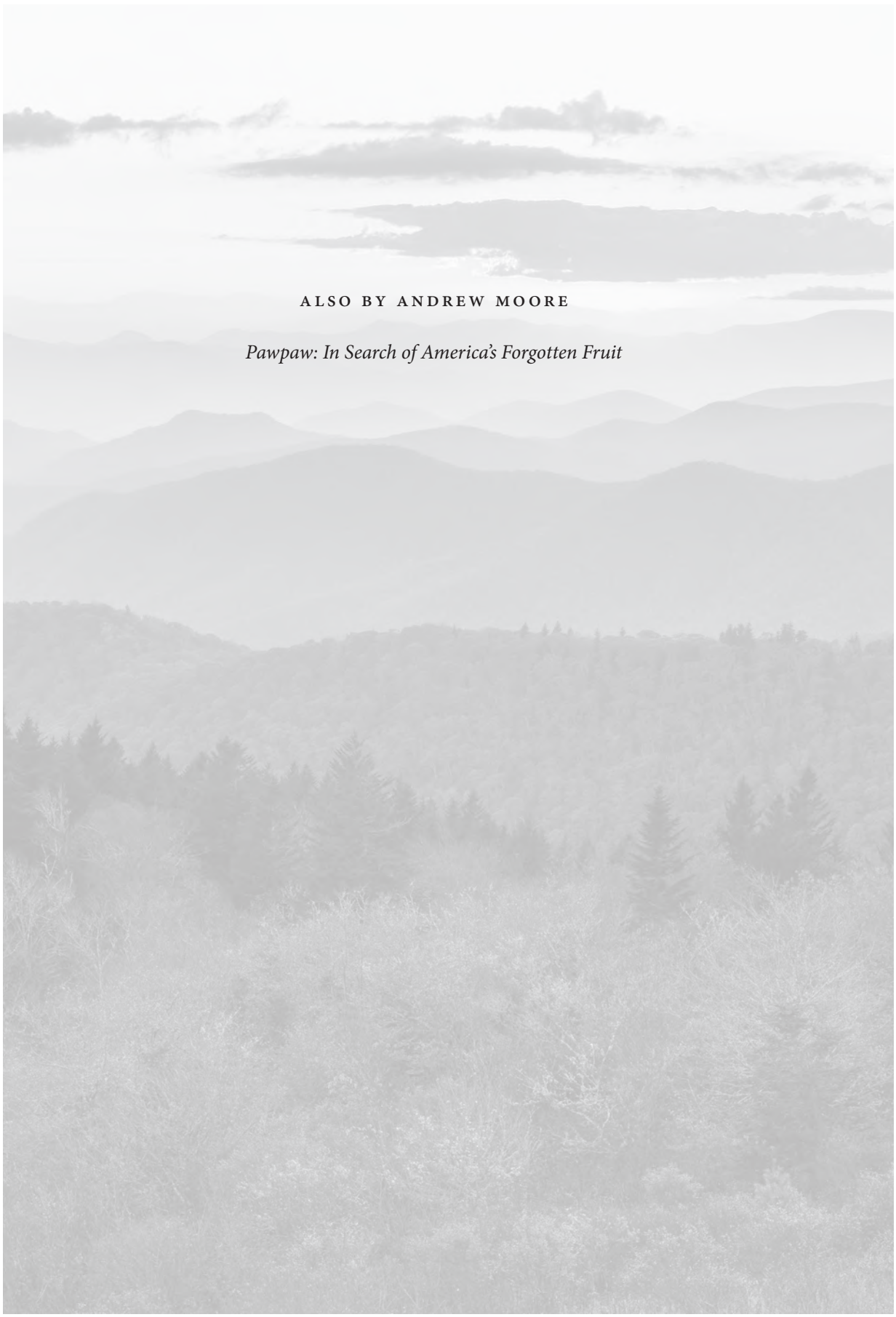
The Beasts of the East

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ALSO BY ANDREW MOORE

Pawpaw: In Search of America's Forgotten Fruit

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The BEASTS *of the* EAST

The Fall and Rise of America's Eastern Wilderness

ANDREW MOORE



Mariner Books
New York Boston

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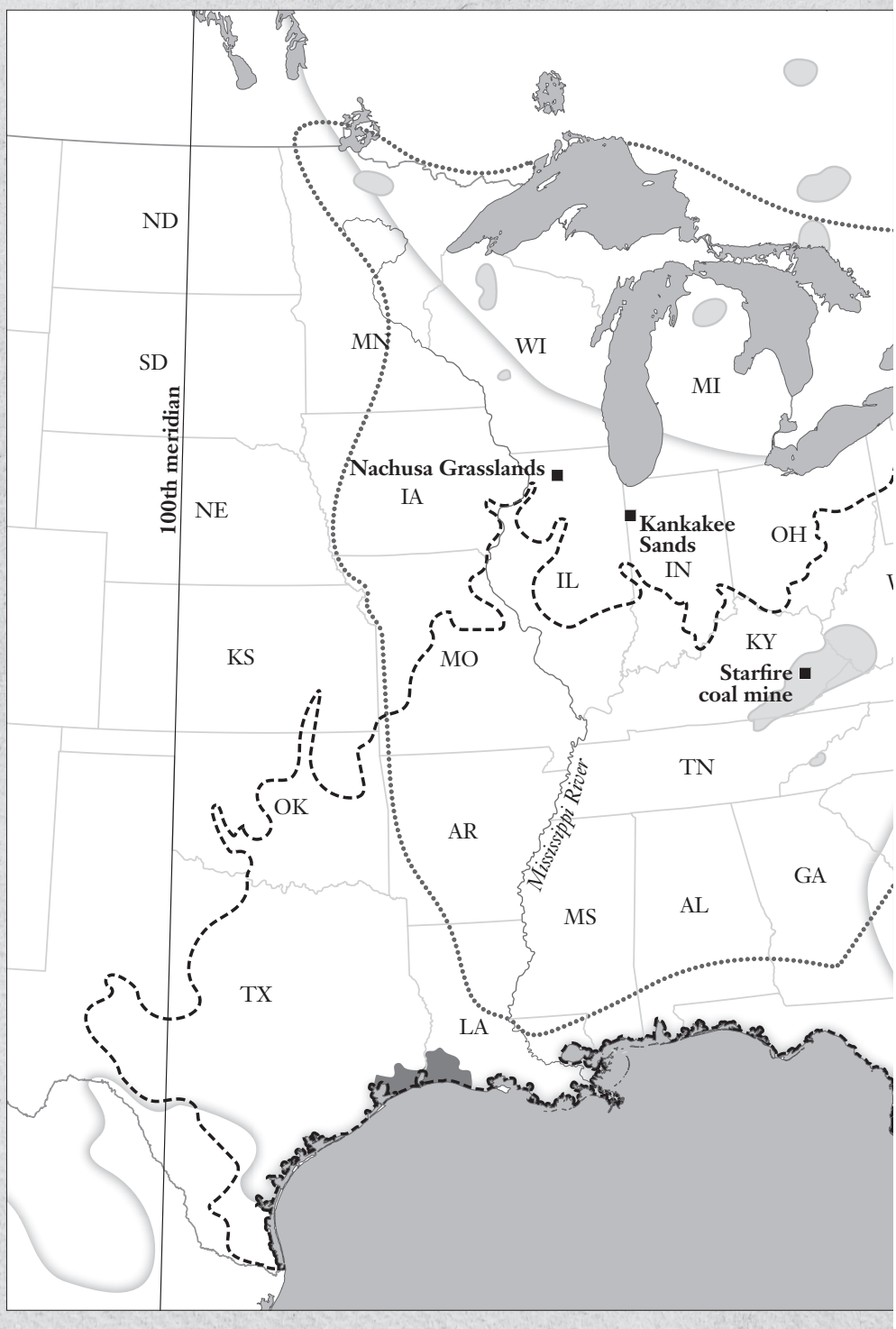
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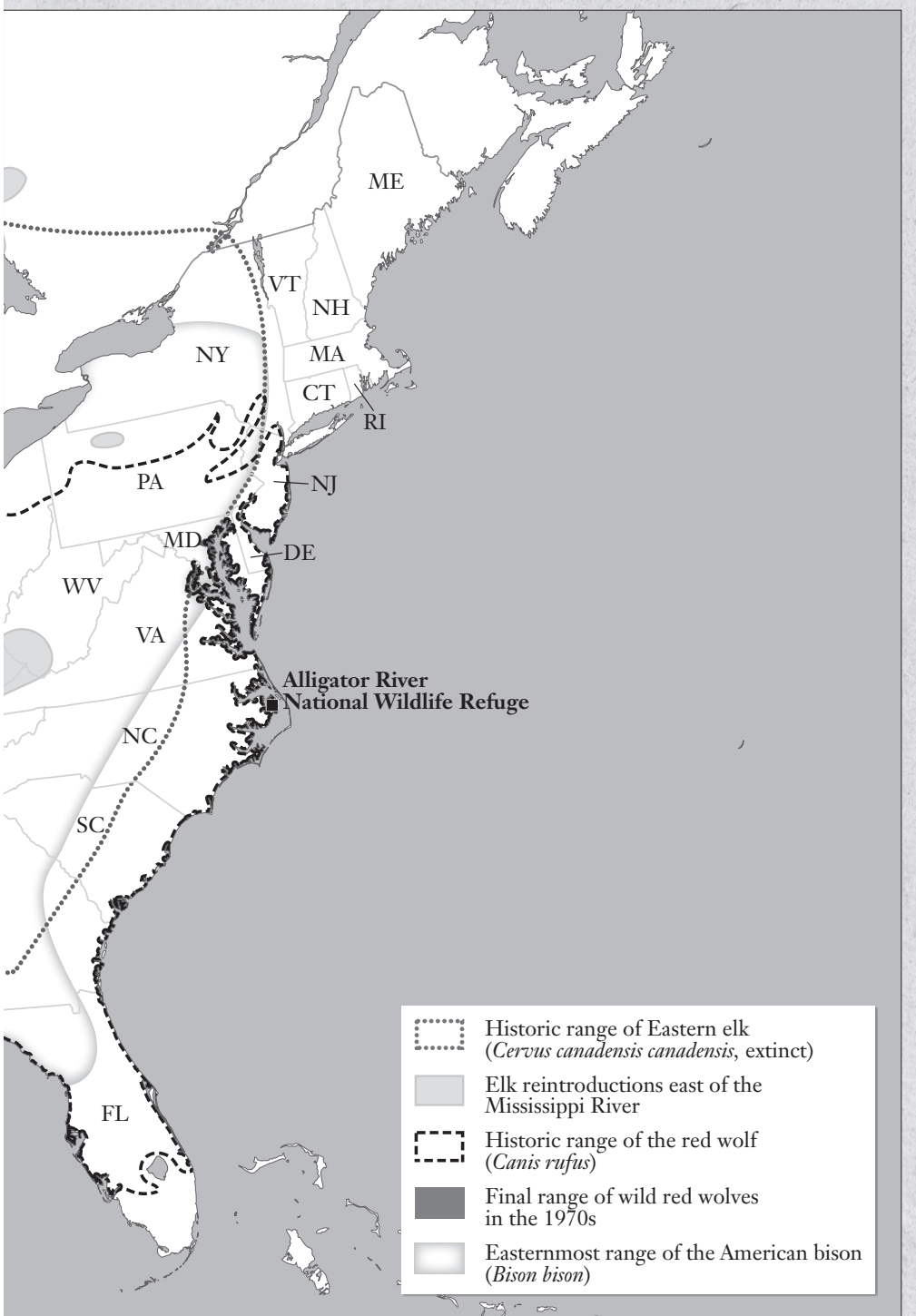
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PROLOGUE

Eastern Wilds, Eastern Beasts

It was late November in Indiana, the sun was rising, and I was traveling to a wetland to witness one of the most striking wildlife migrations in North America. As temperatures dropped in the northern Great Lakes states, tens of thousands of sandhill cranes would be migrating through there for the warmth of Florida, Georgia, and Alabama. It was now quite cold, and the cranes were sure to be on the move. Traveling down a county road, I saw a single crane in the dimly lit sky above me. I heard the trumpeting of another. I know these birds to be mighty: Standing three to four feet tall with wingspans up to six feet, they are as impressive on the ground—hopping, preening, and dancing—as they are in the air. But I was not there to check a species off my life list; I was there to witness the spectacle of a mass congregation. It was a manifestation of an abundance that, for many creatures in the eastern United States, had been squandered. And I wanted to witness this land's enduring capacity for life.

At the preserve, the Jasper-Pulaski Fish & Wildlife Area, I climbed a wooden viewing platform. In front of me, in a shallow grassy wetland, was an unbelievable mass of sandhill cranes. I am not an expert estimator, but I know when I see a lot of birds, and I would later learn that 32,000 sandhill cranes were counted on that single morning. A joyful cacophony filled the air as the birds sounded their rattling bugle all at once. Before long, they began taking off for the day, to feed on the corn stubble in the adjacent crop fields, pecking kernels from the rich, wet, black soil. They flew away in pairs, in groups of six, groups of ten. Stragglers trumpeting loudly, endlessly. And then, at 7:00 a.m., a remaining bulk of cranes lifted all at once, fanning out in various directions.

In addition to the staggering number of cranes, the event was remarkable, too, for its location. I was nowhere near a congressionally designated wilderness area. This remnant bit of wetland is nestled among the cornfields of northwest Indiana, just a few miles from a coal-fired power plant, and an

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hour's drive from Chicago. Throughout the day I'd find groups of cranes in farm fields, roadside ditches, playgrounds, and cemeteries. It was a carved-up, drained-out, fenced-in, domesticated East, and the cranes had made themselves at home. I was there to witness how something so wild and ancient—a wildlife migration that was dictated by food and sun and water—could fit so neatly into our modern world.

The sandhill cranes made the choice to be there, but the truth is that we hadn't left them with many options. In fact, this migratory stopover, this spectacle of congregation, is not a holdover from the former grandeur of an eastern wilderness; it is a product of the twentieth century. And this bit of wetland, at just over 5,000 acres, was all that remained of a far grander marsh that had once sprawled over a million acres. The gathering on that day of 32,000 sandhill cranes in northwest Indiana was not only a spectacle of our making, it was woefully incomplete.

Sandhill cranes (*Grus canadensis*) were once endangered; by the 1930s, there were just two dozen nesting pairs in the Midwest, and they were vanishing because we'd shot them all to eat, and to pluck their feathers from their bodies to place them in our hats. But just before it was too late, we reined ourselves in—when the advocates among us noticed these birds were vanishing, we agreed to stop shooting. Sportsmen's and animal rights groups succeeded in lobbying for federal legislation and protections. To save these birds we agreed on restraint.

We also left them just enough space—even if we weren't aware of it at the time. In the northern Great Lakes, where eastern cranes spend the summer and breed, there were enough wetlands to sustain the survivors, and space enough that they could be unbothered. But their biology necessitated migration—they could not stay in these safe places all through winter—and they must come back down through the East. Herein lay another problem: Not only had we killed the majority of the individual animals, we'd plowed, and drained, and otherwise destroyed their requisite habitats. Sandhill cranes are wetland obligates, which means that the species cannot function without these ecosystems. Prior to settlement, they would have taken their pick of the various marshes and shallow wetlands throughout the East as they hopscotched south in the winter and north in the summer. But by the 1970s, when the breeding population of eastern sandhill cranes began to rebound, the East we'd created looked radically different. Since the colonial era, the Atlantic seaboard's residents had ditched and drained as much land as possible; and after a century of con-

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certed effort in the Midwest, nearly 90 percent of that region's wetlands were gone. And sandhill cranes must have wetlands.

But there was one important pocket of land—the place I now viewed—that had been set aside as a waterfowl refuge, in this one corner of Indiana. The Jasper-Pulaski Fish & Wildlife Area hadn't been established with cranes in mind specifically. In the early twentieth century, local people had tried to drain this bit of land, too, to raise crops, but when it proved to be too expensive and the soils too poor, it was decided to reflood the acreage and establish a waterfowl reserve. It proved to be fantastic habitat—as it had been for thousands of years—and within a decade there were again a million ducks there. In 1958, it was opened for hunting.

Cranes had been coming to Jasper-Pulaski as early as 1940. As they flew south, around the edges of Lake Michigan, this last remaining wetland would have appealed to their needs: It was large enough, and just difficult enough for people to access, that the cranes and dozens of other species of waterfowl could rest there before continuing their journey south. By 1941, there were two hundred cranes in the marsh. Over the next forty years, they kept coming in increasingly large numbers. Today, nearly the entirety of the eastern sandhill crane population, about 90,000 individuals, stops over at Jasper-Pulaski at the end of each year. As Anne Lacy of the International Crane Foundation told me, "It is literally an oasis in an ocean of corn." They seem to come now out of necessity, but also from tradition and memory. Just a few decades ago, this gathering would have been inconceivable.

It's believed that there are more sandhill cranes today than at any point in history. Indeed, for many native species of the East, the late twentieth century has been boomtimes. Populations of whitetail deer, Canada geese, and even the American black bear may have never been higher. Over the course of a hundred years, the eastern United States has been transformed from a despoiled land of waste and destruction, to a verdant country filled again with wildlife and greenery. The physical evidence can be persuasive. But in terms of ecology, in terms of wild lands and wildlife, it is a mirage.

Not long ago, there was more wildness in the East; it was a place of astounding beauty and massive beasts. The area of northwest Indiana, in particular, would have been a sun-drenched oak savanna, with hundreds of bison congregating and grazing, moving from one prairie to the next. Among the sandhill cranes, there would have been whitetail deer, herds of elk with their massive antlers, moving between the forested edges and the wide-open grasslands. Lurking

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everywhere, among the sprawling oaks and the tall grasses, would have been packs of wolves and eastern cougars, black bears and bobcats, each predator looking to feed and mate and live as they had for tens of thousands of years. But what we see today—a fractured and diminished landscape, a depauperate flora and fauna—is a far cry from the complex ecosystems that were indigenous to the East. Our capacity for wildlife, for biological diversity and for big, wild land, is so much greater.

The true nature of the lands east of the Mississippi River is to be lush, fruitful, and filled to the brim. Prior to the arrival of Europeans—prior to guns and ditches and bounties and trading vessels—the East was home to the Mohawk, Cayuga, Oneida, Onondaga, Seneca, Tuscarora, Catawba, Cherokee, Creek, Choctaw, Fox, Sauk, Piankashaw, and so many others. These diverse Indigenous peoples lived in both small villages and large towns, and alongside these human cultures, intertwined with their influences on the land, there was also an abundance of wild beast and untamed lands. The land was muddy and wet and high and dry, and it rolled and sloped and stretched from one horizon to the next. In the southeast, a longleaf pine savanna once covered 90 million acres, from Virginia west to Texas. In the Appalachian Mountains, there were evergreen thickets so dense and impenetrable that they were called Laurel "Hells"; and down in the bottomlands, there were canebrakes of native bamboo that sprawled to conceal black bears and American bison—impassable tangles of vegetation that cradled life and frustrated the hunt.

The land was at once torturous and majestic, and its trees were specimens of grandeur. In the Northeast, white pines and hemlocks grew to more than a hundred feet tall, and lived up to five hundred years; in the South, live oaks sprawled 150 feet wide and bald cypress reached a diameter of 20 feet and lived as long as two thousand years; in the Appalachian Mountains, an American chestnut grew to a hundred feet tall and produced a carbohydrate-dense nut that was prized equally by passenger pigeons, wild turkey, bear, elk, and all of the human cultures from Georgia to Maine.

All of these habitats supported massive and abundant species of wildlife. When the English explorer Henry Hudson approached the river that would soon bear his name, elk browsed on the western shores of what would become New Jersey. Elk were pursued by hunters over the Delaware River, and as far east as Cape May; and the New Jersey Meadowlands were an Atlantic white cedar bog filled with beavers. When the sun rose over the swamps of the Carolinas, hundreds of turkeys arose to feed in the oak woods. Farther west, the thousand-acre wetland I gazed upon in northwest Indiana had once belonged

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to a marsh that sprawled over a million acres. Wetlands like it defined and sustained the continent.

Throughout the East, millions of passenger pigeons famously darkened the sky, and when they roosted in treetops, they were an ecological force capable of opening a closed canopy. Flocks of Carolina parakeets, "a brilliantly coloured carpet," with scarlet behind their eyes, bright yellow heads and necks, and emerald green bodies, roosted in the cavities of sycamore trees, from the Deep South to the banks of Lake Erie and Ontario. There was then a woodpecker larger than any today, black with white stripes, males with a bright red crest, and a bill of ivory white, that hammered into sentinel snags towering hundreds of feet over bottomland swamps. There were whooping cranes standing to five feet tall with wingspans up to eight feet, thriving and appearing much as they had since before the Ice Age.

From the Atlantic Ocean, salmon migrated up the Connecticut River. There were cod weighing two hundred pounds, beluga whales as far south as Boston, and walruses within four hundred miles of New York City. The waters around Manhattan and Long Island were filled with salmon, shad, cod, sheepshead, and numerous other species. "There are seals, tuna, dolphinfish, and the like," an explorer noted in 1655, "and in some places from time to time, also whales." There were Atlantic giant sturgeons, which for 200 million years had migrated in from the sea to breed in the East's fresh waters, without apparent interruption and in astounding abundance.

When the earliest European explorers came ashore in the Carolinas, they found oyster shell middens lining nearly every knoll overlooking the Cape Fear River; oysters enough to sustain Indigenous people for months at a time. Farther inland, in the heart of the mountains, the abundance was no less impressive: There were rivers so dense with mussels that Native people could sometimes subsist on these mollusks. When the tides were low, even the mighty Ohio River could be crossed on foot, using its prodigious beds of mussels as stepping stones.

But it was no Eden. In this land of plenty, death lurked around every corner. Bison drowned in the rushing waters of the Mississippi; bull elk sometimes gored one another with their antlers during the rut. Everywhere, carnivores tore the flesh of living things. Eastern cougars pounced from trees and bit the spines and broke the necks of deer, elk, and moose. There were fisher cats eating squirrels and rabbits and mice; raccoons eating birds' eggs and frogs and insects; in the northern forests, from arctic Canada to Ohio, Maryland, and New Jersey, pine martens ate chipmunks and squirrels and mice. From

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Maine to Florida, there were wolves—in New England, settlers observed wolves eating fish from the rivers. William Penn noted wolves in Philadelphia, alongside panthers, otters, fisher cats, and numerous other species. In the early 1800s, in the northeastern part of Ohio, wolves were numerous, and described as "a grizzly gray on the back, a yellowish gray or dirty white below, a bushy tail fifteen to twenty inches long." In 1810, a wolf was shot where now stands the Cleveland Museum of Natural History. Twenty years later, John James Audubon encountered packs of wolves, as many as seventeen animals, east of Charleston, South Carolina; and he observed black wolves in Kentucky and Indiana. Howling wolves and screaming panthers struck fear into the hearts of these newcomers—emotions and memories that would inform human behavior in the eastern United States for centuries to come.

Long before Europeans arrived, the land was not without change. Extinctions and evolutions had come before. But all of the richness that was encountered and described by Euro-American explorers and settlers existed alongside the rich human cultures of Indigenous North America—cultures whose sustenance, shelter, and clothing came from these same massive beasts, small things, trees and grasses. Through much of the East, no animal provided more than the whitetail deer. "Although the Indians kill many thousands throughout the year, principally in the fall, when they are fat, and wolves cause havoc among the newborn deer, yet the whole country is full of them, with no signs of decrease," wrote Adriaen van der Donck of today's New Jersey in 1655; ". . . rarely can one go out into the open country without seeing at times a few and at other times whole herds of them."

Indigenous cultures were sustained by the flesh of those massive beasts and warmed by their hides, and on the tallgrass prairies east of the Mississippi River, vast herds of bison were not only a tremendous source of food, their bodies were made into all manner of tools and goods. Their hides were used in making robes, blankets, and even shields; the wool was used for making sacks, belts, garters, scarves, and rope; and horns could be used as cups. In the Southeast, Cherokee artisans fashioned arrow tips, made of "brass, copper, bone, or scales of a particular fish," cut to a point, fastened onto a stiff reed, and wound together with sinew of deer, "which, when dry, remains fast glewed, nor ever untwists." Indigenous peoples kept roots and herbs in deer-skins, which they used in ceremonies; turtles were harvested as food, and their shells were filled to make rattles. All of these animals were used and celebrated. All of them had meaning.

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But for flavor and joy, nothing seems to have been more esteemed than bear fat. The rendered lard of bear fat, boiled in kettles, was stored in dried gourds and eaten like butter or olive oil; Creek hunters, in what is now Georgia and Alabama, returned from their hunts and rejoiced with village-wide dancing and feasts of "bear ribs barbecued with honey." Clothing was made from skins, tools from bone. In the fall, Cherokee hunters slept on bear skins, and ate dried venison dipped in bear fat; their bows too were dipped in bear's oil, "and seasoned before the fire, and twisted bear's gut for the string." Black bears, which ranged from the Everglades of Florida to the North Woods of Maine, were the source of legends and joy, food and shelter.

Perhaps no other animal evokes the spirit of wild America like the American bison—and these animals, icons of an idealized West, were undoubtedly present in the eastern United States, too. From Illinois and Indiana to Ohio and Kentucky, bison were so numerous that their collective movements, the pounding of their hooves, carved trails into the earth. The members of the Hernando de Soto expedition may have been the first Europeans to hear about bison—they took Indian shields made of their hides, and were told "of a place where the 'wild oxen' were plentiful." In the vicinity of northwest Georgia or Alabama, the ethnographer James Mooney notes, "They brought back with them a dressed buffalo skin which the Indians there had given them, the first ever obtained by white men, and described in the quaint old chronicle as 'an ox hide as thin as a calf's skin, and the hair like soft wool between the coarse and fine wool of sheep.'"

Although de Soto did not report seeing any living woolly buffalo, reports from other explorers soon poured in. Around 1674, Alexander Hewatt observed in South Carolina: "Numbers of deer, timorous and wild, ranged through the trees, and herds of buffaloes were found grazing in the savannas." "They frequent the remote parts of the country near the mountains, and are rarely seen within the settlements," noted Mark Catesby, an English naturalist who published the first book on the flora and fauna of North America. "They range in droves, feeding in open savannas morning and evening; and in the sultry time of the day, they retire to shady rivulets of clear water, [gliding] through thickets of tall cane, which though a hidden retreat, yet their heavy bodies causing a deep impression of their feet in the moist land, they are often trac'd, and shot, by the artful *Indians*."

In 1709, John Lawson traveled through the Carolinas, as deep into the interior as any English at the time; when he came to an Indian village or town, the

people welcomed him and rushed into the wild to harvest turkey or deer for him. There was such abundance that these societies could be sustained on this wild meat, and he noted "Plenty of Buffaloes" in the fine and rich savannas. In 1724, John Brickell visited the Carolinas and provided a description of the animals in their native habitat: "The *Buffelo*, or *wild Beef*, is one of the largest wild Beasts that is yet known in these parts of *America*; it hath a Bunch upon it's Back, and thick short Horns, bending forward. . . . This Monster of the Woods seldom appears amongst the *European* Inhabitants, it's chiefest haunts being the *Savannas* near the Mountains, or Heads of great Rivers." In 1748, as the naturalist explorer Peter Kalm made his way through North Carolina, he noted, "The *wild oxen* have their abode principally in the woods of *Carolina*, which are far up in the country. . . . The inhabitants frequently hunt them and salt them like common beef, which is eaten by servants and the lower class of people . . . the poorer people in *Carolina* spread their hides on the ground instead of beds." A couple decades later, when the frontiersman Daniel Boone looked down on Kentucky's Red River valley, he, too, found bison. "We found every where abundance of wild beasts of all sorts through this vast forest; the buffaloes were more frequent than I have seen cattle in the settlements, browsing on the leaves of the cane, or cropping the herbage of those extensive plains, fearless, because ignorant of the violence of man," he noted. "Sometimes we saw hundreds in a drove, and the numbers about the salt springs were amazing."

