while the northern end of its range, in Southern California, has been transformed by development. In South Africa and Namibia, rising temperatures on the northern edge of the range of the quiver tree are killing the succulent plants before the species has a chance to shift south.

But assisted migration is in no case a clear solution. Beyond initial concerns about new invasive species and territorial conflicts among conservationists, the meeting in California raised new questions. What if assisted migration is used to justify new habitat destruction? Who decides which species are moved, and who moves them? Isn’t “assisted colonization” a more appropriate name than “assisted migration,” which reminds people of birds on the wing?

Some researchers also worry that continued discussion about the strategy—which most agree is a last resort, likely too expensive and complicated for widespread use—distracts from the more prosaic, immediate duties of conservation and restoration. Brown University ecologist Dov Sax, an invasive-species researcher working on assisted migration, has grander hopes for the conversation. “Conservation has really been built around a static view of the world,” he says. “Given that climate change is going to happen, we need a whole new suite of strategies that could complement the old ones. This could get more people thinking about the other strategies we need.”

DISCUSSIONS OF CLIMATE CHANGE always seem to end with a dreary litany of required sacrifices, uncomfortable changes that will be demanded of the penitent. There is no doubt that stabilizing the climate will require deep, societywide reforms, some of them costly. But as climate change delivers its inconvenient truths, it also asks us to chuck a persistent and not-very-useful notion: the idea that conservation, and by extension restoration, is about guilt-framed landscapes.

Commitment to particular places and their histories has taken conservation a long way. It gives conservationists ground to stand on, in ways that range from the literal to the spiritual to the political. And restoring these beloved places to past states can restart ecological processes still relevant to the present day. But this sort of restoration works only when the climate is more or less stable—when the past supplies a reasonable facsimile of the future. Restoration ecologists remind us that the most effective restoration focuses not on a given point in the past, but on the revival of clogged or absent natural processes. When climate change makes historical analogues irrelevant, it’s these processes that will help species and systems survive in a new world.

Don Falk, an ecologist at the University of Arizona and the first executive director of the Society for Ecological Restoration, argues that assisted migration is simply another way to impersonate the process of dispersal: its adherents intend to transport species from places humans have made uninhabitable, through places humans have made impassable. Despite its undeniable risks, it may not be as radical as it first seems. It may be just another step in the evolution of conservation.

The job is no longer—if it ever was—to fence off surviving shards of landscape or to try to put everything back the way it used to be. Climate change requires conservationists to husband not a fixed image of a place, but instead the fires, floods, and behaviors that create it, in order to help species and natural systems respond to a host of changes we're only beginning to understand. Assisted migration is certainly not the right strategy for all species—and given its myriad possible pitfalls, it may not be the right choice for any species. Yet the idea of it, and the discussion it provokes, point toward the future.

Mark Schwartz, for his part, still holds out hope for the recovery of the Florida *torreya* in Florida, for a small but healthy population of trees in the shady steephead ravines. But each time he visits the Panhandle, he says, he sees fewer and fewer *Torreya taxifolia*.

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