While Lawson, Brickell, and Boone journeyed westward from the Atlantic, French explorers entered the continent from the Gulf, where they encountered bison on the prairies of Louisiana, Mississippi, Alabama, and Florida. Near the site of New Orleans, the explorer Pierre Le Moyne d'Iberville reported spotting and killing buffalo; and further up the Mississippi, at Bayou Goula: "We saw buffalo and deer in the cane brakes . . . and [in the temples of the Indians] bundles of bison skins." Bison were seen in the panhandle region of Florida in 1674: "The Indians went on hunting trips for buffalo, of which there is abundance."

On the tallgrass prairies of Illinois and Indiana, French explorers found massive herds of bison. In 1670, in northwest Indiana, they found the animals to be "so numerous that Miamis sometimes killed from one hundred to two hundred daily." Native hunters burned the grasses, and drove the buffalo toward their weaponry. On the east bank of the St. Joseph River, near the present site of South Bend, Indiana, there had been a sprawling buffalo range "frequented especially by cows with calves," wrote the zoologist William L.

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Engels. "The early French hunters and traders called that part of this strip lying above and below the sites of South Bend and Mishawaka *parc aux vaches* (park of the cows)."

It's thought that modern bison came east after the 1500s after Old World diseases wreaked havoc on Native populations. We know that bison pulsed east of the Alleghenies, following the river valleys, through gaps in the mountains, and great herds of elk likewise came through the New River valley. For hundreds of years, the bison stuck around: Chickasaw hunters were harvesting buffalo in central Alabama as recently as 1749. In 1750, the Virginia explorer Thomas Walker trekked deep into the rugged Cumberland Mountains of eastern Kentucky, where he reported killing and eating eight elk, thirteen buffalo, fifty-three bears, twenty deer, four wild geese, and 150 wild turkey—not to mention an abundance of small game. In Kentucky, herds of elk, bison, and whitetail deer remained so numerous that they trampled the earth and maintained sprawling open areas at numerous salt licks throughout the state. The valleys of present-day West Virginia, a state known for its mountainous terrain, were filled with great herds of buffalo. In 1737, an expedition into the heart of the rugged mountains would occasionally stumble into vast openings and savannas, up to four miles wide, "in which were an infinite quantity of Turkies, Deer, Elks, and Buffaloes, so gentle and undisturbed that they had no Fear of Appearance of the Men, but would suffer them to come almost within Reach of their Hands." In another account, far east of the Alleghenies, Sir Samuel Argall wrote of the "Shag-haired Oxen" he encountered along the Potomac River in 1612, "[a] great store of Cattle as big as Kine, of which the Indians that were my guides, killed a couple which wee found to be very good and wholesome meate, and are very easie to be killed, in regard they are heavy, slow, and not so wild as other beasts of Wildernesse." Argall was just fifteen miles from the present site of Washington, DC.

Throughout the East, from the Carolinas to the Mississippi River, maps record the presence of these animals in their former places—from the numerous Elk Forks and Elk Rivers to Buffalo Springs, Virginia, the old Buffalo Swamp of South Carolina, and the former Buffalo Creek just outside Nashville, Tennessee. It is important to emphasize just how numerous and common these animals were—east of the tallgrass prairie and east of the Appalachian Mountains—while we continue to piece together the ecological questions that remain. Indeed, for hundreds of years, bison were at home and expanding their range in the East. For thousands of years before that, their ancestors had been there, too, coevolving with the other plant and animal communities that

defined the land. In their lives and deaths, they made possible the abundance and richness of eastern life.

Of course, that is not the East of today. A number of these animals have been gone for so long that most Americans have no idea that they were present east of the Mississippi River. By and large, we've come to think of these large animals as denizens of the West—a misunderstanding that not only deprives the East of its rich natural history but also diminishes our capacity to imagine the future.

If we have a hard time visualizing bison or elk—and the predators that feast upon them—in the East, it's because the vistas we gaze upon, even the ones we think of as natural and wild, are not what they would have been prior to settlement, nor as they had been for thousands of years. The open meadows and savannas have either grown thick with brush or have filled with houses and interstate highways; and wherever the eastern forests have grown back, they've been so rearranged, and stripped of species and diversity, as to be unrecognizable to their former selves.

Among naturalists in the East, it is often said that prior to European settlement, a squirrel could travel from the Atlantic to the Mississippi without touching ground. Like most fables, the squirrel's journey should not be taken literally. But it's a useful illustration of the vast eastern forests before the massive clearing for agriculture and timber. The forest *felt* endless, even if it was something different, a mosaic of forest and meadow and wetland. This diversity of ecosystems was necessary to support the East's diversity of large wild animals—but the squirrel's journey remains an important lesson: Perhaps it was not treetop to treetop, but when a squirrel looked out from the canopy, it saw wild nature in every direction. Replacing the squirrel's vista has not only impacted this single species' arboreal journey, it has impacted every single piece of wild nature in the eastern United States.

When John Lawson rambled through the Carolinas in the late 1600s, he noted the frequency of openings in the dense forest. Those openings, described variously as savannas, barrens, or meadows, were the preferred habitat of bison and elk. In 1718, a map drawn by French cartographers marked the region between the Cumberland and Ohio rivers, parts of middle Tennessee and central Kentucky as a wide treeless plain, where the Illinois hunted buffalo: *"Desert de six vint lieues detendue ou les Ilinois font la Chasse des boeufs."* In 1670, another explorer wrote of traveling "through the savannah among vast herds of red and fallow deer [elk and whitetail deer] which stood gazing at us, and a little

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after we came to the promontories or spurs of the Appalachian Mountains." In the mountains of present-day North Carolina, Lieutenant Henry Timberlake wrote of the open spaces, "The meadows or savannahs produce excellent grass; being watered by abundance of fine rivers, and brooks well stored with fish." In Kentucky, the Big Barrens, a region that was home to the famous salt lick stamping grounds of vast herds of elk and bison, were among the eastern grasslands that had been maintained, and perhaps even expanded, by centuries of intentional fires set by Native Americans. Those fires maintained the grasslands, which not only attracted the big game, but also made for better and easier hunting.

But the supply of game, and the quality of the hunt, was not to last. The worst was yet to come, but as early as the American Revolution, the cracks were starting to show. In 1761, Lieutenant Henry Timberlake marched from Fort Pitt in the Alleghenies down to the Cherokee towns of North Carolina and Tennessee. The Overhill Cherokee lived in what was then considered the backcountry, which still abounded in wildlife. Along the way, bears wandered into Timberlake's camps; one night, his team shot and ate a four-hundred-pound bruin and in the morning skinned the animal and took along as much meat as they could carry. Following the Holston River, he noted "the amazing quantity of buffaloes, bears, deer, beavers, geese, swans, ducks, turkeys and other game"; he ate and enjoyed the flesh of rattlesnake. Where they camped, near a large cave, he described "the howling of wild beasts" which woke them in the middle of the night, "and kept us wake with this concert till a little before day." At Great Falls, "the fish were sporting in prodigious quantities." After breaking through ice, and enduring rain, snow, and hail, he described his welcoming ceremony, in which "the eatables were produced, consisting chiefly of wild meat; such as venison, bear, and buffalo." The eatables, however, and the wild country from which they were procured, were about to run out. Timberlake's account was of a wild continent, and ancient civilizations, on the brink of change. "The old people still remember and praise the ancient days, before they were acquainted with the whites," he wrote, "when they had but little dress, except a bit of skin about their middles, mockasons, a mantle of buffalo skin for the winter, and a lighter one of feathers for the summer."

Ten years later, the herds of bison roaming toward the Atlantic had run up against the ammunition of the English and the Spanish, and they were just about gone. William Bartram, the famed naturalist who walked from Philadelphia to Florida in 1774, noted the Great Buffalo Lick, roughly eighty miles

from Augusta, Georgia: "The buffalo . . . once so very numerous, is not at this day to be seen in this part of the country; there are but few elks, and those only in the Apalachian mountains." Indeed, the time of the bison and the elk was coming to an end in the East.

Like the massive stumps that are left to rot in a clear-cut old-growth forest—the scraps of a discarded, ancient system—we can catch a glimpse of the former abundance of eastern beasts by counting their skins and skulls. In the late 1600s, 50,000 deer skins were exported from Charleston, South Carolina, annually. In 1686, New York exported 30,000 beaver hides. It was an astounding extraction. As one historian wrote, "Deer skins shipped from the colonies and towns in the Southeast as late as the 1750's brought greater returns than all other commodities combined." The harvest of wild animals intensified with each advancement in technology and transportation—and the animals simply could not keep up. "The English are now so nigh, and encroached daily so far upon them, that they not only felt the bad effects of it in their hunting grounds, which were spoiled," Timberlake noted, "but had all the reason in the world to apprehend being swallowed up, by so potent neighbours, or driven from the country, inhabited by their fathers, in which they were born, and brought up, in fine, their native soil, for which all men have a particular tenderness and affection."

By the 1760s, the biggest animals were fading fast. British colonists were supposed to remain east of the Appalachian Mountains, behind what was known as the Proclamation Line, or the King's Line, established at the end of the French and Indian War to keep white settlers from encroaching on Indian lands. Yet the regulation was poorly enforced, and encroachments were constant. In February 1765, a group of Cherokee went before the House of Lords in London, England, to plead for the boundary, and the promises, to be upheld. Their hunting grounds—their livelihoods, their sustenance—were being ruined. But it didn't work, and after 1776, the King's Proclamation was no more. The lands opened up.

The East once overflowed with abundance, but it was never some magical paradise; it wasn't possible to kill and cut everything in sight and expect the riches to last. Soon there were only bones. When Circleville, Ohio, was settled by whites in 1810, the skeletons of fifty elk were found littering the ground; the big living things themselves were all dead. In 1895, in the sandhill crane country of the Jasper-Pulaski area, a pair of massive elk antlers were pulled from a seine in the Kankakee River—the last of their kind. Once those last

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relics were recovered, there was little left in the landscape to hint that they'd ever been present—just curious place names on a map.

The chronicles of destruction already fill many volumes. Indeed, there is no story of restoration without first the tales of devastation, and in the East, our capacity for slaughter was prodigious. The extractive culture that spread over the land after Europeans arrived would leave no stone unturned, and few animals breathing. But what interested me, especially as I looked upon 32,000 sandhill cranes in a remnant wetland in northwest Indiana, was the story of revival—of finding the scattered pieces throughout the land, and the work of reassembling the wilds of the East. Before I'd gone to Indiana, I'd visited creeks in Ohio where wildlife biologists were attempting to reintroduce the hellbender (*Cryptobranchus alleganiensis*), the five-pound giant salamanders endemic to the eastern United States, whose survival depends on the cleanliness of our shared waters; I'd gone to Maine, where fisheries scientists continue their efforts to restore Atlantic salmon (*Salmo salar*) to the Penobscot River, a herculean undertaking to restore the natural flow of rivers and the ancient migration of this keystone species; and I'd gone to dozens of wetlands throughout the East to observe the abundance of fish and waterfowl that was the result of a century of conservation.

The work to get here has been astounding. In order to restore the charismatic megafauna of the American East, conservationists have needed to not only reimagine the land, but also to remake it. As this book aims to show, the restoration of elk, bison, and wolf populations has also been a story of land—how we use it, how we abuse it, and how it continues to change beyond our abilities to manage or manipulate it in the face of a rapidly changing climate.

In the early twentieth century, at the nadir of wildlife populations in America, the nation's first wave of conservationists started the work of putting things back together. Over time, the eastern forests grew back. There is now a uniform, middle-aged forest covering much of the eastern half of the United States. This forest lacks the dynamism and diversity of the old-growth forests, and its species composition is drastically altered, but the trees are back. New England, which had been aggressively cleared for agriculture in the early colonial period, is now 80 percent forested; and by 2000, more than half of Pennsylvania was once again covered in trees. Enough time had passed for a kind of healing to occur on the land.

But there are no seeds in the soil from which a mammal can grow. If the last of a species is killed, it cannot return from material buried in the earth.

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An elk's antler doesn't grow a calf; a wolf's incisor does not produce pups. A mammal must breed. It cannot incubate in the soil like an acorn until the sun warms the earth—a mammal's life and death are of the instant.

Sandhill cranes fly and move about the landscape with relative ease. If we do not shoot too many of them, they live and breed and are more than capable of finding open wetlands for feeding and mating. They've done well, and have been able to recolonize the East. But what about the other animals in this picture of the old, wild East?

Jeffery Larkin, a wildlife biologist who began his career by studying the reintroduction of elk to eastern Kentucky, says it's an obligation to do so. "We have a certain responsibility to return lost portions of biodiversity that we can return. And those species, no matter where they are, they enrich our experience when we go to these places that they exist."

As the eastern cranes hit their historic low, so too had the continent's large mammals. Elk were killed out of the East by 1867. The last bison, south of the Great Lakes, were killed in 1830, in French Lick, Indiana, and in 1837, in Illinois. Wolves took a bit longer, but they were gone from most of the East by the early twentieth century; a few holdouts lingered in Wisconsin, but by the 1950s, we'd gotten them, too. The last wolf in the Atlantic states had been killed in Georgia's Okefenokee Swamp, in 1918, and within ten years, the last wolves of Mississippi were dead, too.

These big animals were long gone, and they were unlikely to ever appear again in the East unless we made a concerted effort to bring them back. And over the past several decades, that's exactly what we've done.

This book charts the fortunes of the American East through the story of the restoration of three signal species—the elk, a species of game and meat; the bison, an engineer of ecosystems and a cultural icon; and the American red wolf, a species whose existence, and right to exist, remains hotly debated. In Kentucky, elk restoration began in 1997; the herd there has grown to be the largest east of Yellowstone National Park. In Illinois and Indiana, ecosystem restorationists have replanted native tallgrass prairie in the former cornfields south and west of Chicago—and their movement now calls for bison. In North Carolina, a decades-long effort to recover one of the world's rarest mammal species, the American red wolf, continues—and the success or failure of this project will likely determine the fate of carnivore reintroductions through the East.

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Each of these three projects differs in significant ways. Some species are free roaming, while others are behind fences. Some enjoy broad support, while others are deeply polarizing. But taken together, these stories form a picture of the complex task of restoring large animals in the American East. Carrying out this difficult work is necessary if we desire to share the land with the animals we admire—and if we are to once again live among whole and functioning ecosystems.

As these stories demonstrate, bringing extirpated animals back to the East is only the beginning. The work of caring for the land, and for its myriad species, will necessarily go on forever. Hunters and anglers, many of whom have dedicated their lives' work to the conservation of game and fish, know this work; they were the pioneers of restoration. Endangered species biologists know it too, and they have attempted to extend this conservation ethic to every living thing. And while this narrative follows the course of three large mammals, the story is necessarily complex, and like all things in nature, each is inextricably tied to the other—the story of elk, bison, and wolves is the story of entire ecosystems, and the multitudes of birds and fish and plant species conserved under these larger mammals' umbrella.

Caring for this diversity has become our responsibility and privilege, and with each new generation, we must decide if we're up for the task. For better and for worse, we continue to have a role in deciding what gets to live, and what dies.

Indeed, not even this image of sandhill cranes in northwest Indiana is assured. Thousands of acres of solar panels are rising throughout the area, replacing farm fields and with them the food source these tens of thousands of migrating birds depend on. To be sure, cornfields are not biological hotspots, but the stubble that cranes feed on in these fields has become critical for the sandhills and other migrating birds—sandhill cranes, whooping cranes, and tundra swans included—it's the niche they carved for themselves in the modern world we've created. "They're basically agricultural birds now," says Rich Beilfuss, the president of the International Crane Foundation. "The cranes only exist because they've adapted to agriculture." So if we're going to lose the cornfields, we'd better think of something else for the cranes, or we might lose them again, too.

As they pass through the Jasper-Pulaski Fish & Wildlife Area, cranes roost in the cooling ponds of the local coal-fired power plant just a few miles from

the refuge. The power plant, however, like some of the adjacent cornfields, is to be decommissioned. This is good for the climate, and so it is good for the world, but if those cooling ponds are removed, there will be one less place for sandhills and whooping cranes to roost in their critical, essential corridor.

Amid this uncertainty, the Jasper-Pulaski Fish & Wildlife Area is solid as a rock. Thanks to the foresight of hunters and anglers in the 1930s, the place is sticking around. But as this book aims to demonstrate, this slice of land—and this migration spectacle—is only a fraction of what needs to be protected if we're going to conserve the abundance, and attempt to restore the essential wildness, and the richness of Eastern biodiversity, that can only be found in this region.

My last evening in northeast Indiana, I watch the cranes return from a day spent feeding in the stubble. A dozen deer run into the field. They seem curious and playful—perhaps a bit mischievous. Sandhill cranes rise up to get out of their way, only to land a few feet away, seemingly unbothered. But the cranes are aware of the dangers that lurk, both in the present, and in the not-so-distant past. That the cranes roost in this wetland is an ancient survival tactic honed by thousands of years of evolution—the shallow, open water is protection against predators, making sure that the approach of a wolf, or bear, or panther is visible and audible. Those 32,000 cranes have both danger, and survival, in their memory.

Though I'm aware of our shortcomings, I can see the immense progress we've made: This spectacle wouldn't have been possible a century ago, when the cranes were all but gone. But as we continue to restore large animals of the East, this vision of cranes and bison and predators on the wide, wet prairie might yet be the future of the East.

It's a choice we're making now.

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PART I

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CHAPTER 1

Elk of the Eastern Mountains

It's difficult to say with certainty when the last eastern elk was killed, but most accounts agree that Jim Jacobs pulled the trigger.

Known as "The Seneca Bear Hunter," Jacobs had killed hundreds of deer and bear in his lifetime. A Seneca Indian, Jacobs was born on the Cornplanter Tract in Warren County, Pennsylvania, around 1795. Over the years, his hunting exploits had grown into legend, and with a body covered in scars from battling bears, he'd become a local folk hero not unlike Daniel Boone or Davy Crockett. His hunting territory ranged for hundreds of miles, from the Allegheny River in southwest New York to the West Branch of the Susquehanna River in Pennsylvania, all of which he covered entirely on foot. He was tall and strong, and even into his eighties he was described as "erect as a pine and as strong and active as a buck."

Killing bears made Jacobs his name, but killing elk made good supper. Elk were once an abundant source of food in the Alleghenies, both for the Seneca and for the settlers streaming in. One year, as work crews poured into the forest to build a new rail line, Jacobs fed the men elk steaks and "kept the surveyors, axmen and chain-carriers supplied with plenty of it all summer long." Pennsylvania, and much of the rest of the East, had been elk country for thousands of years.

But by the 1860s, the elk were scarce. In fact, Pennsylvanians began to wonder if they weren't extinct in the state, as they hadn't been seen for more than twenty years.

Then, in September 1867, while setting traps in the wilds of the Sinnemahoning Valley, a hunter heard the unmistakable bugle of a bull elk.

In earlier times, autumn bugling would attract a harem of suitors, when more than a dozen cows would congregate to feed and mate. An elk's bugle is a singular sound, beginning with the high notes of a brass horn and finishing with a low roar. The call fills the landscape and seems to come from all

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directions at once. The author David Petersen wrote that if you've never heard an elk's bugle, "you'd think it was some tortured soul from hell, howling in anguish and pain." Today, an elk's bugle is most often associated with the high Rocky Mountains, but that haunting sound also belongs to the valleys and hilltops of the eastern United States.

News of the bugle spread quickly and sent local hunters into a frenzy, scouring the forest for one last chance for glory. Perhaps a few were content with the chase alone, a chance to relive the thrill of hunting days gone by when large game was common. The youngest among them may have never even seen a living elk. A few hunters may have been desperate for meat and hide. Whatever their motivations, these hunting parties would not succeed, and the elk would elude its would-be killers for a little while longer.

But Jim Jacobs was on its trail, and Jim Jacobs was a slayer of big game.

That lone elk was accustomed to staying on the move. Elk, deer, and buffalo had migrated to and from mineral licks throughout North America for millennia. Commonly known as "salt licks," these naturally occurring mineral deposits provided lapping tongues the sodium, calcium, zinc, iron, and other elements necessary for bone and muscle growth. Throughout the eastern United States, one can still find places named for them, including French Lick, Indiana; Big Bone Lick, Kentucky; and Buffalo Lick, West Virginia. These locations had attracted herds of mammals for thousands of years, and their migrations created trampled-earth game trails that would be used and expanded by Native American travelers. In some cases, the trails would become modern American highways.

Rutted migration routes, carved by the constant pounding of animal hooves, littered northern Pennsylvania. A report from 1896 described those regular paths as "runways through the woods" that "invariably led to salt licks." The animals' predictable movements made the elk relatively easy targets. Hunters often lit blazing fires, which disoriented and frightened the elk, and as many animals as possible were killed. "Hundreds of elk were killed annually at the licks or while traveling to and from them, along their well-marked runways."

That licking instinct may have led Jacobs's elk to an area known as Flag Swamp, a one-acre wetland filled with blue flag irises and shrubby willow trees. Early surveyors recorded it as an old salt pond. Today, extensive drainage makes it difficult to know exactly where Flag Swamp was, but sources have placed it north of Boone Mountain, in Elk County. The elk may have come there to feed on marsh grasses, for its minerals, or perhaps for a sense of safety.

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It was there that Jim Jacobs first spotted his bull. The man and the bull may have watched each other from across the marsh—elk are not quick to flee and will stare at pursuers for some time before deciding that it's best to run. Or Jacobs might have simply picked up the animal's trail there, following the baying of his dogs. Regardless, the elk got the lead on Jacobs—though less nimble than deer, elk can run up to thirty miles an hour. Encumbered by antlers up to four feet tall and forty pounds in weight, a bull raises its immense jaws, antlers tilted toward his spine, and races through the woods until reaching safer ground. To trail the elk, Jacobs would have listened for its crashing through the understory: twigs and leaves crushing under hoof, low-hanging branches snapping from the collision with antlers and the elk's five-foot-tall frame. He would have scanned the ground for fresh hoofprints, alternating teardrop-shaped indentations, three to four inches wide. But as the hunt wore on, as its energy was depleted, the elk would have needed to stop and eat. Jacobs would have looked for signs of browse, the torn twigs and leaves left behind when an elk pulls at its food. If he had gotten too near, the elk might have betrayed its position with a warning call, described as a "squeal mingled with a hoarse bark," emitted like an alarm at the approach of danger.

Jacobs continued trailing the elk—looking for signs of browse and prints and always listening for the faintest sound—for the next four days and forty miles.

In his younger years, Jacobs would have hunted in ancient forests, now known only to our imaginations—old-growth stands of hemlock, pine, oak, and chestnut, with trees standing more than a hundred feet tall and nearly four hundred years old. Here and there, fire, wind, and flood would have broken the forest into a mosaic of old and new, grass and forest, shrubs and sentinels. Jacobs, with his long rifle and pack of dogs, was not the only predator in the Alleghenies—wolves and mountain lions still lurked in the forest. The water, too, was wild—the Allegheny and its tributaries had yet to be dammed, and Flag Swamp was noted as one of the last hideouts for beavers in the state. In fact, the marsh through which he trekked, and the steep, rugged terrain that surrounded it, had slowed the approach of railroads and posed challenges for the earliest timber harvests—unlike the piedmont and coastal plains, those Allegheny Mountains frustrated the initial waves of extraction. But all of it—the trees, the wildlife, the assemblage of diversity in both life and death through which Jacobs stalked in 1867—all of it was in a last gasp for existence.

Jacobs lived at a period of dramatic ecological change, and old-growth forests were fewer and farther between. Settlements and farmsteads spread

across the state, and each year the timbermen marched deeper into the woods. Lumber was in high demand for fueling iron furnaces and providing timber framing for local coal mines and for shipbuilding. The first American oil well was dug nearby, in Titusville, Pennsylvania, in 1859, and by the time Jacobs was hunting the last elk, an extraction bonanza was well under way. Industrialization was nigh.

Four days into Jacobs's chase, it began to snow, and Jacobs finally brought the bull elk to bay on a large boulder. Hunters of the region referred to the boulders as "elk rocks," as the animals were known to mount them and turn to fight their pursuers by stomping them with their forefeet. The largest eastern elk would have weighed up to a thousand pounds, and a stomp or kick from that powerful animal was fatal; the skulls of dogs and wolves would be crushed. Jacobs found his elk atop one such rock, defending itself and attempting to stomp his dogs to death. For several hours, he tried to capture it alive—it was, after all, the last of its kind—but the elk would not be subdued, so Jacobs shot it in the heart.

According to one report, the bull was "too old and tough for food." Another source claimed that the animal had been taken back to the Cornplanter Reservation, "where the event was celebrated with great rejoicing." However it was commemorated, it was now over—both the hunt and the eastern elk.

Jacobs's elk, "the lone bull of the Sinnemahoning," had been alone for most of its life. Because elk are social animals, forming large herds and seasonal harems, the bull must have had a sense of its solitude. And if no other elk were present to form bonds with for mating or kinship, it must have struggled. Instead, it had gone about its days and years alone, climbing the remote ridges of the Alleghenies and feeding in the rich floodplains below; it remained on alert for predators and listened endlessly for the sounds of other elk. To the very end it sought companionship: When the bull was discovered by hunters that day in the Sinnemahoning Valley, they first heard its bugle, a vain attempt to communicate with another elk that simply did not exist.

People of this era thought the supply of game in America was inexhaustible. That the forests went on forever. Perhaps this was true for a time—we can read these kinds of statements in the explorers' own journals—and perhaps it seemed that way when the first colonists came ashore. But by the late 1800s, hunters were aware of their deeds, aware that the animals they shot were often the last of their kind. They found triumph in being the skilled woodsmen who shot the last elk, bear, wolf, or bison.

John Decker, "one of the greatest hunters Pennsylvania has ever produced," also claimed to have killed the last elk, ten years after Jim Jacobs, in 1877 (although most agree that his was an escapee from captivity). "I have killed more game than anyone else around here, and that is saying a lot, as this was a great country for hunters," he said. "When I was a boy there were panthers on the ridges . . . and the wolves howled nearly every night." Although men such as Decker were often quick to claim their kills, they were reluctant to admit that the killing was the reason the animals were no longer abundant. As he himself said, "It is too bad that game is so scarce these days, but I lay it to the forest fires, which give the wild creatures no peace." Decker understood the disappearance of wolves and even passenger pigeons in similar terms: "I have not seen or heard of a wolf in these parts in forty years, and my opinion is that they left here when lumbering opened up on a big scale. . . . All of a sudden they left the [mountains of Pennsylvania]; that's what makes me think they were not killed off by the hunters. About the same time the wild pigeons, which used to darken the sun with their flights, left here, never to return. I don't believe they were exterminated, either."

Decker was not alone, nor would he be the last to struggle with that sense of responsibility. The truth was that the animals hadn't gone anywhere—they hadn't "left" or "withdrawn" or "fled" to virgin county—they were in fact all dead. They had been hunted out of existence—shot for personal sustenance, shot for sale as food by market hunters, shot for their hides. Their habitat had collapsed, too, and entire ecosystems had been altered to the point that they failed to properly function. But habitat became inconsequential when the animals ceased to exist.

That the elk (*Cervus canadensis*) was so quickly and so thoroughly extirpated from the American East was no small feat. It's estimated that there may have been as many as 10 million elk in North America at the time of European settlement. (By comparison, 30 million whitetail deer roam the continent today.) They were once the most widespread member of the deer family in all of North America; their historic range extended from the Pacific Ocean to the Atlantic coastal plains, and from northern Mexico to central Canada. East of the Ohio River, elk lived throughout the Appalachian Mountains from South Carolina to New York and were reported to have been most abundant in the mountainous areas of the Cumberland and Allegheny Plateaus.

Technically, they hadn't always been there. The species originated in Asia, during the Oligocene period, around 25 million years ago. That proto-elk

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spread throughout Europe and into North Africa, becoming those continents' red deer. Then, around 15,000 years ago, during a period of global cooling, the emergence of the Bering Land Bridge allowed elk to cross from eastern Siberia into westernmost Alaska, and eventually, into the rest of its historic North American range. A great many mammals joined them at various times over the millennia, including steppe bison (the ancestors of American bison), woolly mammoths, and American lions. Evidence suggests that elk were also joined in their migration, at roughly the exact same time, by North America's first humans.

Those humans had been killing elk for a very long time and may have even followed the elk and bison onto the continent. As they ventured farther south, they would have found an incredible bestiary, at once a land of milk and honey—imagine the amount of meat on an eight-ton American mastodon or a giant ground sloth or giant turtle—and a land of abject terror—imagine the claws, teeth, and power of saber-toothed tigers, dire wolves, and a short-faced bear that weighed up to two thousand pounds.

A few theories help explain why none of the above animals exist today, including climate change and disease, but much evidence points to the bipedal new arrivals: spear-wielding and atlatl-thrusting humans. According to this theory, those now-extinct megafauna—the giant ground sloths and the giant beavers, the mastodons and mammoths, and even the lions and dire wolves—were relatively quickly hunted to extinction.

But the suite of large animals that remained in North America when Europeans arrived in the sixteenth century—the elk, bison, deer, panthers, wolves, beavers, bears, and so on—had survived the changing climate, and had survived the assaults of the migrating humans, and they were flourishing. For a few species, that condition was not entirely in spite of but *because of* Native Americans, who set fire to the landscape to clear brush, to stimulate new and vigorous growth, and to improve the ease of movement and hunting. These fire regimes supported the humans dependent on meat, the mammals dependent on early-successional browse and grass, and the plants dependent on fire and light.

After Native people killed elk, bison, and deer, they turned their bones and skins into tools and textiles. In the Ohio Valley, elk antlers were fashioned into hoes and chisels; and at one village site north of Portsmouth, Ohio, archaeologists have discovered elk ulnas that were worked into pointed awls six to eight inches long that were likely used to open freshwater mussels. Elk and bear

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tooth pendants were also common items of ornamentation, and important community members were buried with those adornments. But most useful was the animals' flesh. For thousands of years, elk would have accounted for the second largest amount of meat in the diets of many eastern peoples, after the ubiquitous whitetail deer. Not only were the animals present in the East; for thousands of years they sustained human life and were integral to Indigenous material and spiritual culture.

Although they were great and skilled hunters, Native Americans in the East rarely killed all of the elk or all of the deer in an entire watershed. The systematic extirpation of those animals would not occur until the global demand for hides increased and the weapons to shoot their sources spread over the continent. The purpose and the extent of hunting were radically altered by the arrival of European guns and markets—the killing of wild animals became an occupation with commercial ends, for both whites and Indians; and wild hides and wild meat became the goods of an insatiable marketplace. That commodification of wildlife would lead to the downfall of nearly every large mammal in North America.

By the late 1800s, as Jim Jacobs was serving elk steaks to railroad workers in the Allegheny Mountains, wild meat was also being sold in nearly every urban market from Detroit to Baltimore and from St. Louis to New York City. Taverns and inns served all manner of wild game: elk steaks, fresh venison, oysters, grouse, quail, woodcock, crabs, plover, snipe, duck, rabbits, squirrel, and every kind of fish. Thousands of passenger pigeons were shot in the countryside and taken to urban markets by the wagonload. All game was fair game, and eating wild things was both luxurious and banal—throughout the country the consumption of wild animals was entirely typical. In early America, practically everyone consumed the meat of wild animals. As the Jim Jacobses and John Deckers were shooting the last elk of Pennsylvania, their western counterparts were doing their part to exterminate the species continent-wide. Wherever elk lingered, "tusk hunters" shot the biggest elk for their canine teeth, known as "ivories," to be sold to members of the Benevolent and Protective Order of Elks. Consumption could not go on like that. A herd of elk, like old-growth hemlock, has biological limits.

European arrivals to early America harvested the forests as quickly as the animals within. Shortly after Jim Jacobs downed his elk, Flag Swamp was drained and leveled for a new rail line. In a few short decades every forest in Pennsylvania—and nearly the entirety of eastern North America—would be

clear-cut and transformed into a wasteland of stumps. In place of the ancient forest was a shorn land besieged by uncontrollable wildfires, prone to landslides and erosion. Passing trains dumped coal, and sparks from tracks ignited fires that raged across the land. They were not the fires of Indigenous hunters clearing the understory of brush; they were due to the carelessness of Industrial Age people burning too hot and too much. The dried-out humus, which in some forests had been six feet thick, was burned off to bedrock. Without a forest to absorb the rain, water rushed off the land. In Pennsylvania, "No effort has been made to preserve or renew the forests of the Allegheny valley," one observer noted in 1904, "[and] the streams have shrunk to mere creeks or dry beds of sand and gravel in summer . . . [the watershed] is now a waste for briars and brush." A US Geological Survey report from that same year concluded that "there are few places in the east where the natural beauties of mountain scenery and the natural resources of timber lands have been destroyed to the extent that has taken place in northern Pennsylvania." Joseph Rothrock, who would become the state's first forester, even called the region the "Pennsylvania Desert." Where once had stood a dense canopy of three-hundred-year-old trees, forest cover spanning thousands of miles, gave way to charred stumps and bare earth—a landscape of wanton destruction. The despoilers had given no thought to the future, and disregarded the past, as they gathered every resource in the present.

Jim Jacobs, the last great long hunter of the eastern mountains, was killed there, too. In 1880, while walking to visit relatives in New York, Jacobs was struck and killed by a train near Bradford, Pennsylvania. He was ninety years old. The railroads had drained Flag Swamp, had brought the lumbermen deeper into the Alleghenies than ever before, and they had killed Jim Jacobs.

Over the next several decades, a roll call of Pennsylvania's native animals would be extirpated, including mountain lions, wolves, wolverines, badgers, pine marten, and fisher cats; whitetail deer were nearly wiped out of the state, as were black bears and turkeys. River otters, once ubiquitous, were gone from much of the East; and beavers were eliminated from all 29 million acres of Pennsylvania. By the turn of the twentieth century, no elk remained east of the Mississippi, nor on the Great Plains, and Merriam's elk, a subspecies of Arizona, joined the eastern elk in extinction in 1906. The animals were now found only in the high Rocky Mountains and in scatterings along the Pacific Coast.

As the American experiment marched on, we found other things to eat—elk and whitetail became unnecessary because we had pigs and cows—and we

didn't mourn for long the passing of big animals in the East. While a few of the old hunters were wistful about the memory of the large mammals, others saw extirpation as necessary progress. The big game and the big trees, the wild lands and the wild lives—they had to give way. They were among our national sacrifices.

Theodore Roosevelt was among the wistful. Ten years after the Sinnemahoning elk was killed by Jim Jacobs and decades before he would become president, he was on a hunt in the Dakota Badlands and couldn't find elk there either. Back home in New York, along with the anthropologist and naturalist George Bird Grinnell, he formed the Boone and Crockett Club and kick-started a conservation movement to right the wrongs of their pioneer forefathers. Roosevelt and his club promoted the "fair chase" of game species, worked to outlaw the market hunters that were driving remnant populations to extinction, and helped lay the foundations for the North American Model of Wildlife Conservation.

That sportsmen's movement, driven by the men who loved to hunt big animals, took hold in the Alleghenies too. In 1913, the Pennsylvania Game Commission arranged to have fifty elk wrangled out of Yellowstone National Park, hauled back to Pennsylvania by rail, and turned loose. Most of these animals died, and two years later they tried again with a hundred animals. In 1915, Michigan sportsmen did the same, starting with just seven elk. Some of the elk were shot by farmers, some were shot for food, and others died of disease. But enough remained on the landscape so that these two populations would persist for decades to come. The animals would remain a novelty throughout the twentieth century, rarely seen backwoods curiosities, but they were on the ground. It was enough to demonstrate that they had been there before and perhaps could be there again.

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CHAPTER 2

From Bushy Tails to Whitetails

For the wildlife of eastern North America, it was rock bottom. Never before had so many large mammals vanished from the landscape in such a short period of time. The scrub forests that grew over the hills were eerily quiet, and the big animals were just a memory.

But it's as they say: When you're down, the only way to go is up.

Inspired by the likes of Teddy Roosevelt, twentieth-century conservationists were soon doing their best to put things back together—and to restore the populations of wildlife that yet remained. It was a big job and at times impossible. After all, now that the land had been cleared of its original forests, where would the elk, the turkey, and the deer be placed? There were farms and cities and highways just about everywhere. Many Americans thought it was time to put those wilderness days and those wild beasts behind us.

More than a hundred years after the last eastern elk was killed, Doug Hensley, a sportsman from east Kentucky, began his first term as a volunteer commissioner of the Kentucky Department of Fish and Wildlife Resources, the public agency responsible for the management of all wildlife in the state. Around that time, he began to wonder if the days of big game were in fact over. He had come to believe that elk should once again live in east Kentucky. And even when his colleagues and neighbors failed to support this vision, he wouldn't let it rest. By the end of his twenty-four-year term, he would witness changes in the landscape, and the wild animals, that rivaled the scale of change witnessed by Jim Jacobs's era—and he would see an opportunity.

Hensley was not an environmentalist; he would never identify as a "rewilder," nor as a champion of wilderness. He was a lifelong hunter and angler—later estimating to have killed more than five hundred deer—and it was from that older conservation tradition, with its roots in the early twentieth century, that his radical ideas would emerge.

Nothing about his upbringing—nothing about the landscape or the animals

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his neighbors hunted—told him that elk belonged there. East Kentucky was not a place for big game, certainly not in the twenty-first century. But Hensley would change all of that. By the time he was done, he'd redefine big-game conservation in the eastern United States.

In the east Kentucky of Hensley's childhood, there were squirrels but not much else. In the 1950s, the image of wildlife had been reduced to that of a bushy-tailed rodent bounding up the shag of a second-growth hickory tree. And even that was rare. The deepest woods might have harbored chipmunks and woodrats, but the deepest woods were nearly gone. Even at night, raccoon and opossum remained scarce. In terms of wild game, families had scant left for the pot except for an occasional rabbit and a few species of rodent. Over the course of just a few generations, the mammalian chorus of eastern beasts had been whittled down to little more than whistle-pigs and chirping squirrels.

Hensley was born in the back room of a cinder-block house and tire store in Darfork, Kentucky, in 1947. It was not even a hundred years since the last eastern elk had been killed, and none of his family, no friends or relations, could recall a time of abundance. Most had never even seen a deer. They cherished what did exist, however, and the humble pound-and-a-half eastern gray squirrel had become a prize. Among the state's hunters, squirrels ranked as the number one game species year after year—in Kentucky, the act of hunting and the hunter were largely synonymous with squirrel. In some communities, squirrel brains were a delicacy. For many Kentuckians, a spicy burgoo wasn't complete without the animal. "But no squirrel stew needs to be all 'gormed up,'" wrote one Kentucky author, "because nothing should detract one iota from the delicate flavor of the wild meat." But it wasn't for any laundry list of attributes that squirrels had become the premiere object of desire—in terms of flavor, in terms of the thrill of the chase and in succulence of meat, the squirrel's competitors were few.

The natural world, though diminished, remained close at hand. Nestled in a sharp bend of the North Fork of the Kentucky River, Darfork was hemmed in by rushing water; on the horizon, hills loomed in every direction. Rising earth and flowing water were boundaries, limits on where and how to build, and how to move about the land. The hills and the waters, undulating and seemingly endless, were fraught with both containment and release. Before trains and automobiles, the North Fork had functioned as the region's highway. Large flatboats had been poled upstream, deep into the mountains, hauling

coffee, flour, and other household goods along with passengers and livestock. More significantly, however, both economically and ecologically, had been the items flowing out. Massive trees—centuries-old poplar, oak, chestnut, walnut, and beech—were felled by hand, stripped of bark, and floated to sawmills at Jackson or Quicksand or as far away as Frankfort. For decades, these harvests were minimal, and occurred in rhythm with the seasons. Oxen carried logs to the water's edge, where they were bundled onto rafts. Hickory saplings were wrapped around the lumber like rope. A few manufactured items were sent downstream—ax-carved railroad ties, barrel staves, wooden shingles, and a bit of whisky, tobacco, and hemp—but by and large the outflow was of raw materials. Because the river was the loggers' only mode of transportation, they waited for the spring floods, or "tides," as they were called, when immense trees would float. If water turned to ice, the rivermen simply had to wait.

In the early years of extraction, biology and geography conspired to limit the harvest of merchantable timber in east Kentucky. Many hillsides were too steep for oxen to climb, and large equipment was difficult to haul. Like the lonely stretches of Pennsylvania's Allegheny Plateau, where Jim Jacobs had stalked his Sinnemahoning elk, Perry County's rugged mountains had created an unintentional refuge for the native biological communities. Indeed, although Daniel Boone and his Kentucky frontiersmen had thoroughly removed the game of eastern Kentucky, a fair amount of the region's old-growth forests remained into the early twentieth century. The big beasts were gone—but even into the early twentieth century, pockets of untrammeled lands remained.

The mountain forests were so special, in fact, that one of the nation's most important botanists, Emma Lucy Braun, visited Perry County, Kentucky, on several occasions in the 1930s. Originally lured there by the reputation of the "Big Poplar of Perry County"—an enormous tulip poplar with a twenty-foot circumference—she became enthralled by the diversity and ecological significance of east Kentucky. One of the first Americans to identify as an ecologist, she came to know more about the eastern forests than any other living person—over the course of her career, she covered 65,000 miles on expeditions to document species, associations, and communities, plotting out succession and climax trajectories; she documented species new to Kentucky, and built an herbarium collection of nearly 12,000 species. She went as far as roads and rails would take her and then went farther on horseback; if a mountain slope was too rugged for the animals, she went on foot. But when she arrived in eastern Kentucky's Cumberland Plateau and Mountains, she lingered. That, she said, was the Mother Forest.

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That sort of primeval forest had vanished elsewhere in the East. Braun coined the term "the Appalachian mixed mesophytic" to describe the ecoregion—the moist, broad-leaved, deciduous forests characterized by diversity, canopies of shared dominance, and rich herbaceous understories. The assemblage of salamanders, snails, and insects there was among the most diverse in the world. During the last glacial period, east Kentucky was a refugium for species pushed south by the advancing ice sheets. Because of its variations in topography, slope, and soils and because of its north-south axis, species migrated to and fro as the climate warmed or cooled—and in that irregular topography, species found niches to survive, and to speciate—to evolve and grow and repopulate.

"The deciduous forest of the Cumberland Mountains is outstanding in its superlative quality," Braun wrote. "In number of tree species, in size of individuals, in variety of forest types it ranks as one of the finest deciduous forest areas of North America. The mixed mesophytic forest association is here at its best; nowhere else"—not even in the Great Smoky Mountains—"is it as well developed." The work was revelatory. "Botanizing in eastern Kentucky is particularly interesting because of the element of surprise which is introduced from time to time by the finding of totally unexpected plants," she wrote in 1937. ". . . Because of geographical location, Kentucky is a meeting place of northern and southern Allegheny species. We expect, hence, to find white pine and magnolias, for instance, but we do not expect the extreme northern forms which extend south in the higher mountains . . . neither do we expect to find in the plateaus and mountains any considerable number of plants from the Coastal Plain; nor, because of separation from the Blue Ridge Province, typical Southern Appalachian species in any quantity. *Yet all of these groups of species do occur* [emphasis mine]."

As Braun saw it, one tract of forest in Perry County, the Lynn Fork of Leatherwood Creek, rose above the rest. "Often times we see tracts of so-called virgin forests from which this or that tree has been removed; or if the canopy is intact, with the undergrowth ruined by grazing or by rooting hogs. But not so here," she wrote. "Nothing has ever disturbed this area; the luxuriance of the undergrowth is beyond description. There is a wealth of herbaceous plants, and beautiful wildflowers everywhere. The whole place is awe-inspiring in its beauty and grandeur." There was one particular tree, the Big Poplar of Perry County, that had drawn her to Lynn Fork in the first place. "It took five people with arms outstretched to reach around the tree," she wrote. "This gigantic trunk towered upward, unbranched, to such heights that it was impossible to

distinguish the leaves of the crown. Nowhere east of California have I seen such a gigantic tree. And this was only one of many large trees."

But while the land—remote and exceedingly rugged—was difficult for industrialists to conquer, the task was not impossible. In 1917, the Louisville & Nashville Railroad had completed its tracks along the North Fork, and the surviving stands of old-growth forest were suddenly accessible. "Great forests of oak and other hard woods abound, untouched by the saw," the Louisville Board of Trade had announced as the rail was being laid. "These forests have passed and are passing into strong hands financially, and the products are to be marketed without delay and without waste." Lumbermen did not value those ancient forests for their richness in species and diversity; likewise, the herbaceous understory of Lynn Fork was of no interest to the Board of Trade in Louisville. Lumbermen valued lumber. Over the next twenty years, the final wave of eastern clear-cutting commenced.

Braun saw the writing on the wall. By 1935, she'd help establish the Save-Kentucky's-Primeval-Forest League, and spoke to civic groups, garden clubs, and met with the National Park Service in Washington, DC, leveraging her scientific chops to exude authority as an advocate for Kentucky's forests. The secretary of the interior approved Lynn Fork for National Monument status, if only they could find the money to purchase the land and the timber rights. The forest was the last of its kind, and Braun advocated for preserving it in this state of wilderness. "Why not save a piece of your native country, your native state, in its original condition as a monument to the original beauty and grandeur of your forests, just as you save an historical shrine?" she asked. "If sufficient pressure is brought to bear—if we want this bad enough—we can get it."

Braun would go on to secure the protection of a number of natural areas in Ohio and Kentucky, but the saws and the lumbermen finally made it to the Lynn Fork section of Leatherwood. The lumbermen had a new economic incentive: Hat makers had recently decided that they favored the tulip tree's soft wood for the hat blocks used in manufacturing their goods. "Just when sentiment was crystalizing in favor of the purchase more than a year ago, some of the larger trees were felled," a reporter noted in 1938. "That was the death blow to the park movement, and since then the Lynn Fork of Leatherwood has been reduced from an impressive forest to a wreckage as if it had been hit by a hurricane."

A few decades later, by the time the young Doug Hensley was prowling the woods for game, Braun's beloved poplars were gone. Most of the remaining

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trees were scarcely twenty years old, and many other hillsides were entirely denuded. Where a bit of forest had regrown, it was likely to be consumed by flames. The big trees were gone, and the formerly luxuriant understory was withering in the sun.

The rivers took a hit, too. As Hensley came of age and railroads and highways replaced rivers as a mode of transportation, Kentucky's waterways turned into dump sites. Straight-line pipes carried sewage directly from homes to the river, and waste from coal miles turned its waters a sulfuric orange. Hensley wasn't allowed to eat the drum fish, catfish, and sunfish he loved to catch in it. (Ever determined, he'd take his catch to a friend's house for cleaning and frying.)

Coal had been dug in east Kentucky for more than a century, but with the coming of the railroad, extraction accelerated, and pollution grew apace. The year Hensley was born, there were 259 truck mines in Perry County alone, and by the year's end, more than 6 million tons of coal would be dug from local mines. Mines drew water from the North Fork of the Kentucky River to wash the minerals and dumped waste from this process back into it. In some nearby streams, coal waste deposits were four feet deep. When officials investigated the health of a nearby watershed, scientists found some creeks to be entirely devoid of animal life. Whether in heaps, slurry ponds, or gob piles, whether embedded in the muck of creek beds or the molecular level of wildlife, waste lingered.

Companies didn't do much if anything to mitigate the damage; and as one historian wrote, "Coal companies argued that coal could not be mined economically if they concerned themselves with the pollution problem." At the turn of the century, in the adjacent coalfields of West Virginia, the state's game warden concluded that "if coal is more important than water, then we must abandon these streams altogether." In the ensuing decades, coal's hegemony would not be challenged, and in the years of Hensley's youth, the fish, mussels, reptiles, and amphibians continued to suffer. Some would be extirpated from the region; others would go extinct. A number of streams would in fact be abandoned, but not in the spirit of the game warden's plea; they were buried under the refuse of mountaintop removal coal mining. Species would vanish, and so would entire mountaintops.

The presence of coal, as an industry, as a polluter, as a physical object, was inescapable. The coal companies were brutal with the land, brutal on water, and because they were often the only game in town, they could afford to be brutal with the people. In winter, families burned coal to keep warm, and the

dust and smog lingered in towns and camps. Particulates settled in these low-lying, river-bottom settlements, and in the lungs of those who mined it. A film of black dust coated windowsills, porches, and clothing hung outside to dry. Coal tipples, where coals were screened and sized and loaded into rail cars, were often adjacent to the miners' homes, and created even more dust (a single tipple in Darfork could load up to twenty train cars a day). Coal was the reason Darfork existed. At one time, the industry employed more than 50 percent of Perry County's workforce. Doug's father's first job, at the age of thirteen, was as a truck driver for a coal company.

The first three weeks of 1957 were dry, but on January 22, it began to rain. The next morning it rained again, and later that evening, the downpour intensified and would not relent for the next three days. The big rivers rose, and floodwaters soon inundated Hazard, the county's principal city, just three miles upstream from Darfork. Bridges were washed away, and all roads leading to Hazard were blocked by floodwaters. Water, gas, and electrical utilities were shut down. It would be declared the worst disaster and the worst flooding the watershed ever experienced. Parts of West Virginia, Virginia, and Tennessee were likewise devastated. Downtown Hazard was inundated with as much as seventeen feet of water.

Doug Hensley, who was ten years old at the time, sought refuge with his family at a home up the hill along with thirty other neighbors. From that vantage point, he could see a horrific scene unfold: Entire homes, whisked away by the floodwaters, were crashing into bridge pilings and riverbanks, smashing to pieces. Televisions, bathtubs, tires, refrigerators, automobiles, whole trees, and even a small airplane floated down the river. Horses and cows were carried off by the current, as were pigs and chickens. Some animals found their way onto rooftops, but many others drowned; a few hogs were seen attempting to swim.

As night fell, people needed to eat. Some cooked on woodstoves or outdoors over open fires; Hensley remembers eating soup beans and cornbread. At the home on the hill, candles were lit. But gases had filled this home, and would cause an explosion. Hensley was one of the last to scramble out, his hair burned off and his ears blistered. Two others were not so lucky; an elderly couple huddled on the floor would die.

President Dwight D. Eisenhower declared the Kentucky River basin a major disaster area. Twelve lives were lost and $50 million in damage caused across eastern Kentucky, $4.5 million of it along the North Fork and in Hazard. A federal government report following the disaster noted that without forests

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to hold water in the ground and the river in its bed, even the strongest dam would be unlikely to prevent a future flood.

When there is space for a river to be wild, to express its potential as a force of nature, seasonal floods bring an explosion of new life. The violence of the rushing waters clears away trees and sparks the growth of grasses, forbs, and fast-growing young trees—the food of native herbivores such as elk, bison, and deer. Historically, the North Fork of the Kentucky River would have contained patches of those successional habitats, and the larger rivers of the eastern mountains—the Ohio, the Kanawha, the Cumberland, and the Tennessee—would have contained great open meadows. When Kentucky was settled by the likes of Simon Kenton and Daniel Boone, it was in these grassy, herbaceous openings that the big game would have been most abundant. But in the Kentucky of the 1950s, without those large wild animals to flesh out the scene and without the forests to control erosion after flooding, the successional habitats were of diminished value and unable to function. After all, what is a meadow without an animal to graze? What is tender browse without the toothy tear of a doe? Furthermore, with towns and cities now occupying the floodplain, natural processes, such as spring floods, fire, and wind, had become something to fear. As the scale of mining grew, so, too, would its consequences. Faced with increasing flood risk, Kentuckians were now at a crossroads: Should they learn from the dictates of nature and bend to its will, or should they redesign the natural world to try to protect themselves from its might? East Kentucky was rugged, its mountains were steep, and flooding was its nature.

For some, the flood of 1957 was a rude awakening. "[We have] experienced the most disastrous flood of our time," wrote Bernard Baldridge of the Kentucky Department of Fish and Wildlife Resources (KDFWR). "We often wonder if this was the result of our own waste. We must now know that conservation plays an important part in flood control . . . it is a proven fact that a good forest and heavy vegetation retards the flow of water and gives it more time to evaporate and to be absorbed. The dwindling of our natural resources is nothing new. We can look about us and view the naked hillsides, that have been cleared of forest and plant life, and the land that is washed to a shale, then we can understand why we need conservation." Baldridge's essay appeared in *Kentucky Happy Hunting Ground*, KDFWR's quarterly magazine, a few months after the flood; a direct plea to the state's hunters and anglers. "Are we going to stand idly by and see such tragedies reoccur or should we start an extensive conservation program?" he asked.

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Because of the scale, and the rapidity, of deforestation in east Kentucky—unprecedented in the history of the Appalachian Mountains—and because of the frequency and the intensity of wildfires, the forest was failing to regenerate. Local groups took small-scale action. In 1952, local farmers and 4-H clubs planted 32,000 seedlings, including pine, walnut, and locust. In Perry County, Kentucky's Conservation Service collaborated with civic leaders, the Soil Conservation Service, and the Kentucky Division of Forestry on reforestation projects and planted hundreds of thousands of saplings. But as the survivors of the 1957 flood could attest, not only were the projects insufficient, they were too little, too late.

The service station in Darfork that Doug Hensley's father operated was damaged in the flood of 1957, but business and life soon returned to normal. Behind the service station, young Doug shot at tin cans with a BB gun. He shot birds. He roamed around with his dog and shot whatever he could find. Shooting offered opportunities to touch and engage with the natural world. (John James Audubon had done the same for nearly every portrait he painted, though Hensley is quick to note, "I shouldn't have, but I didn't know any better. Back then, things were different.") By the age of ten, he had seen a lot of creatures up close. He could shoot. And he was ready for a proper hunt. So his father and his uncle took him squirrel hunting. The mast was heavy that year and the squirrels plentiful, and Doug succeeded. Back home, his father skinned the animals, while his mother prepared the meat for supper. "She would never cook a squirrel unless we skinned the head for her," he says. "She liked the brains and the cheeks." Shooting squirrels was a sport, and it was a source of food.

Hunting and fishing would become Doug's deepest passions; he was skilled enough to teach marksmanship at Boy Scout camp (later earning Eagle Scout rank). When his father was busy, neighbors took him along. Although he enjoyed every outing into the woods, Thanksgiving was special; for that holiday, he and his father took a morning hunt with a dog. After the hunt, they'd eat a can of Vienna sausages on a mountain perch before returning home to clean their kill. Though it was Thanksgiving, this harvest would never include wild turkey; the last of those birds was killed more than fifty years ago. Thanksgiving was a squirrel hunt.

Kentuckians such as the Hensleys had become squirrel hunters not because they preferred to eat those animals over deer, elk, and bear; they had become squirrel hunters because everything else was gone.

The squirrel's presence at midcentury was not the result of a coordinated

conservation strategy—it was a bit of luck. Though they were killed for an altogether different reason, squirrels had fallen victim to the same persecution big game as deer, elk, and buffalo had; in the colonial period, those forest-dwelling rodents had been classified as vermin and targeted for eradication. Only a short time ago, they were one of the most reviled and hated species on the continent. In fact, had the colonists and European settlers of the nineteenth century been successful, squirrels, too, would be extinct.

In 1716, Providence, Rhode Island, placed bounties on the hides of just two animals: the gray wolf, a seventy-pound, pack-hunting apex predator; and the lowly squirrel. Because of the damage they could do to a field of corn and wheat, colonial farmers wanted squirrels dead. "Among the troubles to which our goodly ancestors were . . . subjected, was the depredation committed by the legions of squirrels with which the forests swarmed," wrote a historian of eastern Pennsylvania. In 1795, a law was passed in the Kentucky territory requiring all white males over sixteen to kill a certain number of squirrels and crows each year. In time, the mass slaughters begat contests. In Ohio, 10,000 squirrels were dispatched over the course of a week. Often, hunters didn't use guns; they just beat the animals to death with a wooden club. The eradication campaigns lasted more than a century.

Amid that persecution, millions of squirrels began to migrate. In 1819, the naturalists John Bachman and John James Audubon observed a squirrel "scourge" near Cincinnati. "Mountains, cleared fields, the narrow bays of some of our lakes . . . present no unconquerable impediments," they wrote. "Onward they come, devouring on their way every thing that is suited to their taste, laying waste the corn and wheat-fields of the farmer." In 1803, the Lewis and Clark expedition witnessed a migration swimming the Ohio River near Marietta, Ohio. Meriwether Lewis recorded the scene in his journals, noting that the squirrels "swim very light on the water and make pretty good speed." (Not quick enough to elude his dog, however; "they wer fat and I thought them when fryed a pleasent food," Lewis wrote.) Squirrel migrations were documented in New England, the middle South, and across the Midwest. In 1842, a single mass movement of an estimated half-billion squirrels spanned from Iowa to Wisconsin. So significant were the movements that early mammalogists referred to our common gray squirrel as *Sciurus migratorius*, or the migratory gray squirrel.

Unfathomable as migratory squirrels may be to us today, such was the scale of wild spectacles, and ecological change, in the American East. Soon, they would be the only game in town. By the time Doug Hensley killed his

first squirrel, the small mammals were no longer viewed as an insurmountable scourge threatening agriculture and all of civilization; they were now a prize. By 1904, game wardens in northern Kentucky were prosecuting squirrel poachers—in a region where, less than a century before, residents had clubbed the animals to death as they migrated across the Ohio River. Squirrels were now one of the most beloved game species in the eastern United States, and whatever predators that still lingered should now be shot to protect this precious quarry.

In the late 1960s, when Doug Hensley was in college, he would shoot a squirrel and swear it was the biggest specimen he'd ever seen. He had it mounted.

Not everyone was content with small game, and a number of Kentucky sportsmen had been pining for big game for decades. The Kentucky Division of Game and Fish (later to become the Kentucky Department of Fish and Wildlife Resources) was formed in 1912, funded by hunting and fishing licenses, and they were tasked with enforcing game laws and increasing fish and game populations. The agency was soon releasing thousands of 53,000 fish into Kentucky streams. In 1916, they imported ten thousand quail from Mexico (but every single bird would die in quarantine in New York City). There were some successes and lots of failures in those early years—there was no precedent for any of this work, and it was going to involve a lot of trial and error.

The big work of reintroducing game to these forests started as early as 1919, when thirty whitetail deer were purchased from a Wisconsin farm and released into the Kentucky Woodlands game reserve in far western Kentucky. But game agencies didn't limit themselves to native species—Kentucky released English fallow deer and European red deer; and in Maryland, Japanese sika deer were turned loose in 1916 and soon filled the lower Eastern Shore. Western rabbits were set loose in West Virginia (only to be halted over concerns about bubonic plague). Wild boars were released in south Georgia, to mingle with the existing feral hogs; and by the 1920s, wild pigs and feral hogs were roaming free and reproducing in the Great Smoky Mountains. ("Russian wild boar hunting is the most fascinating sport in America today," a West Virgina conservation commissioner wrote in 1950, arguing that his state should have the hunts, too.) The South American nutria, a twenty-pound semiaquatic swamp rodent, was released in Louisiana in 1937 and persists in the coastal South to this day. The US Congress even considered introducing African hippopotamus to the swamps of Alabama to boost meat production in otherwise "unproductive" habitats. Some landowners introduced animals

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to fenced preserves, but elsewhere, exotic species were allowed to range free because establishment was the goal.

Game agencies tinkered with plant life, too, urging farmers to plant multiflora rose, sericea lespedeza, and a number of other exotic species they believed would improve the productivity of wildlife habitats. Their good intentions were filled with a fair amount of naivete, and a belief that modern man could not only restore the natural world, but improve upon it—that ecosystems which had evolved there for millennia, composed of thousands of species, could be replaced and improved upon with a few fast-growing shrubs. There were dramatic unintended consequences from all of this—and we wrestle with the fallout to this day.

Just as those conservation efforts lacked research and data, they lacked funding. Translocations typically occurred on the cheap, only when another region happened to have a surplus of raccoon, turkey, quail, or whatever was on hand; stockings routinely involved fewer than a dozen animals who were simply caged, trucked, and released. For all but the hardiest of critters, the odds were stacked against them, and the various efforts were not quite effective.

The states could keep going it alone, but what they needed—and what conservationists clamored for—was support from the federal government. In the early twentieth century, leaders of the conservation movement came through. On May 25, 1900, President William McKinley signed the Lacey Act, which prohibited the sale of illegally harvested fish, wildlife, and plants across state lines, and effectively outlawed market hunting. More legislation followed, including the Migratory Bird Treaty Act of 1918, which outlawed the killing of more than a thousand species of migratory birds. This bill was aimed at the international trade in feathers and was doubly significant for the precedent of federal protection of species. Those two laws ushered in a paradigm shift for the concept of ownership of wild animals. No longer did they belong to the free market, to be consumed, bought, and sold by anyone with a rifle—birds and mammals were now entrusted to the states, and owned by the entire American public. Whitetail deer and squirrels were now to be governed like water and air—a natural resource that belonged to the American people.

But legislative impacts often take time to see results—and time wasn't something that vanishing species had to spare. One of the great barriers to reestablishment was the fact that Americans harvested wildlife not just for sport, feathers, and hide, but for sustenance too—and mere words on paper weren't going to change that. During the Great Depression, poachers went into a game refuge in far western Kentucky and nearly wiped out the state's

remaining big game—within just eighteen months, an estimated one thousand deer and three hundred turkeys had been killed. The state agency was largely powerless—and the region's lone game warden was responsible for patrolling thirteen counties. When one group of local sportsmen found the carcass of a deer, wounded and left to die by poachers, they placed its legs and antlers in the back of a pickup, along with the carcass of a wild turkey, and toured local communities with a hand-painted sign: "Use your influence to save the few remaining deer and wild turkeys." But their plea fell on deaf ears; meat in the present was more compelling than the promise of progressive game management. It was hard for anyone to convincingly argue otherwise. Decline was all that anyone had witnessed. If the big wild animals were destined to vanish—and if your neighbors were out looking for them, too—you might as well be the one to eat the meat.

Wildlife needed more than just a refined sense of ownership—large mammals, especially, need large places to live. To that end, President Roosevelt established the first federal reservation for the protection of wildlife at Pelican Island, Florida, in 1903 (the three-acre island had been a popular spot for plume hunters, and it was the species' only breeding grounds on the East Coast). A flurry of refuges followed: Along and east of the Mississippi, the majority were dedicated to waterfowl; in the West, they were large enough to provide space for big game such as elk and bison.

Carving out land for wildlife was no easy thing, especially in the East. The Weeks Act of 1911 gave authority to the secretary of agriculture to investigate and "recommend for purchase . . . such lands within the watersheds of navigable streams as . . . may be necessary to the regulation of flow of *navigable* streams." Prior to that, the federal government had no constitutional authority to purchase private land for the purpose of forest conservation. The federal government could now purchase private land if it could be deemed necessary to protect the navigability of a river and/or the headwaters of watersheds in the eastern United States. And it allowed the lands to be preserved and maintained as national forests; in 1916, North Carolina's Pisgah National Forest became the first in the East. The navigable streams clause was criticized as a constitutional loophole, and there was opposition to the bill by western interests, but the spirit of the Weeks Act was popular. There were many families farming on degraded and unsuitable land in the East, desperate to escape financial and ecological ruin; just as lumber barons were eager to sell their cut-over timberlands for one last big payout.

In east Kentucky, the US Forest Service had its eyes on three regions: Pine

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Mountain and the headwaters of the Kentucky River; the Quicksand Unit, and the tributaries of Troublesome Creek; and the sprawling Cumberland Forest Unit. The first two areas had been abandoned in large part because the federal government couldn't afford it—coal was known in these mountains, and the price per acre was simply too high. After more than twenty years of surveys and negotiations, the Cumberland National Forest, later to become the Daniel Boone National Forest, was established in east Kentucky in 1937. (E. Lucy Braun, the botanist and conservationist who'd fought to save the primeval forest of Lynn Fork, would succeed in establishing a primitive area to preserve a tract of old-growth forest.) It would later include the Beaver Creek Wildlife Management Area, a designated area not just for timber production but for wildlife, too.

The Cumberland was no remote wilderness. Its forests had been cut, its bottomlands farmed, and it was still filled with people: Many families declined to sell their land, choosing instead to stay within the "purchase area" boundaries of the new national forest, and they continued to farm and harvest timber as their families had for generations. (While the Parks Service had used eminent domain for a number of projects in the East, including the Great Smoky Mountains and Shenandoah National Parks, land for the Cumberland National Forest of eastern Kentucky was to be purchased from willing sellers only.) Not that the Forest Service was thrilled about it. "Some 8,000 resident land owners within the Cumberland National Forest Boundary present a most vital problem," one forester wrote. But it was the eastern United States, people were everywhere, and conservationists would have to make the best of it.

The national forests were established as timberlands, not as wildlife habitats; once cut, the forests were to be rehabilitated as timberlands again. Yet the wildlife in them would benefit, too. Indeed, the Cumberland National Forest was a great step forward for wild nature, and within its boundaries the Beaver Creek Wildlife Management Area would be managed under a cooperative wildlife protection and research program between the Forest Service and the state Fish and Wildlife agency. But across the nation significant work remained, and so in 1936, at roughly the same time as the Cumberland National Forest was established, President Franklin D. Roosevelt organized a North American Wildlife Conference, where he implored hunters and anglers to take grassroots action. Locally, the League of Kentucky Sportsmen, which had been founded the year prior, urged their state legislature to support scientific game management, and to support a new bill making waves in Washington, DC.

The Federal Aid in Wildlife Restoration Act of 1937, also known as the Pittman-Robertson Act, would apply an excise tax on guns, ammunition, and other hunting equipment, and the funds it raised would be distributed to the states to be used exclusively for wildlife management; the funds would *not* go into a general operating fund and could be used for no other purpose. The bill was supported and promoted by sportsmen throughout the nation, and was so wildly popular that it took just ninety days from introduction to passage. The impact of this money cannot be overstated: Those fledgling state agencies, which had struggled to enforce game laws or protect dwindling populations, now had revenue to purchase and manage wildlife refuges, to pay game wardens, and for the first time in Kentucky, to hire professional wildlife biologists.

The Pittman-Robertson Act was the critical final component that got wildlife conservation efforts off the ground in the East. Shortly thereafter, in 1944, the Kentucky Department of Fish and Wildlife was overhauled to reflect the development of modern, scientific game management. The next year, the department bought and established a game farm. It would soon spend $8,000 on more quail, place an order for a hundred raccoons, and release more than half a million fish into streams and ponds. They made plans for wild turkey and beaver. And Fish and Wildlife wasn't just interested in small game. "Today there are thousands of square miles of range suitable for the larger game species in the State," wrote the department's federal aid coordinator, Harold E. Alexander, in 1946. "An occasional flock of turkeys and an occasional deer is reported but their numbers are pitifully few." The department even discussed reintroducing black bears to east Kentucky—a species that had been regarded as a vermin predator during the settlement period, but with enough time and absence, had become a nostalgic symbol of a wilder, richer Kentucky.

In 1946, the state was allocated $23,670 of Pittman-Robertson funds for big game, and with this humble budget, dove headfirst into whitetail deer recovery. Fish and Wildlife partnered with local sportsmen's associations in seventy-one counties, and where there were no official groups, partnered with more than three hundred individuals to create 101 new refuges, 31 of which were in eastern Kentucky. The department leased this land and, in most cases, posted it closed to hunting for ten years. Not even private landowners were allowed to hunt. "It is a long, slow job and Kentucky is far behind," Alexander wrote, "but a start is being made."

Kentuckians had been squirrel hunters for decades. But when they finally got a taste of whitetail deer, there would be no turning back.

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CHAPTER 3

Moving Large Mammals

In far western Kentucky, between the Cumberland and Tennessee Rivers, is a wide strip of land known as Between the Rivers. The land had been owned by the Hillman Land Company, of St. Louis, Missouri, since the mid-1800s, and it was far from what any era's preservationists would have called pristine—not long ago this property had been the third-largest producer of iron ore in the nation, it had been littered with open mine pits, charcoal hearths that consumed vast quantities of trees, and at its peak of production, no fewer than eight massive furnaces smelting ore to produce pig iron. A hardscrabble boomtown community that included enslaved African Americans grew up around the work. But after the Civil War, when iron production moved to the Great Lakes, the flurry of industrial activity on this strip of land began to fade. Over the course of decades, a second-growth forest closed in on the cut-over landscape, and amid the slag heaps and abandoned furnaces, a character of naturalness, if not a bit of wildness, too, had returned. In fact, it was the prototype of the kind of land that would bolster eastern conservation time and time again in the twentieth century—a big tract of land whose development plans had fizzled out.

Most of Kentucky's paltry deer population was marooned there, and local people successfully appealed to the company to turn the land into a game refuge. In addition to deer, this new refuge was home to the state's last wild turkey population, as well as raccoons, squirrel, opossum, foxes, mink, and even the rare Kentucky bobcat. In the winter, as many as ten thousand geese and ducks migrated to the refuge's lakes. Although poaching and other illicit activity was still common (it was a hotbed for moonshine making, too), by simple virtue of being quite large (68,000 acres), and undeveloped, it was capable of supporting Kentucky's last large animals. So when federal government officials came to the region with the aim of creating a federal wildlife refuge, in 1938, they found a place that was as wild and supportive of game as anywhere else in the East.

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By 1946, there were around a thousand whitetails at Kentucky Woodlands, enough to seed other regions of the state. At the most basic level, that was the purpose of game refuges—a place where animals are protected, and from which other regions can be repopulated—either naturally, or with a bit of help. With funds from the Pittman-Robertson Act, the Kentucky Department of Fish and Wildlife Resources began trapping animals to send east.

The animals were baited into long wooden chutes with salt blocks. Once captured, deer were taken to a stable near the refuge headquarters. If a buck had antlers, they were sawed off to prevent injury to their captors and to the deer themselves. It was difficult work, but especially onerous was stamping each deer with a tag that identified where it had been trapped. "Deer aren't too happy over being manhandled and a 150-pound deer can put up an amazing scrap," an observer noted. "It usually takes four men to complete this operation." There were six release sites, five of which were in the east, more than two hundred miles away along poorly maintained roads. Not a minute of the experience would have been pleasant for the deer—and at the end, they were simply tossed out. Transit stressed and often injured the deer, and a stressed and injured large mammal, far from home, was likely to die. Even healthy deer were at a disadvantage—when they were let loose, they were disoriented, knowing nothing of the local terrain, and often headed straight for trouble.

To give them the best start possible and to help build up the population, Fish and Wildlife asked sportsmen to refrain from hunting for several years; once the department gauged the herd to be of sufficient size, they could open the season to antlered bucks.

That opportunity finally came in 1956; after ten years of stocking, there were an estimated 25,000 deer in Kentucky, and so the state's first modern deer hunt was scheduled. At the Beaver Creek Wildlife Management Area within the Daniel Boone National Forest, the local deer herd was estimated to have grown from 106 to 1,000 animals. Successful hunters drove to check stations, deer strapped to the hoods of their cars, so the animals could be weighed and counted. They were excited, proud, and perhaps a little expectant—a successful whitetail hunt was becoming part of America's postwar promise of abundance. At midcentury, the restoration of large mammals was not a quest to restore biological diversity, and many decades would pass before the phrase "ecological restoration" would come into common usage. Instead, the motivation for all of this effort was game and sport. While many hunters got an opportunity that fall, the majority of Kentucky's would-be deer hunters were still champing at the bit.

* * *

Kentucky learned from Pennsylvania and Wisconsin that a dual-sex harvest—the shooting of not just bucks but does, too—would keep the deer population from getting out of control. But Pennsylvania, for example, was working with a herd of a million whitetails, whereas Kentucky had just two thousand. In the fall of 1956, more than 250 bucks and does were legally harvested in eastern Kentucky. That would prove to be too many for the fledgling population, especially with the challenges that soon came to light.

Everywhere in east Kentucky, from private timberlands to official game refuges, bands of free-roaming dogs were harassing whitetail deer. If the dogs caught a deer, they might wound it, kill it, or begin to eat it. Dogs ran the deer into fences, over cliffs and high walls, and into automobiles. These translocated deer, set loose in unfamiliar terrain, were at a terrible disadvantage. The department concluded that "Free running and stray dogs are the worst problem that we have to face in deer restoration."

Of course, whitetail deer had evolved with predators just as fierce and outlasted them, too; they'd managed to thrive alongside contemporary wolves, bears, and mountain lions and had remained abundant even as Native Americans had harvested thousands of them year after year. But in contemporary east Kentucky, in the remote Cumberland Plateau, there weren't enough living deer for the population to gain a foothold under this kind of constant harassment.

Dogs were not the only domestic animals in the woods. For generations, Kentuckians had run their hogs in the woods, fattening them on acorns and wild roots, only to round them up at slaughter time. This, too, impacted forest ecology. "The forests of Kentucky . . . suffer severely from the almost universal custom of using woodlands for pastorage," the botanist Charles Sprague Sargent observed in 1884. "What the fires spare, browsing animals devour; hogs root out seedlings, and by selecting the sweet acorns of the white oak in preference to the bitter fruit of the black oak, are gradually changing the composition of the oak forest." Even after the Cumberland National Forest was established, neighboring landowners continued grazing cattle and running hogs on the newly designated public lands. They'd done it for generations, and they were going to keep on doing it—likewise, so long as people enjoyed training dogs, as long as the sound of barking hounds was music to their ears, dogs were going to keep running the deer out of the mountains. What could the department do? "The decision must be made by those who live in the deer country and it is they who stand to gain or lose the most," a Fish and Wildlife

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official noted. ". . . No single conservation officer or group of conservation officers can bring about the desired results without the firm backing and cooperation of the public." But again, the general public seemed rather disinclined to cooperate.

After those initial seasons in the late 1950s, the state once again closed east Kentucky to deer hunting. But enough local people ignored those statutes and kept on shooting; as the wildlife biologist Robert Leo Smith noted, "poaching is the rule rather than the exception." Some of the rule breaking was tied to poverty and need—and whenever there were lulls and layoffs in the mines, poaching increased—but it was also a hunter's honest instinct to shoot. "People wasn't used to seeing deer," Doug Hensley recalls, "and ol' hunter out here, he sees a deer, he's going to kill it." Like the Jim Jacobses and John Deckers of a century before, shooting was the natural thing to do.

In 1926, the Kentucky Game Commission lamented that there were some five million acres of land suitable for deer in the mountain country, but that "every time a deer appeared in this section, it is at once killed by illegal hunters." The Louisville *Courier-Journal* went so far as to say, "It has become instinctive with a very large class of men living in the rural districts, especially in the rough hilly or mountainous territory, to kill practically every living wild thing at sight, regardless of the season." Although the poorer districts bore the brunt of the blame for poaching, it was common in every corner of the United States. In the early twentieth century, after market hunting was outlawed, the sale of wild meat simply went underground. In the Adirondack Mountains, towns and hotels continued to be supplied with venison by "crusters" five years after the passage of the Lacey Act. Even illegal timber harvesting, something as brazen and obvious as the felling of trees, continued in such hallowed grounds as the Adirondacks in the East and Yellowstone in the West. On federal wildlife refuges, plume and market hunters continued to slaughter wildlife, and shoot-outs were common. The game warden responsible for protecting the endangered birds of Florida's Pelican Island—the celebrated first wildlife refuge in America—was eventually killed by a vengeful poacher.

In Kentucky, men risked their lives in the pursuit, and the protection, of even the smallest game species. In 1947, while investigating the case of a squirrel taken out of season near Bowling Green, Kentucky, a conservation officer was shot and killed. On another occasion, officers smoked two men out of an abandoned coal mine for poaching a few cottontail rabbits. Game was har-

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vested to feed one's family, but hunting was also an expression of independence and skill—and these men would be damned if any conservation officer was going to take that way. "Every settler felt it his God-given right to kill when and as he pleased until, in most sections, the last deer and turkey had died at the crack of the hunter's rifle," the department's Harold Alexander wrote in 1946. The belief in a God-given right had not vanished with the passage of legislation against it. If anything, law enforcement officers often intensified ill will and poaching with it.

Meanwhile, for a struggling population of whitetail deer, all it took was a few men with rifles—it did not matter if they were disgruntled or merely destitute—to set a population back to zero.

One of the department's release sites was the Robinson Forest area of Perry, Knott, and Breathitt Counties—the same forest where Doug Hensley would spend countless squirrel hunts. But there was never a chance of seeing deer there; all of the released animals had been shot, killed by dogs, or killed by cars. The first time Hensley saw a deer was in 1970, when he was stationed at Fort Dix army base in New Jersey. He didn't think much about it at the time; the Vietnam War was ongoing, and there were more pressing things to occupy his mind. Shortly thereafter, though, he was transferred to Fort Hood, Texas, where there was a bit more time for leisurely pursuits: Not only was Doug able to resume small-game hunting, he was entered into the draw for the first two days of deer season, and his name happened to be chosen. At first, he wasn't too impressed with the sport; he didn't like sitting in a tree all morning and waiting. "I was used to walking and flushing and having action." Later in the day, as the sun was setting and he was about to swear off deer hunting completely, a deer came within twenty yards of him. Hensley aimed and fired, and the animal fell. It was a six-point yearling buck. "I was elated," he says. "I didn't know what to do." Hensley had never field-dressed a deer before. "It was dark, but there was a moon out," he recalled. "It was not a professional job by no means, but I got it done." His friend, a professional butcher, was on guard duty until the next morning, so Hensley stayed up all night to protect his quarry, with the deer sticking out the back of his car. In the morning, they hung it on his porch, skinned it out, and processed the animal, halving it with each other. There was significantly more meat on this young buck than any squirrel he'd encountered in Perry County. A few weeks later, Hensley went home for Christmas; when he returned to Texas, he took his dad's rifle back with him and started hunting does. "I was hooked," he says.

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In 1971, after two years in the army, he returned to Perry County. He started driving a fuel truck for the oil company his grandfather had started, delivering to coal mines and other industrial sites; eventually, Hensley bought the company. As a hunter, he was aware that other eastern states boasted whitetail herds in the millions; and in Texas, he had been encouraged to hunt does in an effort to bring down the population. Farmers in Pennsylvania killed thousands of "nuisance deer" each year, and as the population continued to skyrocket throughout the 1970s, foresters in both Pennsylvania and New York warned that young forests were failing to regenerate under the pressure of the herds. Yet in east Kentucky, the animals remained scarce.

Hensley joined the League of Kentucky Sportsmen; gregarious and charismatic, he soon became the district president. He'd become an avid bow hunter, and eventually harvested a deer in northern Kentucky, but he spent most of his time driving seven hours west to the old Kentucky Woodlands refuge at Land Between the Lakes. He'd camp out for a week, hunting deer with a recurve bow; one year, he even harvested an exotic fallow deer from a population stocked in the early twentieth century. But he couldn't help but wonder: Would it be possible for the forests back home in east Kentucky to produce something bigger than squirrels? In 1983, he campaigned for a seat on KDFWR's volunteer commission with a mission: He would solve the deer problem of east Kentucky.

By the 1970s, managing deer was becoming an established science. John Phillips, a native of Winchester, Kentucky, had worked for the department since the early 1970s and had participated in the state's deer restoration efforts firsthand—stocking had continued in fits and starts for the past several decades, and western and central Kentucky now had sustainable, huntable herds. There was enough work in this sector that by 1982 he was working as the state's first deer program coordinator. The most recent stocking effort had brought fifty deer to each county whose population was either nonexistent or too low to allow for hunting—and in east Kentucky, those fifty deer vanished rapidly. The problem, he came to believe, was not exclusively one of dogs and poaching but also one of sustenance for the animals: Eastern Kentucky's mature, closed-canopy forests could not provide the food demands of deer anywhere near as well as the veritable buffets that the agricultural lands of western Kentucky did. He didn't believe that deer restoration was impossible in east Kentucky, but the path to success would be different from that of the western part of the state. "You basically needed more deer to overcome some of the decimating factors, like dogs and poaching."

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If fifty deer were insufficient to establish a herd in an eastern Kentucky county, perhaps the answer was simple: Bring in a whole lot more. If the combined effects of poaching and harassment by dogs could not be curbed, the agency could overwhelm those impacts with sheer abundance.

Phillips and Hensley developed a plan to conduct a mass stocking: They would release five hundred deer into each underpopulated county. They could source the animals from a wildlife management area in far western Kentucky that was overflowing with deer. But the stakes were as high as ever. The deer were living, breathing, charismatic creatures, and to release five hundred whitetails into an area only to have them all poached or killed by dogs would be a disaster. "It was kind of a leap of faith," Phillips says, "but it was based on the science."

It would be the final effort. The department appealed directly to the community with townhall meetings, newspaper articles, radio and television spots, emphasizing that this was their last chance to establish a local deer herd. If they closed the season, stopped the poaching, and controlled their dogs, they would have a sustainable population providing harvests well into the future. But if all the deer were shot out, the department would not try again. Hensley, who was well-known and well-liked throughout Perry County and much of east Kentucky, invited community members and young families to witness the releases. "And I'd jump up on top of a truck," Hensley recalls, "and I'd say, 'We're going to give y'all something. Now you can kill them, or you can take care of them for these kids, and they'll have an opportunity.'"

The effort began in Knott County in 1984. When it seemed like things were going smoothly, they did a couple more. It required a lot of hours in the field, trapping and hauling deer, and a lot of money. There was one minor hiccup, an outbreak of the epizootic hemorrhagic disease, a virus spread by biting midges, but because they were doing mass stockings, the nascent herds survived and overcame the losses. Meanwhile, Hensley pushed for more hunter education classes in an effort to reduce poaching; and to address free-roaming dogs, he partnered with animal welfare advocates to raise money and build regional animal shelters. After the first shelter opened in 1989, more than a thousand dogs were brought in over the first few months.

In Doug Hensley's Perry County, deer were stocked at sites around Leatherwood, Vicco, and Buckhorn and just down the road from his home in Hazard, at an active surface mine known as Starfire, a complex of surface mines that was becoming one of the largest mountaintop removal mine sites in the world. At Starfire, not only were the deer and wild turkey thriving, but with all of the

land cleared and leveled for surface mining, the animals were highly visible. Hensley was proud of the spectacle, and in 1994, Fish and Wildlife leased it for a wildlife management area.

The final sixty-six deer were released into Perry County in March 1999. All told, more than 3,300 deer had been released in eastern Kentucky. In the fall, all of the state's 120 counties held a deer season. Harvest numbers and population surveys indicated a healthy, sustainable herd; over the next five years, the statewide population would soar to a million animals. Soon Kentucky hunters would be harvesting a record 155,730 whitetails in a single season without coming close to reducing the herd's numbers.

The mass stocking had worked. East Kentucky, a wildlife backwater, the region of so much potential but so little to show for it, had turned itself around. And for the smallest window of time, that was enough.

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CHAPTER 4

Not a Novelty

In the 1980s, Thomas M. Baker was a young commercial realtor from Bowling Green, Kentucky, but his passion, his calling and life's work, was big-game hunting. He hadn't grown up with hunting and had gotten his start relatively late, at the age of twenty-seven, when his brother-in-law had invited him to a quota deer hunt at Land Between the Lakes in western Kentucky, in 1984.* From under the branches of a cedar tree, he saw the black and white of the animal's muzzle first and then its antlers. "He was magnificent," he later recorded in his journal. He shot the buck in the heart, and then tracked it to the edge of a stream. With the help of two friends, they dragged it to the top of a ridge and then to their truck. The experience changed Baker's life; he was now a big-game hunter. And he was going all in.

Baker was not content with whitetail alone. As his passion for big-game hunting developed, he would continue to look for the next big thing, and soon, he was determined to kill an elk. Although the animals hadn't been in Kentucky in a hundred years, they thrived in the West's iconic and breathtaking landscapes. Baker made frequent trips to the Rocky Mountains, where peaks rise beyond 8,000 feet, and where stalking elk requires gazing upon wide-open landscapes and vistas stretching for miles. The country is unforgettable in the fall, when the cottonwoods are vibrant yellow, the air is crisp, and the bulls, five times the size of a whitetail deer, are fired up. During the rut, herds come out of the high elevations and down into sagebrush and meadows; bull elk court and assemble harems, and bulls fight each other for dominance and the ability to mate—the sound of crashing antlers mingles with bugling to echo through the valleys.

* And he was a deer hunter that day, because Land Between the Lakes, the former Kentucky Woodlands Wildlife Refuge, had been enshrined as a National Recreation Area in the 1960s. It was a fact not lost on him. Years later, he would defend the preservation of that place and other places like it across the nation.

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Like other easterners, Baker took physical trophies home from the mountain West; mounts and racks of elk, mule deer, and bighorn sheep soon lined his study (in just over a decade, he would accumulate more than thirty trophies and a forty-foot wing added onto his house). He took on the look of a westerner, too; he purchased a cowboy hat, custom fit, from a shop in Billings, Montana, and into the hat's outer band he fastened ivory teeth taken from each elk he harvested.

Western elk led him to even bigger game. Years later, he would go on his first of several African safaris, where he'd harvest a bull elephant, a male lion, giraffes, zebras, and dozens of other species. Killing these animals may have been distasteful to certain segments of American society, but he was quick to point out his contributions to wildlife conservation, and offered no apologies. Back home, he was a member of the Wild Turkey Federation, Ducks Unlimited, Quail Unlimited, and the National Rifle Association; he earned a lifetime membership in the Boone and Crockett Club and would serve on the boards of the Appalachian Wildlife Foundation and the Congressional Sportsmen's Foundation in Washington, DC. But over the next twenty-five years, there was one organization with which he would have the most impact and, together with Doug Hensley, would bring about significant change for the state of Kentucky: the Rocky Mountain Elk Foundation.

Baker wanted to bring back to Kentucky more than just western trophies and headwear; he wanted to bring back the elk themselves.

In 1984, four Montana hunters organized the Rocky Mountain Elk Foundation (RMEF) to preserve and enhance the habitat of elk, modeled on the success of groups like Ducks Unlimited. After just three years, they facilitated their first land purchase—16,440 acres of elk habitat which the foundation turned over to Montana Fish, Wildlife & Parks. Eight years later, they could boast 66,000 members, and a budget of more than $10.5 million, and were closing in on a $12 million project to protect 10,000 acres of winter elk range just outside Yellowstone National Park. Many of the foundation's members hailed from the West; elk country *was* the West now.

Yet despite a conspicuous lack of elk in their states, easterners kept joining the organization. Elk Foundation chapters and fundraising banquets sprang up in Roanoke, Asheville, Knoxville, Nashville, Charlotte, and even Tampa, Florida, and various cities hosted a regionwide eastern rendezvous. In 1992, Tom Baker was among the founders of the Bowling Green, Kentucky, chapter of the Rocky Mountain Elk Foundation—he would serve as both chairman and a three-year term as Kentucky state chair. In 1994, he took out an ad in

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Bowling Green's *Daily News*, introducing RMEF to his neighbors; it had raised over $54,000 for elk conservation. There were soon more than six hundred dues-paying members of RMEF in Kentucky who enjoyed fall trips to western states and reading about adventure in the high country in *Bugle* magazine; supporting the Elk Foundation ensured that those opportunities would still exist for their children and grandchildren.

But by and large this work was about furthering conservation, and elk habitat, in the western United States. Money raised in the East could hardly be spent in the East if there weren't any elk there. So it was natural that folks such as Tom Baker eventually began to wonder: What if we could restore a herd of elk back East?

Tom Baker was not the only elk enthusiast east of the Mississippi. Ray Anderson, a professor of forestry at the University of Wisconsin–Stevens Point, had been curious about the prospects of restoring Wisconsin's extirpated ungulate species for years, and in the late 1980s, he found a kindred spirit in State Senator Joseph A. Strohl. An avid outdoorsman, Strohl secured $25,000 for the state's Department of Natural Resources to conduct a feasibility study for reintroducing not just elk, but also woodland caribou and moose. The investigation, however, revealed that if moose and caribou were brought back to Wisconsin, they were certain to die; a parasitic brainworm, *Parelaphostrongylus tenuis*, was now endemic in their former range, and there were no preventions or cures for the affliction. Once infected, animals deteriorate rapidly and either starve to death or are eaten by predators.

In the East, where the parasite originates, the brainworm's primary hosts are whitetail deer. When deer graze upon grasses and other plants, they inadvertently consume the snails and slugs that might cling to them. Some of these gastropods are infected with the larvae of *P. tenuis* (also known as meningeal worm). Although these animals are intermediary hosts to the parasite, it's the whitetail deer that the worms require to complete their lifecycle. As Cornell University field professionals described it, "The larvae move through the digestive tract of the host and travel along spinal nerves to get to the spinal cord and brain." The worms then grow to adult stage on the meninges of the deer's brain; they are about the size of a human hair and visible to the human eye (if you cut into a deer's skull, you can see the worms in the cavity between the brain and skull). Once mature, they begin laying eggs. "The eggs hatch into larvae and migrate through the bloodstream to the lungs. Larvae are coughed up and swallowed and travel through the gastrointestinal tract to be shed in

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the deer's feces." Deer feces contaminated with the worm's larvae infect new gastropods; deer then consume the infected snails and slugs, and the cycle begins anew.

Yet, incredibly, whitetail deer are not negatively affected by brainworms; they are hosts of the parasite but not victims of it. In fact, once a deer is infected, the worms live in the deer's head for the rest of its life. Deer and brainworm evolved together in the forests of the eastern United States, and whitetails are somehow able to survive with worms crawling around the inside of their skulls.

The same cannot be said for moose, caribou, and elk; for these animals, brainworms can be lethal, and there is no treatment. Once the parasites have migrated from their digestive tracts up through their spines and into their brains, they become deranged; they walk in circles, they lose control of their limbs, and eventually they stop moving altogether.

Before the state's settlement by Euro-Americans, moose and caribou had been common in the northern areas, and whitetail deer had been most abundant in the south. But after a century of forest clearing and after the moose and caribou had all been shot, the whitetail deer's range had shifted north and now encompassed the entire state. The deer colonized the habitats naturally, or the habitats were stocked by eager hunters; in either case, the animals took their parasites with them—which meant that the prospects of restoring moose and caribou to northern Wisconsin were not very high.

But the same could not be said of elk. The reason for this was the persistence of two modest elk herds in a pair of eastern states—Michigan and Pennsylvania—where there was both a large number of whitetail deer *and* a high occurrence of brainworm (where brainworm is endemic, whitetail deer show an infection rate of as high as 80 percent). Biologists monitoring the elk of Michigan and Pennsylvania reported a low mortality from brainworm. Evidently, elk and whitetail deer could coexist in the East, even with those deadly parasites.

Anderson and Strohl still needed a workable habitat. In Wisconsin, the state's southeastern oak savannas had been the core elk range, but most of that land had been converted to farms, towns, and cities; its proximity to major highways made it an unlikely location. But in the state's northernmost Bayfield Peninsula there existed a similar kind of ecosystem, the Moquah Barrens, a pine savanna found primarily on National Forest lands. In addition to jack pine, there were dense stands of aspen; rare butterflies such as the Laurentian skipper, the brown arctic, the pink sallow, and the tawny crescent spot; and it

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was an important site for sharp-tailed grouse, brown thrashers, Connecticut warblers, and vesper sparrows. Fires kept it open, and in general appearance it looked an awful lot like elk habitat. Furthermore, an elk introduction there had the potential for a win-win—the charismatic elk could draw attention to the unsung barrens, and any work to improve habitat for elk, including prescribed fire, would improve the health of the savannas. From an ecosystem approach, it made sense.

Senator Strohl proposed a fundraising partnership among the state, the US Forest Service, and the Rocky Mountain Elk Foundation to study the feasibility of bringing in elk. But snowmobilers were concerned that an elk introduction would limit their abilities to use the forest for open-country riding, and fruit growers did not want elk wandering into their orchards. Ultimately, a state senator representing the Bayfield Peninsula came out against the project, and the state's governor promised to veto the proposal.

Ray Anderson kept looking for an opening and partnered with Bernie Lemon, a tireless volunteer with the Rocky Mountain Elk Foundation; Lemon soon established his own nonprofit, Elk Wisconsin, to raise funds for the effort. Anderson and Strohl, meanwhile, found support within the US Forest Service and gained approval for a location in the Clam Lake area of the Chequamegon-Nicolet National Forest, a 1.5-million-acre swath of public land (Governor Tommy Thompson, an elk hunter himself, secured a $50,000 appropriation from the state budget). On the surface, this densely forested landscape looked like poor elk habitat. But there was this one strange tract—a twenty-eight-mile linear strip of open grassland—that might have potential. Truth be told, Anderson had been wondering about it for years.

In 1968, at the height of the Cold War, the US Navy established an extra-low-frequency (ELF) antenna in the middle of the forest to transmit radio messages to nuclear submarines around the world. The two-inch-diameter transmission cable was twenty-eight miles long, buried hundreds of feet deep, and grounded in bedrock. Aboveground, the surface was maintained as a grassy opening—and the project's supporters, including the regional director of the Forest Service, thought that the long stretch of grassland, in the shape of a large *X*, might be enough for a small herd of elk. Ray Anderson had done research in the forest for years, and he'd often wondered if it could support elk. He hoped to find out soon.

The Clam Lake region was remote. The nearest farm was thirty miles away. Enough local people thought that elk-related tourism would be beneficial. Ecologically, Clam Lake wasn't anyone's first choice, but it was 350 acres of

linear grassy openings inside a massive block of public land; after an environmental assessment was done for an experimental release there, it was suggested that the ELF line might support a small herd of elk.

By 1995, the project had cleared all hurdles (RMEF had raised more than $162,000), and twenty-five elk were to be brought in from Michigan. They were captured on private land, tested for disease, and implanted with microchips and ear tags. After a ninety-day quarantine, they crossed the state line to Wisconsin for the first time in a century. Ray Anderson wasn't sure if they'd stick around Clam Lake or roam back to Michigan. "We've done everything possible to minimize their bolting and leaving the scene," he said, "but we just don't know."

It was an experiment. In four years, the state would decide if the animals would be allowed to stay. But the symbolism was significant: When those twenty-five elk began grazing the ELF line, they were unfenced and free roaming—and it meant that wildlife departments east of the Mississippi were once again stocking elk. And eastern elk enthusiasts took note.

Back in Bowling Green, Kentucky, Tom Baker was fired up. He was now on the national board of RMEF and working closely with staff in Montana. More and more easterners were thinking about elk—in addition to Wisconsin, there was renewed interest and investment in Pennsylvania's long-neglected herd; and the Great Smoky Mountains National Park had contracted with a University of Tennessee grad student to conduct a feasibility study for reintroducing elk to this iconic park (RMEF provided a $30,000 grant to the project). Baker, meanwhile, continued to focus on how the foundation could support agency work, when in the fall of 1994, he learned that biologists at Land Between the Lakes National Recreation Area in his home state of Kentucky were also exploring the possibility of an elk introduction. It was the best possible news, and he committed himself to doing everything in his power to make it happen.

The former Kentucky Woodlands Refuge, the heart of the Between the Rivers landscape, had been designated a national recreation area in 1963; when the Tennessee Valley Authority built a pair of dams there, it inundated several towns and farms, displaced 3,500 people, and renamed the area Land Between the Lakes. Managed by the US Forest Service, the property was more than 170,000 contiguous acres of wildlife habitat, and it was surrounded by water on three sides, including a pair of massive lakes. If the Forest Service was serious about reintroducing a herd of elk—animals that might wander out of the park and into trouble—a peninsula had a lot of utility.

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The plan at LBL revolved around a 750-acre restoration of the old Kentucky Barrens—years earlier, botanists had discovered prairie grasses growing there and realized that it was a remnant of the former grassland ecosystem. The woodlands were thinned, trees were cut, and the area was seeded with native grasses and wildflowers. The elk would be placed behind a fence, along with a herd of bison that had been on display in a nearby enclosure since the 1970s. "What we're doing here is restoring a Kentucky barrens ecosystem," a project leader said, from the grazers down to the grasses.

There wasn't a lot of money to pay for this—in fact, budget cuts at this moment were leading TVA to consider leasing or selling significant acreage to private developers for golf courses, amusement parks, and vacation homes. Hunters and other naturalists hoped that bringing in more large mammals was one way to stall development and draw more visitors and support. To help pay for the feasibility study, Tom Baker convinced a federal judge presiding over a high-profile case of illegal dove hunting—twenty-seven hunters were found guilty of hunting over bait, a violation of the Migratory Bird Treaty Act, at an annual dove hunt event—and Baker convinced this judge to divert those fines to help pay for the feasibility study of relocating elk to Land Between the Lakes. The study was favorable;* environmental assessments were completed and submitted to federal and state agencies, and the project was officially under way. The Tennessee Valley Authority raised or invested $500,000 (with RMEF committed to raising more than $270,000, including a donation of $10,000 from Baker himself) for infrastructure, signage, and habitat work. A crew of biologists and volunteers drove to Elk Island National Park in Alberta, Canada—which had a surplus of elk—and trapped a number of animals for the journey back to Kentucky. On an unusually snowy day in Kentucky, twenty-nine elk arrived at Land Between the Lakes.

Yet, as momentous as the occasion was, the elk were behind a fence. They were a captive viewing herd, visible to tourists along a three-and-a-half-mile loop road. For Baker, it was a foot in the door—and he held out that they might someday soon be let go. LBL officials were likewise optimistic: "If a captive herd works well, we would consider a free-roaming elk population on the northern end of the Land Between the Lakes." But for now, they were little more than a novelty.

* Conducted by the University of Tennessee's Bob Long, who had also done the assessment for Great Smoky Mountains National Park.

* * *

Doug Hensley had been off the wildlife commission for a few years. He stayed busy, raising a family and a growing business, but he still found time to hunt. Together with John Tate, the land manager of a local coal company (whose interests included the sprawling Starfire complex), he'd bought a western Kentucky farm known for its whitetails and wild turkey. He remained in contact with the Fish and Wildlife Department, and in 1993 was considered a finalist for the commissioner's job (the director of the agency is *the* commissioner, and the volunteer appointments are also known as commissioners). Then, in September 1995, he was reappointed to represent the 7th District. He felt that there was more he could do.

Hensley had been following the Land Between the Lakes project through the pages of the *Lexington Herald-Leader*. One day he drove over from Hazard to have a look. In fact, he had been thinking about elk for a while now. In the 1980s, he'd gone to Colorado to hunt elk on a reclaimed strip mine owned by Cyprus Mountain Corporation, the parent company of the mine lands that were managed by his friend John Tate in east Kentucky. The footprint of mountaintop removal coal mining had begun to sprawl over vast acreage in east Kentucky—and a number of the reclaimed landscapes began to bear a superficial resemblance to arid western grasslands. Doug couldn't help but notice the similarities.

When he saw those twenty-nine elk behind the fence at Land Between the Lakes, it only reinforced what he already knew; he was not interested in novelties. He wanted to stock a free-roaming herd of elk in east Kentucky, and he wanted it big. It wouldn't be enough to catch rare glimpses of these animals in the rut; he wanted a herd of elk large enough to hunt.

After visiting LBL, he cold-called Tom Baker—the two had never met—and told him about his idea. He described how the scale of mountaintop removal coal mining had changed the landscape in east Kentucky. Maybe they could introduce a couple of herds there. "It looks like Colorado on top of these mountains," Hensley later recalled. The comparison was high praise for a big-game hunter. Baker heard him out and then asked, "What do you want me to do?" Hensley didn't beat around the bush. "I want you to pay for it," he said. Baker agreed. The details were yet to be ironed out but Baker, as ever, was all in.

It was not the 1920s, and Hensley couldn't just buy some elk and turn them loose. Like the elk enthusiasts in Wisconsin, he'd have to conduct a study, present the idea to the public, and, ultimately, secure the votes of his fellow com-

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missioners. But first and foremost, he would have to run it by the new fish and wildlife commissioner.

Although Tom Bennett was the youngest commissioner in the agency's history, he brought a tremendous amount of government experience to the job. He had previously served as commissioner of Kentucky's Department of Surface Mining, Reclamation, and Enforcement; deputy secretary of the state's Natural Resources and Environmental Protection Cabinet; and, most recently, deputy secretary in the governor's executive cabinet. But when Doug Hensley strode into the Fish and Wildlife headquarters, with all the confidence of a ten-year commission veteran, he presented Bennett with something he'd never had to consider in all his years. "I want to put elk in east Kentucky," Hensley said, direct and to the point. Not a novelty, not behind a fence, but a wild, free-roaming, robust, and huntable herd of elk. Bennett thought he was joking. As he would later recall thinking, "It sounds like the craziest idea I've ever heard."

Hensley wasn't the first to talk about elk in the East. A few years earlier, Scott Thiele of the Pennsylvania-based Wildlife Recovery Council had called for the return of elk and bison to eastern landscapes. Thiele was a member of the radical environmental group Earth First!, which was known for its "monkeywrenching" and direct action and whose founder, David Foreman, had recently coined the term "rewilding." Thiele's ideas for reintroducing large mammals to the East received some limited media coverage, but they were roundly shot down. "Our refuges don't look anything like the historical habitats of those animals," the chief of the US Fish and Wildlife Service refuges division had said in response. A paleontologist said that the ecological equilibrium had changed too much over the past 150 years: "No one can say how the species will respond to current conditions. . . . It would be an unpredictable situation." Wisconsin and Arkansas might have let a few elk loose in their remote forest districts, but most eastern agencies thought the idea was, to borrow Bennett's phrase, crazy. The Illinois Department of Natural Resources was at the time studying the feasibility of reintroducing free-roaming elk to its southern forests. They had enough habitat, but the public was split on the idea. Illinois ultimately declined reintroduction because it felt it couldn't keep the elk out of farmland—and it was worried about spreading chronic wasting disease (CWD), which had just been found outside the Colorado/Wyoming "endemic zone."

But Doug Hensley was not an Earth First! rewilder. Nor did he identify as an environmentalist. He was a practical old-school conservationist with a

track record of advocating for sportsmen in eastern Kentucky. Under Hensley's leadership, both whitetail deer and wild turkey restoration had finally succeeded. Hensley was credible—never had he proposed something so outlandish. Most important of all, the linchpin of Hensley's project was that this was a project for hunters—his proposal to restore elk to Kentucky was not centered on wildlife watching or ecotourism, this was not a wilderness-inspired project of ecosystem restoration, but rather to provide sportsmen the opportunity to kill an exciting species of big game.

Regardless of how this project was discussed internally, restoration of rare and endangered animals was a source of pride and excitement throughout the state. In fact, Hensley's district wasn't the only one experiencing success in Kentucky. In addition to game animals, iconic species like the bald eagle were on the rebound. Due to egg thinning by the pesticide DDT, bald eagles had vanished completely from Kentucky by the 1960s. But after the pesticide was banned, the eagle population rebounded, and there were soon two dozen breeding pairs in the state. The state had just begun a peregrine falcon restoration program, and over the next ten years, eighty-two of them would be released in urban and cliff-edge habitats. Hundreds of river otters, which had been extirpated from most of Kentucky, were being trapped in Louisiana, and released to fourteen sites in central and eastern Kentucky. All of that activity boded well for Hensley's big idea, and the fact that Kentucky was decades late to deer restoration meant that its biologists were still trapping and moving large ungulates for the purpose of restoration—which meant that Kentucky's professional wildlife agency was comfortable with translocation, and its staff was logistically and technically prepared. Hensley himself was bit by the bug of success: "Everything we touched turned to gold."

Still, despite Hensley's track record and despite the goodwill and success the department enjoyed, to put free-roaming elk in east Kentucky bordered on the absurd as far as Commissioner Tom Bennett was concerned. But for Doug Hensley, he'd look into it.

The first call Bennett placed was to the division's director of wildlife, Roy Grimes. Grimes understood his assignment to be to scrutinize every angle of Hensley's harebrained idea. Doug Hensley was a long-tenured, influential member of the Fish and Wildlife Commission, he'd done a lot of good work for the state's wildlife and sportsmen, and if they were going to tell Doug Hensley no, they'd need to build a strong case. And everything in Grimes's

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research into eastern elk had told him that brainworm should shut this thing down.

But that wasn't how it went. Grimes called his counterparts in Arkansas, who'd reintroduced a small herd of elk near the Buffalo National River. He did the same in Pennsylvania and Michigan, and to his surprise, each of those states reported that brainworm was attributed in just 2 to 3 percent of all elk mortalities. Two to 3 percent was trivial, which meant that rather than being shut down, Hensley's proposal would advance.

As the department's deer coordinator, John Phillips was now more than a decade into whitetail deer restoration in east Kentucky. Like Grimes, he was skeptical about elk's potential in Kentucky and cited brainworm as the primary impediment. But as he reviewed the literature, he saw a pattern: Statements about brainworm routinely failed to cite actual research. Brainworm severely limited moose and caribou populations—that was a fact—but it seemed that the parasite's impact on elk hadn't been thoroughly tested. Furthermore, herds in Pennsylvania and Michigan had persisted for more than seventy-five years, and their longevity was a nontrivial testament to their ability to succeed among whitetails and brainworm. Those herds and the experiments under way in Arkansas, Wisconsin, and Land Between the Lakes were enough for Phillips to give the proposal phase a green light.

Hensley was clear about his vision for elk in east Kentucky—surface mining in the coalfield counties was opening vast acres of closed-canopy forest into something that looked like the western elk habitats—but the department would need to conduct a thorough analysis of the entire state.

After a decade of trapping, releasing, and monitoring deer in every county, John Phillips knew Kentucky like the back of his hand. If crop damage was a problem in Michigan, it would be tenfold worse in Kentucky. The Daniel Boone National Forest, for example, at 700,000 acres, was quite large, but it was far from contiguous—in-holders lived and farmed within the forest area, and an introduced elk herd would head straight for their crops. Tom Bennett would have to present this idea to the state's farming community, and farmers weren't going to like it one bit. The average elk can eat up to twenty-four pounds of food each day, and the Kentucky Farm Bureau, which represented 400,000 members statewide, would not tolerate a single additional pound of crop depredation. George Warren, a western Kentucky farmer who owned corn and soybean fields, was serving on the Fish and Wildlife Commission with Doug Hensley as his elk idea started to filter through the department.

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"The farmers at that time had about all of the feeding the deer they could stand," Warren says. "Our farm community in here just can't handle that. . . . They were already raising Cain about the deer." Even wild turkey were considered a pest.

That was too bad, because what made Kentucky's western region important agriculturally—rich, well-watered, fertile soils—had also made it, historically, Kentucky's finest elk habitat. The soils that produced the state's outsized livestock and feed crops had once provided for legions of wild and migrating mammals. Prior to colonization, western Kentucky had contained the state's sprawling prairies. Although elk and bison had occurred in eastern Kentucky, the western and central grasslands are believed to have held an abundance unparalleled in the Ohio Valley. In the 1700s, the explorer Simon Kenton had reported seeing more than a thousand buffalo at a single mineral lick.

But the Big Barrens were now history. If the department wanted to move forward with elk, it would do well to forget about western Kentucky immediately. The elk grazing behind fence lines at Land Between the Lakes were never going to be let loose. "There were some dandy places in western Kentucky where elk would work," Phillips later recalled. "But there was too much farmland that elk could damage, and the residents would never accept them."

Crop damage, however, wasn't the only concern. The Kentucky Farm Bureau is also an insurance company, and empirically of more concern than crop depredation was the prospect of ever more large mammals standing in roads and crashing through windshields.

Each year, there were more than 1.5 million deer/vehicle collisions reported throughout the nation, causing an estimated $1.1 billion in damage and around 150 deaths. In 1997, nearly four thousand Kentuckians would report a collision with deer. This was something the department would have to reckon with—nowhere in the East was as wide open as the large blocks of public land big-game hunters loved to hunt in out west. They could dream about bringing those mammals back to the East, but this was a thoroughly modified, occupied, and modern landscape. Daniel Boone's frontier was long gone, and asphalt was everywhere.

In the early twentieth century, conservationists might have had a hard time picturing a near future of such abundance and carnage. In 1927, when Kentucky's deer herd was at an all-time low of just a thousand animals, there were 2.5 million residents in Kentucky. But by the end of the twentieth century, 1.5 million additional people would live in Kentucky, and as deer herds spread across the state, so, too, did human developments—they would sprawl into

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nearly every corner of the landscape, and they would be connected by an ever-expanding network of roads. Even in rural east Kentucky, where a pillar of the federal government's War on Poverty had been to build roads, highways stretched into all but the most remote corners of the state (in 1980, a new four-lane highway had been built through Hazard to connect Perry County with Lexington). And like the L&N Railroad extension decades earlier, the roads would have a huge impact on people and wildlife: Large mammals and fast-moving vehicles do not combine to produce happy endings.

Even as large animals go, elk are massive. With the height of a horse and the beefiness of cattle, the average elk dwarfs a whitetail buck. Atop these hefty bulls are antlers—from hoof to tip, they can reach nine feet. The Tom Bakers and Doug Hensleys of Kentucky got a thrill out of glassing an elk in the wilds of northwest Colorado—but would they be so thrilled to see them on I-64? Encountering a herd in the Kentucky bluegrass or suburban Lexington, residents would be in imminent danger. Because of their height, a car striking an elk can clip its legs and send its massive body through the windshield. Residents of western states might have scoffed at such hysteria, but Kentuckians were not accustomed to such dangers. To introduce an elk herd would be to introduce a problem that did not exist before—and few people anywhere enjoy the introduction of new problems.

In the early 1990s, the status quo in wildlife translocations had been to start slowly and take it easy. Arkansas had released 112 elk over a four-year period, Wisconsin just 25. A proposal to reintroduce elk into the Smoky Mountains, which was now on hold indefinitely due to a lack of funding, had called for just 150 animals. But none of those figures impressed Doug Hensley, who wanted to witness a thriving elk herd in Kentucky in his lifetime. He didn't want to lay the groundwork and walk away, hoping that they would grow to a large herd in a hundred years, long after he was gone. He was in his early fifties, and he didn't feel as though he had a lot of time to wait. He wanted a sustainable herd, large enough to hunt, and he wanted it now.

Hensley didn't have to convince John Phillips: Mass-stocking of whitetail deer had been Phillips's idea, and should they move forward with elk, that, too, would be a mass-stocking. Hensley and Phillips were soon getting specific; their plan was to translocate 1,800 animals to east Kentucky in just nine years, a move that would dwarf the new populations in Wisconsin and Arkansas. In a few years, it would surpass Michigan as the largest eastern elk population—a figure it had taken nearly a century to reach.

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As the proposal picked up steam, the wildlife commissions in Kentucky and Tennessee became partners. A biologist at the Tennessee Wildlife Resources Agency, Alan Peterson, had been curious about elk for years, ever since learning about Arkansas' success. As soon as those twenty-nine elk were taken to Land Between the Lakes, he made the case that they should be let loose on the Tennessee side of LBL without any fences.

But Kentucky's other neighbors weren't so gung ho. Hensley recalls a meeting with various state agencies, including representatives from Tennessee, North Carolina, West Virginia, and Virginia, some of whom said they'd be willing to work with Hensley's idea if he would rein it in. When a suggestion was made to begin with just twenty animals, Hensley grew livid. "I slammed my fist down on the table, and I said, 'Hell no, we ain't doing twenty! We're going to do [eighteen hundred]! And if you all don't want to play, you don't have to. But we're going to do it, and we're going to do it right, or we ain't gonna do it.'"

So where, exactly, were they going to put those 1,800 half-ton, crop-eating ungulates? John Phillips wanted a large, contiguous block of forest. He looked for regions with a mix of forest cover and openings for grazing, a low density of major highways, sparseness in human settlement, and he looked for an area without row crops. In the twentieth century, that was a difficult thing to find anywhere in the eastern United States.

The only area that met the criteria was east of Interstate 75 and south of Interstate 65: in the coalfields of southeastern Kentucky. John Phillips planned to conduct an aerial survey—he would need to find a quarter million contiguous acres of suitable habitat. This was the final hurdle, and it was far from a sure thing.

But Hensley was not worried. When he had first strolled into Tom Bennett's office and declared, "I want you to put elk in east Kentucky," he'd spoken from a place of confidence. He'd been in the mountains his entire life, he'd observed the land, and he knew how it was changing. His conviction was that southeastern Kentucky, indeed, would work out fine.

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CHAPTER 5

Moving Mountains

In the winter of 1997, John Phillips and biologist David Yancy conducted an aerial survey of potential elk habitat. From Frankfort, they flew over the interstate highways and the communities of Lexington and Winchester. Soon they were over the Daniel Boone National Forest; from the air, they could see it was not a monolithic forest—there were many inholdings and farm fields. Still, they saw a vast expanse of trees, running from the Ohio River clear down to Tennessee. East of the national forest there were more and bigger pastures, but east of those, the forest thickened up again. The terrain was rugged, too steep and rocky for farms; this was Deep Appalachia, easternmost Kentucky.

But there were disruptions to the forest, gray and dusty zones where nothing appeared to grow—desolate moonscapes sprawling over the lush forests of eastern Kentucky. Phillips and Yancy knew to expect those sites, where entire ridgelines had been blown apart with explosives and dumped into the valleys below. That was the result of mountaintop removal coal mining: white holes, Phillips says, in an expanse of green.

Phillips had visited his share of reclaimed sites in the process of stocking and monitoring whitetail deer. But the aerial survey revealed that there was more mined land, both active and reclaimed, than previously thought—it was astounding, Yancy says, and when the airplane would be sailing over a massive mine, "everywhere off in the distance you looked, you could see more of it. . . . And it was like you weren't really out of sight of it." He had studied the extent of mountaintop removal mining on maps, but "it's not the same as when you see it from the air." Even driving through the landscape, you could miss the mines; the roads wend through low valleys, and these particular seams of coal, and all of the action to recover them, lie higher. From the air, it was all too visible.

The goal of mountaintop removal coal mining was to recover the coal as quickly and as cheaply as possible, with the highest return on investment. In

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addition to the negative visceral reaction to blowing apart mountain ridges, there are an untold number of harmful consequences to this kind of mining—and scientists would later conclude that the impacts of mountaintop removal would linger on the landscape, especially on water quality, indefinitely.

But the coal industry would counter that it wasn't all bad, and the Kentucky Coal Association was soon boasting that the land was now far more useful than ever before; those flattened lands, long coveted in rugged Appalachia, could be used for industrial parks, strip malls, federal prisons, even golf courses and suburban homes. As rosy as mining companies made it seem, their sole purpose was the recovery of coal. If there were in fact benefits, they were unintended.

On that day, John Phillips had flown his plane over east Kentucky to check on one of those unintended consequences; to see if Doug Hensley's assertion—that mountaintop removal coal mining had created an abundance of habitat for elk—was correct.

To move forward with an elk reintroduction project, the Department of Fish and Wildlife determined, it would need at least 200,000 acres, with at least 5 percent of that open grassland. When he got into the plane, Yancy was skeptical about finding elk habitat, but as he and Phillips toured the coalfields of east Kentucky, he grew certain that the idea would work.

When Commissioner Bennett asked John Phillips if he'd found 200,000 acres, Phillips said, "No—I found four hundred thousand."

Appalachian elk are now and will forever be inextricably tied to the history of surface mining in east Kentucky. It is not a story of preservation, or ecological stewardship—it is one of happenstance, opportunism, and for better or worse, transformation. This outcome was never obvious, nor was it the only path that could have led to a successful restoration of elk—but this is how it did happen, and this is how it did succeed.

The first industrial surface mines of Kentucky occurred out west, in the relatively flat lands of Muhlenberg County. The rich biological layers of earth—the soil, fungi, roots, insects, rocks, and critters therein—are peeled back and piled in heaps as high as sixty feet. Below these layers of soil, the remaining stratum of earth is known to the industry as "overburden." Mining companies then use explosives, such as ammonium nitrate fuel oil (ANFO), to blast apart the bedrock and expose the seams of coal. It is devastating to local ecosystems and, in west Kentucky, relatively straightforward.

But in east Kentucky, where the land is rugged and deeply dissected, ex-

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tracting coal from the surface was not so easy. In any direction from a mountaintop there is a slope—as steep as 85 percent in some counties—and you cannot safely, nor efficiently, place mine spoil on a steep slope. So for decades, with no good place to pile the spoil and overburden, companies continued to extract their coal by tunneling into the mountains through deep mines.

Yet surface mining in east Kentucky was inevitable. Every year, the equipment got bigger, and every year, the coal operators grew bolder. At first they approached the coal seams not from the top but from the side. Bulldozers sliced into the contours of the mountains, carving steep cliffs (or "high walls"), exposing rich seams of coal that were then augured out. But there was still the problem of the overburden; that unwanted earth had to be put somewhere. Eventually, most operators decided to just push the spoil down the slopes, grab all the coal they could, and move on.

The problem was that people lived at the bottom of these slopes, on the flat land adjacent to streams. Landslides and loose spoil crashed down on homes—in some cases, as occupants ran out the front door—and boulders crashed through roofs and windows. In Kentucky, coal operators could legally strip land they did not own—as long as they owned the mineral rights to it—even if people lived upon, farmed, or otherwise cherished and owned the land above the coal. In some cases, local people formed direct action groups in response, blocked coal trucks with their bodies, and appealed to their elected officials, but they were met with the ire of neighbors working the mines, the indifference of government, and the armed force of the coal industry. In 1965, when the sixty-one-year-old widow Ollie Combs had lain down on the ground in front of a bulldozer that had come to strip her land, she had been dragged off her property by the county sheriff and a state police officer and taken to jail. (In egregious cases, family cemeteries were bulldozed and sent over cliffs, while bodies in others were exhumed and reinterred.) The few state regulations of the industry were poorly enforced, and reclamation was rare. "These strip [mine] operators just come in here and tear the mountains up, and gets all the coal they can," one anti–strip mine activist said when the national media came to report on the situation in 1975. "Then they picks up and goes to another spot and does the same thing all over again." In 1977, yet another devastating flood drenched the region. Watching the water race off the surface mines "in oceanlike waves," residents attributed the violence of the deluge to the moonscapes above. As during the flood of 1957, it was clear to see that removing all of the vegetation from the mountains had destroyed the land's capacity to soak up water.

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All living things felt the brutality of mining in east Kentucky, not only its people. Central Appalachia was one of the most biologically diverse regions in temperate North America but its ancient ecosystems were being obliterated and endangered species were growing rarer by the day. At the time, however, few people thought of the Appalachian coalfields as a biological hotspot. Indeed, the concept of biological diversity was yet to be coined; and there were no large mammals left in these mountains to mourn. There were squirrels, poverty, and a lucrative natural resource. So on one side, there were people fighting to save their homes from destruction and their water from contamination; on the other, there was a lot of money to be made. The American environmental movement was yet in its infancy, and the strip-mining crisis was just one of many crises that marred the late twentieth century. It also happened to be occurring in one of the most remote and least-understood corners of the eastern United States—and so this destruction was largely out of sight and out of mind to the rest of America.

The coal industry controlled much of central Appalachia, but the ravages of strip mining continued to grow wildly unpopular. The primary miners' union, the United Mine Workers, did not support it, voters did not support it, and neither did a growing number of politicians. In 1970, Knott County even tried to impose a total ban on strip mining. As a college student at Eastern Kentucky University, Doug Hensley had written a term paper about strip mining, "and I condemned it," he says, "because they were raping the land." Finally, after years of debate and failed attempts at passage, a federal Surface Mining Control and Reclamation Act was signed into law in 1977. It was far from perfect, but it enabled federal regulation of surface mining—the newly created Office of Surface Mining and Reclamation Enforcement would make it a priority to stop the landslides that were burying the residents of the Appalachian coalfields, and it would require federally regulated reclamation.

Yet the pace of surface mining hardly skipped a beat. In fact, rather than slowing down after SMCRA, its scale grew larger than ever. It was another unintended consequence, but the law of 1977 paved the way for mountaintop removal coal mining.

Flying over east Kentucky in 1997, Yancy and Phillips looked down upon dozens of mountaintop removal sites, including one of the largest in the world, just north of Hazard. It was best known as Starfire. At the nexus of Perry, Knott, and Breathitt Counties, bounded to the south by Troublesome Creek, the 17,000-acre mine site was one that Doug Hensley knew well. It was

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just down the road from his childhood home in Darfork; he'd gone there as a boy to collect walnuts with his father, and he'd return again to hunt squirrel. Years later, as he had worked his way up the ladder in the petroleum business, he had driven fuel to the site, to power its machinery, and had become close friends with the mining company's land manager, John Tate. For the elk reintroduction, that location and that relationship were his ace in the hole.

The area had for centuries been like all the other corners of the Cumberland Plateau: steep hills, deep valleys, and a serpentine network of licks, branches, runs, and creeks. Although it had been logged, its forests were home to some eighty-three species of trees—oaks, beech, hickory, and hemlock, as well as dozens of others—and provided nesting sites for forest-interior birds like cerulean warblers, Kentucky warblers, and blue-winged warblers, species whose biology requires large, unbroken blocks of forest. That tract of private land was adjacent to the University of Kentucky's Robinson Forest; together they added up to more than 31,000 acres of intact forest. Mammals in the area included well-known species such as raccoon, opossum, and squirrel, but also Allegheny woodrats, Rafinesque's big-eared bats, eastern pipistrelle bats, southern flying squirrels, moles and shrews and voles, muskrats and bog lemmings. It was home to at least twenty species of amphibians and reptiles: salamanders (including the red-spotted newt, northern two-lined salamander, and slimy salamanders), frogs, toads, skinks, turtles, and snakes; and its creeks were home to east Kentucky endemics such as the Kentucky arrow darter. In the early twentieth century, based on its dynamic assemblage of biodiversity, the US Forest Service had considered designating it a national forest.

All of this character and diversity would soon be gone. In the early 1970s, a number of companies, including Star Fire Coals, had operated strip mines in the area. They were rough operators, typical of the era, pushing spoil on the downslope and boulders into homes, doing whatever it took to dig coal fast and take advantage of soaring coal prices. And with the era's hot market for coal, the biggest mining interests in the world would soon descend upon east Kentucky.

John Tate went to Hazard with an Alabama coal company, Harbert Construction, which would soon be mining 7 million to 8 million tons of coal a year. Harbert soon became the dominant land and mineral owner in the Starfire area. Although the landowners would change names and change hands many times during his tenure, he stuck around. In the span of mere decades, Starfire was transformed from an ancient Appalachian ecosystem to one of the largest mountaintop removal mines in history.

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By 1985, a dragline whose cab was four stories high, whose boom was 325 feet long, and whose bucket was large enough to scoop out sixty cubic yards in a single pass, had been assembled at Starfire. Explosives blew apart the mountaintops; it was like a war zone, smoke and pulverized rock mushrooming into the sky before drifting down into the valley. Advancements in machinery hadn't enabled mountains to vanish outright, however, and the company still needed to move the overburden to get out the coal. Its solution wasn't all that different from the push-and-shove outfits of earlier decades: The pulverized rock of the mountaintops went down into hollows and valleys, burying hardwood forests, coves, creeks, and streams in what was termed a valley fill—now legal and permitted by the federal government. There had been people living in the hollers and valleys at the center of Starfire, but when the valley fills were permitted, they had to go. In the community of Lynn Fork, the foundations of homes and a school were buried under one of the valley fills. "The old stuff looks like fingernail scratches compared to the new mines," one longtime anti–strip mining activist said in 1987, ten years after the passage of SMCRA. "In eastern Kentucky, it's far worse now than it was before the surface mining act was passed."

In the early 1990s, Starfire became one of two Kentucky "area" mines. Explosives blew apart the rock layers above the coal, massive shovels and draglines scraped away the earth; where there was more rock, it was blasted again, scraped again, and more coal was dug, reducing the mountain by several hundred feet. By removing the mountaintops and filling in the valleys, mining companies created enough flat land that Starfire now operated like an open pit mine. A Marion 301-M shovel, the third ever built, arrived at Starfire in 1993. By 1996, Perry County alone was producing more than 10 million tons of coal.

Before mountaintop removal, the ridges of Starfire rose to 1,500 feet. After the mining, the companies had created a plateau, three hundred feet lower than the surrounding ridges, where all of the features of the landscape, all of the irregularity that had allowed for evolution and refugia over millennia, had been removed. All of the life that had previously occupied the site was gone.

Dead zones just like Starfire now spanned more than 400,000 acres in east Kentucky. It looked as if a meteor had struck the earth hundreds of times over. As one former Fish and Wildlife official would later tell me, "It looked like a nuclear bomb went off on it."

After the coal was removed from a given area, a bit of the spoil was placed back on top, and the old ridgelines were compacted to prevent erosion, per

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the federal mandate. But there was no topsoil—it was all buried in the valley below—and trees could not grow there in pulverized and compacted rock. To earn back their reclamation bonds, coal operators needed to have something growing on these sites: so the surface was covered in a slurry of fertilizers and seeded with fast-growing, nonnative grasses such as sericea lespedeza and tall fescue. SMCRA required companies to have a plan for the land after mining—an official postmining land use, or PMLU—and in east Kentucky, most mine land was approved for the alternative postmining land uses of either hayland/pasture or the vaguely defined "wildlife habitat." Very little of the reclaimed landscape anywhere in Appalachia was being used according to its official postmining land use—a few companies put cattle on as a demonstration, but rarely was it a legitimate business.

By the late 1990s, several hundred thousand acres of these novel grasslands stretched across east Kentucky, and with coal booming, more were on the way. Since they weren't being used in any meaningful way, Doug Hensley had a good idea of how to fill them up.

"I saw the topography of east Kentucky change right before my eyes," he says. He had long ago changed his tune on surface mining. After SMCRA, the reclaimed mine sites—the hay-lands and wildlife habitats that were seeded with heavily fertilized grasses and shrubs—were proving useful. Whitetail deer, wild turkey, and rabbits thrived. And it wasn't just game species; ornithologists would soon document grassland birds, declining in their historic ranges, nesting in abundance. Ancient ecosystems were being irreparably lost, but some kind of life *did* return to reclaimed mines. In 1994, John Tate leased Starfire to the Kentucky Department of Fish and Wildlife for a wildlife management area, and hunters were harvesting rabbits and even whitetail deer. The industry could point to those things and say, "See, these sites are not ecological deserts. We are *creating* habitat."

Doug Hensley had asked Tate to show Starfire to Tom Baker and the Rocky Mountain Elk Foundation's Ron Marcoux, a land conservation specialist. Marcoux saw the openings, the grasses, and the adjacent cover, and thought it would work. Hensley convinced Tate that the elk would be good for east Kentucky, and Tate agreed that it would be good for the industry.

After the aerial survey, the specific site was shown to John Phillips and Roy Grimes; they'd found an entire region of suitable habitat, and now they had a specific reintroduction site. It was 17,000 acres, with nearly 5,000 acres of reclaimed grasslands, 10,000 acres of intact forest, and nearly 2,500 acres of active mine lands that would soon be reclaimed and seeded. Fields of sericea

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lespedeza were the dominant vegetative cover, along with some dense thickets of autumn olive shrubs, and a few rows of pines that were part of a University of Kentucky reforestation experiment. Again, more land was to be mined and reclaimed. Because there was active mining conducted by one of the most powerful mining interests in the world going on, the site was relatively secure. Adjacent to Starfire, above the high wall, was Robinson Forest, the last remnant of the vast Quicksand Unit identified by the United States Forest Service decades earlier. Grimes and Phillips thought that the elk would thrive on Starfire's novel grasslands, and liked its proximity to the University's Robinson Forest, which would provide cover and browse, and a buffer from the public. "We couldn't have found a better site than Starfire," Roy Grimes says.

The idea had seemed outlandish when Doug Hensley had first proposed stocking elk in that depleted corner of east Kentucky, but when you stepped back and looked at the landscape, it made perfect sense.

CHAPTER 6

Who Wants Them?

Doug Hensley and Tom Baker had money, they had habitat, and they had a corporate landowner willing to let free-roaming elk loose on their property. The natural resources community was generally supportive of their plan. Even the Kentucky Nature Preserves Commission, who by that point had grown concerned about the impact of whitetail deer herbivory, supported this project as the reintroduction of a native species. They had concerns about controlling the herd's numbers, but the fact that the elk had once lived there was evidence enough that they could do well in the East.

But there were other groups that would be less than thrilled about the proposal—and whose opposition could derail the plan even before Hensley went public with it. Department representatives met with the Kentucky Farm Bureau, the state veterinarian, and livestock associations and stressed the safety of the proposal. Of the Farm Bureau's 400,000 members statewide, just 16 percent lived in the eastern counties; and the department pointed out that the cropland that did exist was limited to home gardens or bottomland pastures and "small hay fields." Fish and Wildlife proposed a thirteen-county elk zone, and any elk wandering beyond those counties could legally be shot by a hunter with an ordinary deer tag. The promise to keep elk out of the significant row crop regions—and within the eastern mountains—seemed sufficient. Officially, the Farm Bureau remained opposed, and released a resolution against reintroduction, but they didn't press the issue. East Kentucky was coal country, not farm country, and they could afford to let it slide.

Because of the potential for disease transmission, the Kentucky Cattlemen's Association wanted something more than promises. Although 36 states are larger than Kentucky, the state had more livestock than any state in the eastern United States; and at nearly 2 million head, Kentucky was the leading cattle producer east of the Mississippi. In the West, ranchers worry about elk infecting their livestock with tuberculosis, brucellosis, anaplasmosis, bluetongue,

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and a number of other diseases; after consulting the state veterinarian, and out of an abundance of caution, the department said it would screen incoming elk for each of these diseases. But to further appease the state's cattle associations, the department agreed to radio-collar every elk it released for at least three years—and to track the elk, Fish and Wildlife would partner with researchers at the University of Kentucky. The collars would provide periodic updates of where animals were, and if an elk stopped moving altogether, a mortality signal would be sent; biologists would find the animal, determine the cause of death, and collect tissue for disease testing (chronic wasting disease, an alarming prion disease that had emerged in the West, could be tested for only by collecting brain tissue from dead animals). At least six hundred elk would be collared—above and beyond what was statistically necessary—and the cost of collars and locating signals via an airplane was going to be expensive. The department and its university partners were excited about the research opportunities this level of surveillance presented, but far more importantly, it appeased the Cattlemen's Association.

But the opinions of the Cattlemen's Association and the Farm Bureau mattered less than those of the people who would be asked to live near the half-ton beasts. And the people of east Kentucky had yet to be informed of the department's plans.

Kentucky's elk project was not a grassroots movement. As in Wisconsin, it was a passion project of a few influential people. Both states had likewise started with science—was it biologically feasible to pull it off?—before bringing it to the public. In Wisconsin, the berry growers and snowmobilers of the Bayfield Peninsula had sent the Department of Natural Resources packing. But Kentucky's agricultural interests indicated that they would not stand in the way of an elk project in east Kentucky, and the mining industry stood to benefit from a boost in public relations. So Hensley and Baker had reason to be optimistic about the public's response.

But the general public would have a tremendous interest in their plans, not only because they might be interested in hunting elk in the near future but because they'd already been using the strip mines for their own purposes and they were having a lot of fun.

After the coal was gone from the mountains, so were the companies. Often, they didn't own the land, and they didn't care what happened to it after they'd extracted all they could, so long as inspectors agreed they met minimum requirements for bond release. Soon thereafter, absentee landlordism returned,

and under such conditions local people were difficult to keep out. Among the first to venture onto these lands were the sportsmen. The roads that the miners left behind were relatively easy for sportsmen to access, and the small game, especially the rabbits that proliferated in the scrub, were surprisingly abundant. But locals also used the mine sites in ways that weren't so compatible with Fish and Wildlife activities. ATVs cut trails through the mine lands and into the adjacent woodlands. In remote corners of the site, people grew marijuana; Perry County's sheriff once estimated that there were 30,000 plants growing in the county of just 34,600 people. Eastern Kentucky had recently been dubbed "the center of the Appalachian 'marijuana belt,'" with the state line between Virginia crisscrossed by ATV trails connecting the various grow sites. But far more common than illicit crop-rearing was old-fashioned beer drinking and hell raising. Perhaps strangest of all, there were other large mammals there already: Horse owners had turned their animals out to graze on the hundreds of thousands of grasslands that looked most attractive to Doug Hensley.

The east Kentuckians whose support would make or break Hensley's proposal had already found their own uses for the region's sprawling mine lands. Fish and Wildlife, like its counterpart in Wisconsin, would have to contend with them.

By March 1997, Roy Grimes, John Phillips, and Tom Bennett had the project just about buttoned up. Doug Hensley knew he had the support of the majority of the commission, and through Tom Baker he'd secured RMEF's financial support (nearly a million dollars would later be pledged). (For comparison, the effort to restore wolves to Yellowstone National Park, which had begun in 1995, was estimated to cost more than $3 million over a five-year period and an additional $1.3 million for four more years of monitoring.) It was time for the department to take the idea public.

When the elk project hit the newspapers ("Elk May Again Roam Free in Kentucky"), Starfire was introduced as the proposed first release site (officially the Cyprus-Amax Wildlife Management Area, in recognition of the company that owned the land and minerals). The Tennessee Wildlife Resources Agency was on board, too, and proposed a simultaneous release of thirty free-roaming elk on its side of Land Between the Lakes. A third site, the Big South Fork National River and Recreation Area, 125,000 acres of federal land straddling both states on the eastern edge of the coalfields, was also in the works.

Now that the word was out, the department embarked on a public relations blitz. At a series of eight town hall meetings, Grimes and Phillips told the story

of elk in eastern North America, how they had been native to Kentucky but had been wiped out by the 1850s—and how the project was an opportunity to restore a long-lost piece of Kentucky's natural heritage. Anticipating many of the public's concerns, they outlined the results of the department's investigations into diseases, competition, and vehicle collisions—and what was at stake: Grimes emphasized that some of his colleagues were convinced that poachers would embarrass the project and that when eastern Kentuckians saw "600lbs of meat in a leather coat," the animals wouldn't stand a chance. But Grimes believed their success with whitetail deer would bode well for elk.

The department pitched the project as a boost to the local economy, claiming that $24 million could be expected in tourism revenue. In economically depressed eastern Kentucky, that was a significant figure. The state's tourism secretary was on board, as were a number of county council members; a local game warden went on record saying that he was "tickled to death about it." But unlike a novelty herd, the animals would also be hunted—and soon. It would be a mass stocking, just as they'd done with whitetail deer. They were aiming to create the largest herd east of the Mississippi, and because of the green grass on the reclaimed strip mines, they expected to produce monster bulls; if things went according to plan, elk hunting in east Kentucky could soon rival that in the West.

By most accounts, the meetings were filled with enthusiastic supporters (and folks such as Doug Hensley made sure that supporters turned out in force). There were some questions about free-roaming dogs, whether elk would damage grouse nesting areas, and if the department would neglect its newly established herds of whitetail deer. A newspaper publisher in West Liberty, located just outside the proposed elk zone, was concerned about vehicle collisions. Roy Grimes argued that elk avoid highways and that data from Michigan had demonstrated low numbers of vehicle strikes, just 5.3 accidents annually in an elk population of 1,300. Grimes also stressed that just 1 percent of all land in the proposed elk zone was in row crop agriculture. There were some large gardens and hay fields in the river bottoms, but that was it. Best of all, Grimes said, it wouldn't cost the public a cent; the Rocky Mountain Elk Foundation was going to pay for it.

The department was not interested in feedback or suggestions. "When we went public," Grimes says, "we went in saying 'This is what we are planning to do. . . . We want to know whether you support it or not." The only question was "Yes or no?"

Not every Kentuckian was thrilled about it. Classifying local people's farms

as "small" or "large gardens" didn't make them feel any better about the prospect of a new pest. Charles Hardin of the Breathitt County Farm Bureau, whose jurisdiction was squarely within the elk restoration zone, was adamantly opposed not just to elk but to any additional wildlife. The whitetail deer that the department had worked so hard to reestablish had already become a nuisance to farmers. The department's mandate was to protect and restore wildlife, and it was inevitable that this would cause conflict with farmers. The Fund for Animals, meanwhile, an animal rights organization, opposed the project outright because the elk were to be hunted. One letter writer criticized the department for catering to the interests of "bloodthirsty" trophy hunters. "Their latest scheme to please this small special interest group is to spend hundreds of thousands of dollars in an inhumane and ridiculous plan to transport elk thousands of miles across the country so that local hunters can slaughter them and proudly display their heads over their mantles," the Louisville resident wrote. "Fish and Wildlife claims that current populations of the whitetail deer are decimating thousands of acres of crops and posing a risk to drivers, yet they want to import hundreds of elk weighing four times that of a white-tailed deer. . . . Is this sound biological management?" Tom Baker responded a few days later with "a definite yes!" "Not only is it good wildlife management, but the potential economic benefits for the entire release area are tremendous," he wrote. "[The writer] should understand that the people who believe in sound wildlife management, conservation education, and our hunting heritage are also the ones who pay for it."

Some Kentuckians who lived closer to the Starfire mining complex had other reasons for criticism. Instead of new opportunities for hunting big game, they wanted solutions to cracked foundations, crumbling walls, and polluted drinking wells. They weren't concerned about habitat for grazers; they were fearful of the rush of water coming off the surface mines during spring rains. They mourned the fact that they could no longer swim in Troublesome Creek, and they wondered why the owners of Starfire were being praised for their part in bringing back elk when they weren't being held responsible for damage to private property.

But when it came time to speak their minds, these Kentuckians came out in overwhelming support of the elk. Between May and June, the department received 3,200 written comments, "with 90 percent in favor," including 1,300 comments from southeastern Kentucky, where 99 percent were in support.

In June, the elk project went back before the commission. The plan was to release two hundred elk a year for the next nine years. They had a zone—from

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Prestonsburg in the north to Pineville in the south—they had habitat, and they had public support. In dramatic fashion, Tom Baker stood up in front of the commission and said that the Rocky Mountain Elk Foundation would pay for the project—with a check for $50,000 for each of the first three years and a commitment to raise $750,000 in the remaining six years.

The commission voted unanimously to proceed with the reintroduction of elk to the commonwealth of Kentucky.

It had been a little over a year since Doug Hensley had walked into Tom Bennett's office with an unprecedented proposal. And now the elk were coming.

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CHAPTER 7

The Comeback

To stock elk, the department would need to find some, and they would need to meet three important criteria: wild, disease free, and unwanted in their current homes. For that, the department would have to go west.

John Phillips knew a biologist in Utah, a state that was more than happy to dispatch its surplus elk to Kentucky. Its elk restoration had been a resounding success: Between 1975 and 1990, the herd had skyrocketed from 18,000 to nearly 60,000, which were now causing problems for Utah's farmers. Kentucky employees raced to the Wasatch Mountains—where an estimated 6,000 elk seasonally migrated down from the mountains and into farm fields—to help build the trapping and holding facilities. They had a few months to get things set, and then translocation would occur in winter, when the elk would be less likely to overheat from the stress of capture, and when snow cover would make the baited corral traps enticing.

All was in order when on the eve of translocation, in late November, a horse in Utah displayed symptoms resembling either hoof-and-mouth disease or anaplasmosis. Kentucky was a horse state, and there was a policy that any animals coming from an area with these diseases would need to be tested and quarantined for forty-five days. It was not an insurmountable barrier in and of itself, but it meant that no elk could be on the ground in Kentucky until the next calendar year. And Commissioner Tom Bennett wouldn't stand for that.

Elk had been approved by the wildlife commission in June, while the state legislature was out of session. But Bennett knew that, given more time to think about it, an organization like the Farm Bureau or the Cattlemen's Association could decide to challenge the project and, with support from a member of the general assembly, potentially shut it down. That was exactly what had happened to the companion proposal to bring free-roaming elk to Land Between the Lakes in Tennessee. In July, the Tennessee Farm Bureau called a meeting

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of local farmers to discuss the reintroduction planned for LBL. The heated discussion centered on crop depredations, vehicle collisions, and skepticism toward the agencies' abilities to control the population. "They said their surveys showed that 90 to 95 percent of the people approved it," one Tennessee farmer said. "But they didn't seem to survey those of us that would be affected. We have enough problems with too many deer, already. Why should we believe that they would keep the numbers down on the elk?" The proposal was promptly scrapped.

Bennett wanted to avoid a similar scenario in Kentucky. If elk were in Kentucky's future, it had to happen before the legislature resumed in January. *If we get them onto the ground*, they thought, *then they won't be able to stop us*. "It was as adamant as Tom has ever been," Roy Grimes says. "He was under quite a bit of pressure now from the public and the commission to do this, and if something happened to derail it, that was going to be a bad thing." The program needed another source of elk, and it was Grimes's job to find it.

Grimes was familiar with an elk herd on the Maxwell Wildlife Refuge in central Kansas, from when he worked for the Kansas Department of Wildlife & Parks. That 2,500-acre mixed-grass prairie had been home to captive herds of both bison and elk since the 1950s. Grimes knew that surplus animals were removed each year to be auctioned off and that they were thoroughly disease tested. So the Maxwell herd fulfilled two of three criteria: They were disease free, and they were unwanted. Kansas was happy to donate four bulls and fifteen cows and calves.

The only problem was that they were behind a fence. Although the consensus was to work exclusively with wild-caught animals, Kentucky was willing to make an exception with these few animals to make sure elk were on the ground before January.

The Kansas elk were baited with alfalfa pellets, darted with tranquilizers, and tested for disease. Although they were fenced, they were still treated as, and still behaved like, wild animals—and so they weren't eager to be corralled. Kentucky had used tranquilizers in its recent deer-stocking efforts with great success—but it wasn't so easy with the much larger elk. Heavy, wet snow had fallen on the prairie, and as the animals lay on the cold, muddy ground, a few died of hypothermia. When it was time to load the trailers and head to Kentucky, they had just nine animals; when they got near Louisville, one of the elk broke its neck in the trailer, and they were down to eight.

It was a rough and unfortunate beginning, but finally there were elk in a trailer headed for Kentucky.

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On the morning of December 18, after about fourteen hours of transit, a pair of green livestock trailers bounded up the rough and rocky coal-haul road to the top of Starfire. The big day had arrived. Just after sunrise, cars and buses started making their way up to an area known as Tater Knob. The flat earth was orange and brown with coarse winter grasses; tufts of broomsedge bluestem rose knee high throughout—with so much flat land, it bore a striking resemblance to the Kansas grasslands they'd just left. It was a cold, clear day, warming and brightening as the crowds grew larger, "alive with an almost carnival atmosphere." An estimated 61 school buses brought local students to the site from several counties. There were hunters dressed in camouflage; and historical reenactors clad in buckskin and cotton of the 1700s, carrying the handcrafted flint long-rifles that had been used to kill off Kentucky's large game more than 150 years earlier. More than 3,000 people (with estimates climbing to 4,500) had come to witness the elk's arrival. The occasion was loud and joyful, and that amount of activity was sure to stress the elk, but the department gambled that it would have a positive impact. It wanted east Kentuckians to be invested in the animals, to feel ownership of them. It wanted it to be an event that locals would talk about for years to come.

Starfire was often a spectacle. At 30,000 acres, the site was more than six times larger than the city of Hazard; its reclaimed mountaintops totaled nearly 5,000 acres, and areas of active surface mining totaled nearly 2,500 acres. It was the biggest surface mine in all of Kentucky. Foreign delegates had come to learn about mountaintop removal coal mining and reclamation, and the University of Kentucky was engaged in various reforestation and ecological experiments. D9 bulldozers roared at an active mine site less than a mile away, and five other surface mines operated within seven miles of Potato Knob. The elk were not coming to a tranquil wilderness, they were being plopped down in the middle of one of the most active mining centers in human history at the moment of peak production.

The crowd gathered on a slight rise, looking down on the trailers, parked in a bowl about two hundred yards away. The architects of the program looked on, among them Doug Hensley, Tom Bennett, Tom Baker, with his signature cowboy hat, and the Rocky Mountain Elk Foundation's Bob Munson. "They looked like kids on their first roller coaster ride, excited but nervous," a Fish and Wildlife employee observed. Kentucky Governor Paul Patton flew in on a helicopter to join them. A Pike County native, Patton had worked for twenty years as an executive in the mining industry and was at home in the coalfields.

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He climbed on top of a flatbed trailer, and asked the residents to be vigilant against poachers. "The world is going to be watching eastern Kentucky," he said. "I want to ask all of you all to commit to protect these animals, that are our animals. . . . They belong to no individual. They belong to 3.8 million Kentuckians. We will not tolerate illegal harvest."

Then it was time to let the animals loose.

There are two basic ways to release wild animals: hard and soft. In a hard release, animals are let loose from a transport cage directly into the new environment. They may bolt or linger, but once they leave their transport, they are free and wild and without physical restraints. All of Kentucky's recent deer-stocking efforts had been hard releases. There are drawbacks to this method, especially for large mammals capable of moving great distances: If animals stray too far too quickly, they might leave their delineated restoration zone. They might stumble onto a highway or fall from a cliff or into a pit. In a soft release, on the other hand, the animals are eased into the landscape; they are transferred from their transport cages into larger acclimation pens. They can stretch their legs and get acquainted with the local landscape, but they remain confined. Soft-release animals are less likely to injure themselves and more likely to remain close by even after the gates are opened. If you want an animal to stay in one place—to avoid conflicts, or to maintain group cohesion—soft is best.

But erecting a pen large enough to accommodate shipments of two hundred elk, as was the plan for Kentucky's subsequent stockings, was complicated, and it would have ballooned the project's expenses. To place two hundred wild elk in a pen would risk injury and the spread of disease. So Kentucky opted for a hard release. If any elk died in the process, the mass stocking would account for it.

After his speech, Governor Patton climbed down from the flatbed trailer, and walked down to the elk trailers. He was given the honor of opening the first trailer's gate. "There were 4,000 people watching," Tom Baker recalled, "and you could hear a pin drop when they opened the door of the trailer." After Patton slid the gate open, someone entered the trailer from the front end to shoo the animals out. The silence of the crowd broke as the elk jumped and stomped, their hooves clanging against metal—scared, exhausted, and confused. Four cow elk and a bull calf bounded out of the trailer. They ran single file to a clump of bushes at the top of Tater Knob. The crowd cheered. Then the animals paused, looked over their shoulders, back at the crowd, at the trailer. When the elk stopped at the top of the knob, the crowd grew silent again.

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Their coats were light tan, their heads and necks a darker brown; they fit the landscape to a T. "Look at the size," people whispered. "Look at the color." "It gave me goose bumps," RMEF's Ron Marcoux says. Then the next gate opened. Around twenty minutes later (after "twenty minutes of coaxing"), the smaller of two bulls finally jumped out and followed the cows. The herd ran north toward Robinson Forest. "It was pretty magical, that moment," a project biologist, Jeffery Larkin, recalls. "Just to see the energy of humans, with just this excitement. . . . The energy was just unbelievable, and so positive."

All of the elk had exited the trailer except two. One of them was dead (it had rushed to the other side of the trailer when someone had approached the vehicle and broken its neck). But the other, Bull No. 4, a nine-hundred-pound adult male, was very much alive, and he would not budge. "From the moment he woke up from being darted, he's been a handful," Tom Bennett said. Department personnel had been whooping like cowboys, banging on metal, and waving brightly colored orange cloth for more than an hour. John Phillips said that the bull was doing what bulls are supposed to do: defending his territory, "Popping those ivories and lowering his head like he wants a fight." Finally, someone thought to move a group of photographers out of the elk's sight line. A five-gallon bucket was then thrown into the trailer, and that did the trick; the bull stomped on the bucket and then ran out and north.

If there were any lingering questions about the wildness of these Kansas elk, Bull No. 4 would continue to put them to rest over the next five months.

But for now, the first seven elk were on the ground. As they ran up the hill, 4,000 Kentuckians got a good look at the size of the animals and their namesake white rumps (*wapiti*, an Indigenous name for elk, means "white rump"). They were massive, free-roaming animals, and they were now out of sight.

That first day in their new habitat, the elk would have done what elk do everywhere—look for food, eat, defecate, and repeat. But they'd just been through quite the adventure; they were sure to have been stressed out and feeling way off kilter. Most wildlife biologists are loath to make assumptions about an animal's emotions ("I don't want to anthropomorphize," they often tell me), but surely the elk were happy and relieved to be out of those cramped trailers and off the interstate highways. They would have taken comfort and refuge in the forest lands; if they found a familiar food, perhaps a bit of confidence. As the night drew on, they would have looked for cover, as their species has done for thousands of years.

Unlike their ancestors, though, those seven elk wore very-high-frequency

(VHF) radio collars. A wildlife biologist in a fixed-wing aircraft would locate each of them once a week. Along with the DNA fingerprints the department had on those seven elk, that level of monitoring may have discouraged poachers and led to some wild ideas about the department's capabilities; one rumor held that it had inserted cameras into the eyes of the elk, which, however outlandish, Roy Grimes says, the department did little to dispel. "I'd say you could kill a man and get away with it better than you could one of these elk," a conservation officer said on the morning of their release.

David Maehr, a conservation biologist in the Department of Forestry, was to direct the research out of the University of Kentucky. Before coming to Kentucky, Maehr had spent a decade working to recover the endangered Florida panther, and he was well acquainted with telemetry, monitoring, and capturing large mammals. He was curious about how the elk would navigate the grassy reclaimed sites, the active mine sites (there would be no fences to exclude the animals from the massive open mines), and the highways that snaked throughout the valleys. Habitat connectivity was a hot topic in the spheres of landscape ecology and conservation biology—it was critical to the future of the Florida panther—and Maehr was curious about how the elk would travel from one mountaintop removal site to another. Would habitat corridors need to be developed? Would the elk be able to move freely across the landscape? "They were here when Daniel Boone came through the Cumberland Gap," Maehr said in the weeks leading up to the release. "Obviously, a lot has changed since elk last lived in Kentucky, and it'll be very interesting to see how they readjust. . . . We don't know exactly how they'll repatriate themselves to this landscape."

Jeffery Larkin, at the time a doctoral student in wildlife biology and lifelong hunter, was responsible for tracking the herd. Like so many others, he'd had no idea that elk had once been in the East and was thrilled to be working to bring them back. He was at Starfire on release day and the next day, and each week for the next three years, he was in an airplane looking for the animals. "I was in that plane so much that, I'll never forget, it was Cessna 97436," he says. He was sometimes joined by a recent department hire, Dan Crank, listening to the receiver with a headset, cycling through each collar's individual frequency as the plane circled over the landscape. When a signal was detected, the scan was stopped, and the pilot began flying increasingly smaller concentric circles until the signal was pounding from directly below.

But on their first flight, no one had any idea what to expect. The day before, the animals had bolted out of the trailer, into Robinson Forest, and out of sight.

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Yet it didn't take long for Larkin to pick up signals, and locate six of the seven elk within Robinson Forest; it was December, the leaves were off the trees, and he could see them out his window moving along an unpaved logging road. At the end of the flight, all of the elk were accounted for except for Bull No. 4.

The next day, when Larkin was back in the plane, he expected those six elk to have continued traveling north; instead, they had stopped at the next surface mine, on the north side of Robinson Forest (less than seven miles away as the crow flies). They'd found an area called South Fork, one of the earliest mountaintop removal sites in Kentucky and one of the abandoned mine sites that was filled with free-roaming horses; Larkin wondered if perhaps the presence of another large mammal had sent a signal to the elk that it was a good place to settle in. He was certain that the experience of running through Robinson Forest affected the small herd—coming from that fenced Kansas prairie, they'd never experienced anything like it—and so when they came out of the forest, emerging onto the opening of yet another mine site, they must have sensed safety. "They made it to the north part of that forest, they came out into that mine land, and they stopped, never to go any further," he says. "They just stopped. And I think it's because they didn't want to experience another extended stay in a forest that was so odd to them, with limited groceries."

Then they did what elk anywhere do: During prime feeding hours, they grazed in the open; at other times, they stayed in the shade and security of the shrub border between the reclaimed areas and the forest. "So they basically laid around, shit a lot, and ate a lot, and didn't really move that much," Larkin says. "I mean, just kind of made themselves at home." During his aerial surveys, he almost always got a visual, and the elk were almost always on the reclaimed mine sites around Starfire. They had quickly settled into a routine.

Bull No. 4 was the exception. It was several hundred pounds heavier than the Kansas cows, and at five feet tall at the shoulders, there was no mistaking him for a Kentucky whitetail. He was the biggest thing anywhere in the Kentucky woods. By April, he'd strayed out of the elk zone to Morgan County, and when the department tried to take him back to Starfire, he resisted recapture. Some in the community had taken a liking to the bull, and they didn't want the department to capture and remove "their" elk; whenever a biologist was ready to dart the bull, a car would drive by honking, or its passengers yelling, to scare the bull back into the woods. Bull No. 4 eventually moved on and kept going north. In May, after several months' worth of attempts, a biologist would finally get the bull, but only after a drawn-out fight: John Phillips darted him in Bath County, but the drug didn't take. Later that day, he was darted a

second time—this time in Mason County—and again the drugs didn't take. The elk seemed to be heading north, toward the outskirts of Cincinnati or across the river into southern Ohio. When he was darted a third time, on a hill overlooking the Ohio River, the drug finally took; the bull ran another two miles, stopped, and then fell. He would soon die from what was believed to be complications from the tranquilizer and overheating; the drug was typically safe, but there were often unfavorable and unpredictable outcomes when it was used to attempt to control large wild animals.

Bull No. 4 was likely trying to find his Kansas companions—or any other elk at all—but he'd gone the wrong way and could never get back on track. And he didn't want help from the biologists: Despite the fencing he'd grown up inside, Bull No. 4 was a wild elk.

To the architects of elk reintroduction, that was a lesson: They were wild animals, and they were going to go where they wanted to go and do what they wanted to do.

The seven animals let loose at Starfire in December 1997 were just the tip of the iceberg. A few weeks later, the quarantine period in Utah ended, and the Kentucky department headed west to prepare for its first great shipment of new animals. If all went according to plan, its personnel would capture two hundred elk from Utah's herd and release them at Starfire by the end of the winter.

Capturing elk is no easy thing to do, but in Utah they at least knew where to find them. The 14,000-acre Hardware Ranch was a wildlife area that had been purchased by the state in 1946; it was intentionally managed as winter range for elk to try to keep them out of the private farmlands in the Cache Valley (hay was grown there in the summer and fed to them in the winter). Officials in Utah had been trapping and studying elk since the 1950s and their operation was now a well-oiled machine; their circular corrals were built of steel fencing and lined with plywood, and they were baited with hay. Each corral trap was outfitted with a trip wire; when an elk tripped the wire, the opening closed behind it. Staff from both Kentucky and Utah checked the traps every day for nearly three months straight; they slept in a bunkhouse at Hardware Ranch, and worked twelve- to sixteen-hour days in freezing temperatures, seven days a week. The number of elk inside a corral was random; there could be two or fifteen or however many had run into the trap before the door was tripped. If a bull with antlers entered, someone had to jump on the animal's back and saw them off; a bull elk was a danger to both himself and others. Charlie Logs-

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don, the Kentucky department's first elk biologist, witnessed a massive bull elk corner a spike bull in the corral trap and kill him. "He drove the dagger tines through his chest, threw him ten feet up in the air, and dropped him there dead." When they got seventy animals, they weighed and tagged them. They covered the elk's eyes with towels to calm them down, as they drew blood to screen for disease. The animals were kept in the pens for about two weeks while waiting for the test results. When they were confirmed to be disease free, they were collared and ready to go east.

Yet the hard and dangerous parts weren't over; driving large wild animals across the country was no easy task. At the end of January, the first large shipment of elk pulled out of Hardware Ranch, Utah, and headed for Kentucky. After forty-eight hours in the cold, cramped cattle trailers—eighteen longer than it should have taken—the elk were let out, this time with no applause or revelry.

The department improved its transit strategy with each shipment. By the third shipment, it had hired a reliable east Kentucky cattle driver who had a partner, allowing him to drive continuously and shorten the animals' time in trailers. But Mother Nature conspired to make that trip the most difficult one. In Wyoming, there were warnings of a blizzard, and as they entered Nebraska, I-80 was shut down. The team found a Super 8 motel for the night and parked the trailer behind the building to avoid unwanted attention. "I had this nightmare of CNN or Fox News showing up behind there," Logsdon says. "I didn't want people walking around them. . . . if they spook, the elk against the corner would die—they're that big." He found some hay and water troughs and did his best to keep the animals fed, watered, and warm, but he would soon discover that two of the elk had died. There was nothing to be done about it until they made it to Kentucky; going in and extracting the dead elk without causing further stress and injury was impossible. After a day of waiting, an alternate route opened, and the elk were off again. But then in Missouri, the driver noticed that the air lines between the trailer and the truck had frozen—and so they stopped at another motel and went about trying to find an auto parts store open on a Sunday—miraculously, the lines unfroze, they were patched, and then they were off again. Early Monday morning, the elk were finally free.

The fourth and final shipment of 1998, to the great relief of everyone involved, went off without a hitch.

By the end of March, 167 elk had been released at Starfire.

At the end of 1998, seventy-one of Kentucky's new elk had died—42 percent of all the animals brought into the state. Most of the deaths were attributed to

the stress of those translocation events—thirty-four animals were confirmed to have died from capture myopathy, a condition that results from the stress of translocation when lactic acid builds up in the animals' muscles and breaks them down to the point where the animals cannot move and cannot recover. Even the surviving elk got into trouble. In December 1999, an eight-hundred-pound bull strayed toward Prestonsburg, and drove its antlers through a plastic Santa Claus, tossed it into the air, and destroyed a Christmas tree. In Floyd County, elk damaged a greenhouse full of Christmas trees. They got into cemeteries, knocked tombstones around, destroyed plastic flowers (one woman sent the department a bill, which it declined to pay). In Perry County, elk hopped a deer fence to enter a University of Kentucky plant research facility, and ate nearly fifteen acres of plants. One elk was killed after it was struck by a pickup truck on a US highway in Morgan County—not only had it strayed out of the elk zone, it had gone to one of the few areas where there was vocal opposition to the elk program. Earl Kinner, the publisher of *The Licking Valley Courier*, had written a number of critical editorials. "It's bad enough to hit a deer," he said after the accident. "Do you know how big a damned elk is?" Afterward, the department implemented an unofficial "get-tough policy": If an elk strayed out of the elk zone, it would be darted with tranquilizers, captured, and returned to an appropriate release site. If it strayed a second time, it would be killed. At least one elk was killed under this policy—a cow that had crossed into Virginia and evaded capture. By the end of year one, a total of four elk would be killed by vehicle strikes; one of them was discovered to have been infected with brainworm (which may have led it to become immobile in the roadway). Only one cow was believed to have been killed by a poacher.

While the department didn't relish any of the deaths, it had anticipated that elk would die, and it had designed a program that could absorb those losses: Two hundred more elk were scheduled to arrive the next year and every subsequent year for the next seven years. The mass stocking would ensure success.

There were going to be lots of firsts after reintroducing these elk herds in the American East—the first elk droppings to be driven into the soil by an animal's hooves, the first bull elk to rub its velvet on the bark of a young tree, the first autumn bugling, and the first sheds to be kicked up in the woods. One of these significant milestones arrived early in 1998: the first elk calf to be born in the wild in Kentucky in over 150 years.

The first elk calf Charlie Logsdon saw quickly got away from him. The calf

was covered in spots, just like a whitetail fawn; Logsdon spotted it once, but then it hid back down in the grasses and brush. "They are what you call one of the classic hider species," he says. "And for that first two or three days, maybe a week, they don't move. I've actually went up there, put them in a bag, weighed them, drew blood, ear-tagged them, put a collar on them, and you couldn't have told me they breathed." He soon learned that the cows liked to give birth in the same locations year after year, and at Starfire, that was the timbered edge between the mature forest and the reclaimed strip mines. The first births were celebrated but also expected; a number of the cows had come from Utah pregnant. Between twenty and thirty calves were born in the spring of 1998.

The following year, the restoration expanded to a second site, with a total of 143 elk released on a reclaimed strip mine on the Bell/Harlan county line, just north of the Pine Mountain ridge (the site would be called Orr and then Begley and in later years a succession of other names as the land changed hands from one company to the next). In June 1999, the department celebrated when the first Kentucky-bred elk calf was born to a pair of Kansas elk; it was caught and collared, weighed in at 37.1 pounds, which was above average, and described as "in excellent physical condition." At least two other Kentucky-bred calves were also born that year, and several pregnant cows, brought in from Utah, also gave birth. At 97 percent, their survival was nearly perfect.

In Utah, some adjustments were made to the holding facilities (swapped wood fencing for rounded steel), trapping dates were adjusted, and they got lucky with weather; as a result, mortality was reduced to just 3 percent, and capture-related myopathy was never again as bad as it was that first year. Along with low capture-related mortality, the high birth rate continued. Even yearling cows were getting pregnant. To reproduce at such a young age, the cows needed to grow rapidly, and to do that they required high-quality forage—and the reclaimed surface mines provided it in spades. There was even an unusually high number of twin births in those early years, which was an exceptionally rare thing for elk anywhere in the world.

The elk also passed the eye test. So far as the biologists knew, the elk looked so healthy because they had so much to eat—on the reclaimed mines, the fertilized orchard grass, perennial rye, clovers, fescue, and other cool seasonal grasses grew fast and thick. The forest edges offered an abundance of choices, from browse and twigs to fruits and nuts—and the elk quickly adapted to the eastern smorgasbord. They ate what was best and most nutritious whenever that food was at its best and most nutritious. They were indeed generalists, just as the reports had claimed, and they proved as much in east Kentucky.

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"Man, if it's there," Dan Crank says, "they'll eat it." After a few years in eastern Kentucky, the animals were noticeably larger than their western counterparts. Eastern Kentucky winters are mild, the mountains green up earlier in the spring, and fertilizers on the artificial mesas meant that there was an almost constant supply of food, so the elk lost relatively little weight in winter. "You look at these elk in the summer," Crank says, "and they're just *fat*."

The elk had been a symbol of the Rocky Mountains, but after two years, the Appalachians were proving to be every bit as hospitable.

In the first two years of the project, brainworms hadn't decimated Kentucky's new elk. In subsequent years, biologists would confirm that the cows were passing antibodies down to their offspring—the elk were exposed to the parasites, but they were thriving nonetheless.

But there was another crisis on the horizon. In 1999, John Phillips, who'd written the reintroduction plans for eastern Kentucky's whitetail deer and elk, retired from the department. That summer, Jonathan Gassett, a PhD biologist from Georgia, was hired as the state's new big-game director. The reintroduction plan he inherited called for two hundred new elk each year—but it was clear to Gassett that the translocation program would not last a full eight years. Chronic wasting disease (CWD), a prion disease related to mad cow disease, was rapidly spreading throughout the West. If the disease showed up in Kentucky, it would be a disaster for the department and its big mammals.

In 1996, the disease was confirmed outside northern Colorado and southern Wyoming, at an elk farm in Saskatchewan—the first time it had escaped the "endemic zone" in the thirty years since it had been first described. Early the next year, as Kentucky was drafting its elk restoration plan, CWD was confirmed in several captive elk herds in South Dakota; and then as Kentucky was trapping wild elk in Utah, CWD was confirmed in captive elk herds in Oklahoma. The disease seemed to be following translocated, captive elk. But then in July 1999, a wild mule deer tested positive for CWD in Nebraska. To Gassett, this meant that the window for moving cervids freely around North America was rapidly closing. If Fish and Wildlife was to reach its goal, it would need to bring in far more elk as quickly as possible. Utah was still disease free, so it redoubled its efforts there and brought on several other states—Arizona, North Dakota, Oregon, Kansas, and New Mexico—that were also, for the time being, free of CWD.

Kentucky also got a boost from an innovation in trapping. In the fourth year of capture, Fish and Wildlife contracted with a net-gunning crew, origi-

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nally from New Zealand but now based in Salt Lake City, who had developed a form of capture that no longer relied on waiting for snow cover to entice an elk to enter a corral trap. The net gunners would spot elk from a helicopter, and with a .308-caliber cartridge shoot a wide net around individual animals. In quick succession, the helicopter landed, a crew member jumped out, tackled the animal, and then blindfolded and hobbled it before fitting it with a harness. The animal was then lifted by its legs and taken to a holding pen for disease testing and collaring. A good day's capture was now fifty elk, and more than four hundred animals would be captured with the technique in both Arizona and Utah. For three years in a row, the team brought in roughly five hundred elk each year from all states combined. This was an astounding number not just for Kentucky, but for any project in the country—the movement of this many large, wild mammals was unprecedented.

By 2002, Kentucky had eight reintroduction sites. The hope was that elk would colonize unoccupied reclaimed surface mines throughout the 2.4 million acres of the restoration zone. As at Starfire, most of the reintroduction sites were named after the companies permitted to mine the mountains: Orr (Begley), Czar, Blue Diamond. The Redbird release site, within the Daniel Boone National Forest, was an exception in both name and habitat. There were a few prelaw contour mines there, but no sprawling mountaintop removal grasslands and only a few artificial openings that were maintained in wildlife food plots. Jeff Larkin was eager to see how the elk fared in this forested tract, because it was more similar to what the eastern elk might have encountered centuries ago. "If you wanted to mimic what it was like naturally, then I think you would want to put them into an area where you had less open area," he said. "If elk were here when Daniel Boone was here, I doubt he saw 50 animals at a time." But the release at Redbird was plagued with problems. Many of the elk were injured in the net-gun operation; lifting animals by their legs had worked for moose, but elk didn't seem to have the musculature to support this kind of lift (on subsequent captures, the elk were wrapped with a tarp and lifted sternally). One of the elk coming off the trailer was so severely injured it had to be shot; others managed to survive for a while, but they were unable to easily move about the area and find sufficient food. Because of a lack of grassy openings in the Redbird district, the elk had, tragically, been attracted to the fields adjacent to a local highway. The salted roads in winter had taken them even closer, which had been a disaster.

For every elk that stood in the road lapping salt, there were others that quickly, and expertly, made themselves scarce. Elk had been there before, and

they knew how to survive. A number of elk disappeared upon release, choosing to be alone in far-flung corners of the zone. As young bull elk matured into spikes, they were driven out by the cows and unable to compete with the mature bulls. In turn, the young bulls formed bachelor groups. But in the fall, most of the solitary animals would return to the larger herds—the first time herd dynamics had played out in the Cumberland Mountains in more than 150 years. And their instincts were strong. During the translocation period, Charlie Logsdon observed as, year after year, an elk or two, released at different times at the Orr property, on the Bell/Harlan line, made their way to the same place in Virginia. "They would leave the Orr property, travel down parallel to Pine Mountain, go through this one guy's backyard, go over a gap in Black Mountain, and they'd end up within a mile of each other in Big Stone Gap, Virginia," he says. "Every time." He believed that they were following historic game trails—perhaps the same routes that elk had used for millennia—taking the path of least resistance. And those elk wound up in the exact same place.

But wanderers were the exception. Most of the elk, especially the female social units, simply stayed put. "They didn't go anywhere," Dan Crank says. "Their home range was a couple square miles. Nobody bothered them, they had all the groceries they needed, they had hiding cover, they had thermal cover." For a project that had been concerned about auto collisions and crop depredation, this kind of site fidelity was almost too good to be true.

The average citizen didn't need to fly in an airplane with a VHF receiver to locate elk. Residents of Hazard, for example, could drive a few minutes north to Starfire, park their vehicles, and observe a herd of elk, hundreds of them. Doug Hensley was constantly driving folks to Starfire to get a look at the swelling numbers. They weren't yet hunting these animals—but they were proud of the elk all the same: The Kentucky Department of Fish and Wildlife had succeeded in bringing one of the majestic attractions of Yellowstone to the coalfields of east Kentucky.

It may be difficult to picture, but all of that activity occurred alongside active mountaintop removal coal mining. The establishment of the herd, a feel-good wildlife success story, was occurring at the height of local and national debate over whether mountaintop removal coal mining should continue—whether it was a desecration of our natural heritage or the righteous exploitation of natural resources. As elk bugled and mated, as they locked antlers, gave birth, or traveled from one far-flung corner of a county to another, explosives blasted away at ridges and bedrock, bulldozers pushed overburden into valley fills

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burying miles of streams and forests, and excavators scooped up and away a staggering amount of coal. Throughout east Kentucky, as a direct result of mountaintop removal coal mining, salamanders and forest-interior birds grew rarer by the day and endangered species such as the Indiana bat and endemics such as the Kentucky arrow darter continued to decline. Because the central Appalachian ecoregion is a biodiversity hotspot—and the world center of diversity for salamanders, crayfish, and freshwater mussels—the destruction had an outsized impact on rare and declining species in the East. As one ecologist and Knott County native, Tierra Curry, told me, "You've got one of the most destructive environmental practices ever, in one of the most biodiverse places on the planet—and so you're sacrificing unique species that aren't found anywhere else." But big-game hunters could overlook the loss of biodiversity, the transformation of lush forests into depauperate grasslands, because whitetail deer, wild turkey, and elk proliferated there. I once asked Doug Hensley whether he preferred these reclaimed mined lands to what had been there before. "Good Lord, yeah," he said. "When it was all wooded, I know what we had—we had *nothing*. We had pretty trees, but you didn't have no wildlife."

The coal industry was proud of its transformation of the landscape. "They talk about creating a wasteland with mountaintop removal," the Kentucky Coal Association's Bill Caylor said. "I argue that it was a wasteland before. All you could use it for before was forest land. . . . The coal industry is improving the land, and I'll argue that until I go hoarse." If a coal booster did lose his voice, he could now point to a herd of elk on a reclaimed mountaintop mine as some kind of evidence; good things were happening there. In 1998, the manager of a massive 18,000-acre mountaintop mine in Martin County said that mountaintop removal mining had improved the streams it buried because, before the valley fills, the streams had had sewage in them—and the residents had been forced to move out. Two years later, a Martin County coal slurry impoundment burst open and released 306 million gallons of slurry into two tributaries of the Tug Fork River, which forms the border with West Virginia and flows into the Ohio River. Filled with mercury and arsenic, the slurry had killed all life in Coldwater Fork and Wolf Creek and produced thirty times more sludge than the infamous *Exxon Valdez* oil spill. But it was a blip in the national news cycle; the nation had come to expect these kinds of disasters in coal country. Two years later, 250 elk were turned loose on a mountaintop removal site adjacent to the site of the Martin County slurry spill. Meanwhile, as elk and other game species increased, as grassland and ground-nesting birds proliferated, there were plans to build a 524-megawatt coal waste–burning

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power plant at Starfire; the reclaimed mine could be packaged as a "wildlife paradise" today, but if the plant were built, even those gains would be lost. Life there remained tenuous.

Meanwhile, the elk made do not only in the reclaimed grasslands and the remnant forests—they were mixed in with the industrial matrix, too. There were some minor accidents with the new elk—like the one that suffocated in a slurry pond—but by and large the animals fared well. Surface miners, working twelve- to fourteen-hour days, spotted elk at dawn and dusk; occasionally, busy coal trucks paused to avoid hitting the elk that wandered into their paths. Elk drank water from puddles at coal-washing plants, from man-made ponds and impoundments. When a ridgeline was blasted with explosives, the elk would look out toward the commotion and then lower their heads and keep on grazing. As surface mines were producing record amounts of coal, as the human enterprise of transforming central Appalachia marched on, the elk grew acclimated to their new life. They had not been restored to an ancient Appalachian forest—it was not an experiment of ecological restoration—they were simply finding life for themselves in the fossil fuel heart of the Anthropocene experiment.

Kentucky's elk population grew exponentially. There were no wolves or mountain lions in Kentucky, and although black bears were capable predators of fawns, there weren't many of them and only near the Virginia line. Coyotes might have scavenged the occasional elk carcass, but they were never implicated in any kills. On more than one occasion, Charlie Logsdon saw a group of elk circle a coyote and lone cows defend their calves against coyotes. There were stray and loose dogs throughout the restoration zone, but by and large they were a minor nuisance. The herds held their own.

At the peak of coal production, the elk reintroduction sites were secure. Starfire, for example, was an active mine site owned by one of the most powerful mining interests in the world, and although it was open to some hunting and wildlife viewing, visitors needed to not only pay a fee, but also watch a safety video before passing through a guarded entrance. But despite all of this precaution, and the department's public relations campaigns, poaching was inevitable. In 1999, an elk that had strayed to Elliott County was shot by two young men and simply left to rot. Two years later, three men from Leslie County pled guilty to "poaching an elk calf after witnesses reported seeing them run over it with a four-wheeler, cut its throat, then drag it off a mountain." That same year, a man killed an elk, put it in the back of his truck, and paraded

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through town; he later told the department that he had thought it was just a really big deer. But after four years, despite a few sensational headlines, only a handful of elk were known to have been poached—and these were statistics Fish and Wildlife biologists could accept. By and large, the animals were left alone.

After five years of stocking, the translocation phase of Kentucky's elk restoration project was coming to an end. Although there was much to learn about CWD, one thing was becoming clear: Moving the animals was the primary reason the disease was spreading far and wide, and Kentucky had been doing a lot of moving of animals. Between 1997 and 2002, it had translocated 1,541 elk from the West to the coalfields of east Kentucky. For Gassett, that was close enough. It was time to quit while they were ahead.

Fish and Wildlife could not have made a better decision. In February 2003, CWD was confirmed in a mule deer in Utah, where the vast majority of Kentucky's elk had come from. If the program had continued a year longer, it could have been a disaster. (None of the translocated elk ever tested positive for CWD—and as of this writing, none of the deceased, disease-tested elk has, either.)

Although the project's architects were three hundred animals shy of their original translocation goal, the population was well ahead of schedule. After their first difficult year of translocation-related deaths, myopathy accounted for just around 5 percent of the herd's losses. The team of Kentucky biologists had gotten good at moving large animals. Which meant that their population was far ahead of schedule and ahead of target, despite wrapping up four years early. There were a lot of animals on the ground, and they were not just surviving, they were thriving.

After six years of population growth, twinning, and bulking up, the herd appeared to be sustainable. Not only did Doug Hensley's crazy idea appear to have worked, it was succeeding beyond all expectations.

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CHAPTER 8

Hunting Elk

Elk had been brought to Kentucky so that they could be hunted, and on October 6, 2001, just after dawn, Tracy Cerise had his eyes on a big bull. He had come east from Lexington to scout Starfire twice before—there was lots of elk sign, he felt good about his chances, and he was now watching a bull amble through the hardwoods, antlers swaying with each lumbering step.

Cerise and two friends, Ed Thompson and Jeff Sartaine, were on a forested ridge. Moments before, Cerise had spotted three cows and a calf but had decided to wait for a bull. The night's rain had finally stopped, and a mist rose from Rattlesnake Branch to meet the clouds in the sky. The men sought cover, and Sartaine started calling the bull. It responded and came closer, but Cerise couldn't get a shot through the trees.

The elk then moved past the hunters and stopped—it seemed to have spotted them. Sartaine kept his call going, and after thirty minutes, the elk came within twenty yards of them. Cerise aimed a .50-caliber muzzle-loading rifle at the bull elk's right front shoulder. It was the same kind of gun used to down the last elk killed in Kentucky 150 years ago. "I got down on one knee, and there was just one small branch between us," Cerise said. "And I had a clear shot. It was almost broadside." He pulled the trigger.

The bull ran about thirty yards and then collapsed.

Compared to the hearsay on the killing of Kentucky's last nineteenth-century elk, that hunt, at the dawn of the twenty-first century, was a paparazzi event. A cadre of film crews, journalists, members of sportsmen's clubs, and academics attended, along with Doug Hensley, Tom Baker, Roy Grimes, and nearly every other department employee from east Kentucky. Cerise and the other hunters of the short season were accompanied by a game biologist, a conservation officer, and a third research specialist.

The team dragged Cerise's bull back to the base camp, where the Rocky

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Mountain Elk Foundation had big canvas tents and campfires blazing. A yellow tag in the elk's ear identified it as a 4½-year-old Utah bull brought to Kentucky in 1998; he weighed in at seven hundred pounds, and his antlers scored 12 points—impressive statistics for the first legal elk to be harvested in the state in over 150 years. Roy Grimes made the first cut, near a rear hoof, and the men proceeded to skin the elk whole; Cerise had plans for a full-body mount. The biologists took tissue samples to screen for CWD, and the animal was soon quartered before Cerise knew what was happening. The aftermath was a blur. "My mind is just whirring with emotions," Cerise said that morning, "and it's just hard to put into words what this feels like. To be a part of this in any fashion would have been fantastic; the part that I played is just overwhelming."

Before the bull had been taken back to camp, Cerise posed for a picture where it lay. In the distance, fog burned off the forested hills; but in the foreground, where the bull now rested, and where Cerise knelt, was the compacted earth of a reclaimed mountaintop removal mine.

Cerise was one of just six hunters drawn in the lottery for a bull hunt—with relatively few elk on the landscape, only a lucky few would have the opportunity to pursue an elk. The hunt was largely symbolic; the department knew it was important to establish a hunt before too much time had passed, before anyone got the impression that the elk were there exclusively to be looked at. All of the season's hunters were located on the Starfire complex, and when the next hunter downed an elk, the party caravanned to the next site.

At the time of the hunt, an estimated 350 elk lived in the Starfire area, and region-wide, there were 1,400 elk clustered around five reintroduction sites. Some criticized the move, saying the department was hunting animals they'd just stocked, with tags still in their ears—put-and-take elk hunting, they said—but Roy Grimes countered that enough time had passed and that animals had now been born and raised in Kentucky.

But shooting Kentucky's elk, it turned out, was in fact relatively easy—as one Kentucky forester told me, "I could hunt one of these things with a shovel as easy as I could with a rifle."

If hunters in the eastern United States wanted an elk-hunting experience, they were now looking to Kentucky. Applicants would come from all over the nation, as far away as Maine, Alaska, Hawaii, Puerto Rico, and Canada. Success rates were high, and bulls were big. For the next ten years, hunter success rates hovered around 90 percent, or up to 96 percent for bulls—which is incredibly high for any species, let alone elk. In most western states, elk success rates were rarely above 40 percent. The elk were a draw for wildlife watchers, too, with

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state parks offering bus tours. "The people who are interested in hunting and in viewing both are looking for the big bulls," Doug Hensley said in 2003, "and in five years, there will be a world-record bull taken in east Kentucky." It was a bold statement, the kind Hensley was not afraid to make, and it wasn't entirely out of line. Year after year, the state's record bull was bested. The big bulls harvested in 2005 were Kentucky born and around five years old; antler size typically peaks around year eight. In 2006, two hundred people would have a crack at shooting them; it was only a matter of time.

It was affordable, too. A tag cost only $10, and the department just about ushered elk hunters to their quarry. For years, nearly every bull hunter was successful. As long as hunter success was high, the department's approval rating was also high. All of that boded well for the acceptance of these massive critters in east Kentucky.

Each September, Kentucky's elk put on a show: The bull elk joined the herds of cows and formed large harems of more than seventy to a hundred in the wide-open grassland of the reclaimed surface mines. Charlie Logsdon recalls a night on the Paul Van Booven Wildlife Management Area, adjacent to Starfire and Robinson Forest, where at least twenty-five bulls bugled all night long.

Kentucky's rapid success emboldened other states—and Kentucky offered a blueprint. In 2000, after putting the Land Between the Lakes project in the rearview, Tennessee found support for releasing elk into the Big South Fork area, which was adjacent to Kentucky's elk zone. Over the next three years, they released 136 animals. In 2001, elk reintroduction in Great Smoky Mountains National Park finally cleared all hurdles, and the National Park Service released fifty-two elk into the Cataloochee Valley; visitors to that area of the park more than tripled. Pennsylvania's herd was receiving renewed interest, and after nearly a century on the landscape, they began to colonize new areas of state forest and wilderness lands. Pennsylvania would soon translocate elk from its "classic range" to other open lands, including strip mines in Pennsylvania's north-central counties, some of which had been purchased by RMEF. (In 2009, a $10 million Gold LEED-certified Elk Center opened in Benezette, Pennsylvania.) Soon Missouri would receive elk from Kentucky, and even the state of Virginia, which had bitterly opposed elk being sent to Kentucky, had begun to investigate its own reintroduction. There was enough momentum that Tom Baker had begun talking about a continuous elk population from Georgia to Maine—and he wondered about growing Kentucky's elk herd to more than 25,000—enough to best Nevada.

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Although relatively small herds of elk had lingered in Pennsylvania and Michigan for decades, those projects hadn't inspired other states quite like Kentucky's mass stocking. By 2005, the Kentucky herd had grown to more than 4,000 animals and was by far the largest elk population east of the Mississippi. Because of CWD, it was unlikely to be replicated anywhere else with the same intensity. That was what Doug Hensley wanted; east Kentucky now had something no one else could claim.

In 2007, when there were an estimated 6,500 elk roaming eastern Kentucky, more than 30,000 hunters from forty-eight states applied for just three hundred tags. From the standpoints of both interest and revenue, the project was a runaway success.

And then, two years later, it happened: In 2009, the herd reached an estimated 10,000 animals. That was the magic, slightly arbitrary, big round number that the department had been aiming for; it was ten times as large as Michigan's elk herd, which had previously been the largest herd east of the Mississippi, and it was a major milestone.

Within the Fish and Wildlife Department, there was talk of significantly increasing the number of elk tags. If the population was allowed to exponentially increase, for years on end, there would be trouble with elk in roadways and gardens; and the herd would necessarily spread out of the elk zone toward population centers and agricultural areas. At the outset of the project, the department had promised that it would not let that happen. Furthermore, the department was in the business of providing opportunities to hunters, and 10,000 elk could provide a lot of opportunities. Doug Hensley, however, was strongly opposed to a dramatic increase in tags—he wanted the population to continue growing exponentially—and commission meetings produced heated debate.

Although this project was Doug Hensley's brainchild, he was not the czar of wildlife policy in Kentucky. In fact, after years of outsized influence, he no longer held sway on the commission quite like he had a decade earlier; there were new commissioners and new ideas moving through the department. Elk restoration may have started with Doug Hensley, but this herd of wild animals was now out of his hands. Other commission members, department staff, and scientists believed in the need to control the population and increase the number of hunters on the landscape. "I begged them not to do it," Hensley recalls. "But the commission voted to do it." In December 2008, the number of elk tags was increased from four hundred to one thousand.

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Over the years, Hensley had volunteered to guide dozens of elk hunters. He did this as a favor to friends and acquaintances (in fact, he did it for complete strangers, too). He says he never charged anyone for that "work"; he guided elk hunts because he loved the sport and the experience of killing an elk in east Kentucky, and he was proud to share the landscape and the animal with others. But as the elk population topped 10,000, his views on the value of the animals to east Kentucky were changing; he disagreed with the department's decisions, and he would soon stop guiding elk hunters altogether. He had a number of reasons for that, but when I asked him about his motivation, he put it succinctly: "They're more important to east Kentucky alive than they are dead."

The first Kentucky elk I saw was in a field just outside Big Sandy Regional Airport in Martin County in 2016. It was a young male, with nubs of antlers just beginning to push forth. As far as I could tell, he was alone. He was standing in a patch of tall grasses, looking at me, with a thicket of scrawny trees for cover just behind him. I had been driving around on top of one of the largest mountaintop removal sites in east Kentucky—a sprawling area mine with an airport, a federal prison, a network of paved roads, active surface mining and restoration, and lots and lots of open space to spare for elk to graze. A few years later, I went back at both dawn and dusk and saw a few groups of eight to ten elk; the evenings up there were quiet enough that I could hear the elk chewing grass. I watched a bobcat stalk a rabbit, then lose it in an autumn olive thicket. There was no hunting up there aside from wildcats, and so long as I stayed in my car, the elk were not afraid of me.

But when I'd gone to Starfire, it was different. I saw no elk in the late morning, and in the evening, they were far off in the distance at the edge of Robinson Forest. Elk were no longer abundant and visible at Starfire. In fact, as I drove around the rural counties of east Kentucky, I saw very few elk. On the surface, it seemed as if the days of Yellowstone-sized wildlife spectacles were behind us, the days of hundred-animal harems a thing of the past.

When I started investigating Kentucky's elk, asking local people about the project, I was greeted with a refrain. "You don't see them like you used to," they'd say, with a shrug of the shoulders. At first I thought it was a simple observation. But I soon came to realize that underneath the phrase were a few bold suggestions—that too many elk were being killed, that this successfully restored herd was vanishing, and that the Kentucky Department of Fish and Wildlife was mismanaging its resource.

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By the close of the 2009 hunting season, 778 elk had been harvested. By spring, a commensurate number of calves was expected to be born. In 2010, another thousand tags were issued—and another robust crop of calves would follow. Those calculations were part of scientific game management. Western biologists warned Kentucky that without hunting, they could expect the herd to grow by 25 percent annually, at which point they'd have a significant problem (a number of those same people thought that Kentucky was foolish for taking them on and said as much). Utah was quite liberal with hunting, and yet farmers still felt burdened. So, no, department biologists were not fearful of overhunting. East Kentucky had already proven to be a fertile and productive habitat—if anything, they needed to be wary of overpopulation. But Doug Hensley, and a number of local people, felt they were killing too many.

The elk project was now more than ten years old. For Hensley, it was a source of pride that in Hazard, Kentucky, you could drive just a few minutes down the road and see several hundred wild, free-roaming elk atop one of the nation's largest surface mines. That visibility was something that east Kentucky had to the exclusion of nearly every other region east of Yellowstone—and its residents were proud that the abundant herds of elk had been made possible through the process of mountaintop removal. But once hunters started shooting at a herd of elk, and once they started killing a significant number of them, the elk weren't so accommodating to standing around and being looked at. When hunting opened up on a bigger scale, the herd dynamics changed; those impressive hundred-animal harems, two hundred animals gathered on the wide-open surface mines, reminiscent of Yellowstone National Park, were far less common. The elk grew wary and rarely hung out in the open.

Perhaps there were 10,000 elk somewhere in east Kentucky, but one thing was certain: You sure didn't see them like you used to.

But just because you don't see an animal, even something as big as an elk, doesn't mean it's not there. The department's population estimates would never show a dramatic decline. Year after year, the herd remained steady at around 10,000 animals, some years rising to nearly 14,000. Biologists continued collaring and monitoring calves, continued getting hands and eyes on elk, and individual animals continued to weigh what healthy elk should. According to the department, there were just as many elk as ever. They were just a little bit harder to find.

In the early years, elk rarely entered the forests. At Starfire, a ring of massive mines encircled Robinson Forest, and the elk skirted the edge of the forest as

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much as possible. But elk had always poked their heads into the forest to some extent. When it was hot, they went in for shade; and in the spring, cows sought tree cover for calving. But they seemed to prefer the edges—those transition zones that provided both cover and shade and easy access to the grasses of the mine sites. Even in east Kentucky, where there were no four-legged large mammals fierce enough to kill and eat a full-grown elk—no wolves, no grizzlies, no mountain lions—they liked having a place to hide. But as hunting increased, elk went farther into the timber. Biologists studying the elk observed deep-cut game trails and broken brush, evidence that the animals were routinely traveling from the mine lands to locations deep within the forest. Cameras in forest openings revealed elk resting, eating twigs, or simply passing through—once, a pair of elk biologists stumbled into a group of forty cow elk bedded down together in the leaf litter. Some elk wore GPS collars, and that data confirmed their suspicion that a number of individual elk rarely left the forest. As they increasingly utilized the forested areas, they broke into smaller groups. In the forest, they still found ample food; the first week of gun season, which is when the elk began moving into the forest, is also when east Kentucky's acorns began to drop. There were some "forest elk" that even preferred the forest year-round and for their entire lives. "We have one cow that except for about two months in the winter, you never see her," Dan Crank says. "And she moves a lot—but she never comes out of that forest. Especially in the hunting season, these elk don't come out. They're not visible, at all. Daylight to dark, they're in the timber. And then they come out at night—they'll come out right where people been hunting all day—but at daylight? Man, they're gone."

As much as it frustrated hunters, taking to the forest was natural. "Once we started throwing hundreds of hunters and even a thousand hunters for several years, those elk figured out that you can't just stand on the side of a coal-haul road and eat and watch the truck roll by," says Jon Gassett, "because there's probably somebody in that truck that may take a poke at you." The animals were smart—they'd evolved together with predators and human hunters—and there in Kentucky they'd changed their behavior. Their seasonal behavior mirrored that in the West; Colorado, for example, is flush with elk, but during hunting season, they head for thick timber, and the success rate of killing bulls in Colorado is often as low as 24 percent. "People think there are fewer elk now than there were in the early 2000s," Gassett says. "And they try to attribute it to poaching and some other things. But what happened is, in my opinion, the elk became elk." Hunting Kentucky elk now meant going deeper into the

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woods, but according to department surveys, few Kentucky sportsmen hunt more than a few yards from a road or vehicle. The same number of elk were on the landscape, but hunters were not following them into the forest. As Dan Crank says, "It's not the petting zoo it used to be."

Not only were the elk growing wary; the mine sites were also getting crowded. If you were lucky enough to be drawn for an elk tag, it was becoming difficult to find a place to hunt; strip mines may have transformed mountain terrain into something that resembled Colorado, but they hadn't brought the West's vast swaths of public hunting land. In the earliest years, there were just two WMAs open to elk hunting—and so of course they were swamped with elk hunters; on at least one occasion, competing groups of hunters nearly came to blows when they realized they were stalking the same elk. In 2008, the department established an Elk Hunting Unit system that assigned tag holders to a specific region. And it incentivized private landowners with 5,000 acres or more to open their property to elk hunters, with a special elk tag for the landowner as an incentive. The department added 100,000 acres of accessible hunting land through these efforts—including agreements with a West Virginia–based company that owned 50,000 acres across four counties—but they soon maxed out on large, willing landowners.

The bottom line was that the characteristics of a successful hunt were changing and required going not only deeper into the timber but deeper into your pocket. With little public land available—and with both elk and land at a premium—private landowners began leasing their property to hunters and guides. Even the most economical guided hunt could cost as much as $6,000. That may have been part of the economic development the department had projected, but $6,000 for a local elk hunt flew counter to the populist message it had campaigned on a decade earlier—the idea that "These elk are your elk." If Kentucky sportsmen grew disgruntled with the program, with a decline in hunter success, they planned to address those issues—one way or another. "I predict that it's just a matter of a few years until elk start showing up dead by suspicious means in the rural mountain areas of Kentucky's elk zone because of a growing resentment by local folks who had the blessing of elk bestowed upon them by RMEF and KDFWR whether they wanted them or not," a member of the Kentucky Hunting forum wrote, ". . . [and] will exact their revenge on the program by destroying the animals as they see fit—whack'em and stack'em." There may have been some evidence that that type of protest was already happening. In 2009, four elk were gunned down in Leslie County near a reclaimed

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strip mine. Nothing had been harvested off of the animals; they had been left to rot. That did not resemble the work of a hungry poacher hoping to fill his freezer; it had the hallmark of a disgruntled local resident.

Ahead of the reintroduction, the department had boasted that 98 percent of surveyed local residents were in favor of the elk project. But that approval rating—to the extent that it was ever truly representative—was never going to last.

Stoney Fork is a compact community nestled in a Bell County valley between two towering ridges; the two-lane road that carries you there winds along Straight Creek, a scenic mountain stream. It is a beautiful valley with a broad, fertile bottomland—unlike in many other communities in the region, the valley is broad and large enough for significant hayfields and crops. Just beyond the core of the village, a road climbs in elevation away from Straight Creek, and follows a drainage to the top of a massive old strip mine. The old mine was one of the original eight release sites, known variously as the Begley or Orr site. In winter, elk started making their way down from the mine lands and into the valley, to those broad, fertile bottomlands, where they found the fields, crops, gardens, and ornamental trees of Stoney Fork. Some residents enjoyed seeing the elk—they fondly recalled going to the mountaintop to watch the animals arrive. But others were losing patience. They could perhaps put a fence around fruit and ornamental trees, but it was expensive, and it was frustrating and fencing was impossible for those with a significant amount of crop acreage. Furthermore, the residents of Stoney Fork had never had such problems before the department had let the elk loose. Elk ambled into family cemeteries, ate flowers, knocked over tombstones. They did all the things that deer do in communities throughout the East—but bigger.

Bigger, on a roadway, is more deadly. As the elk got comfortable moving between the mine land and the bottomlands, they began crossing the two-lane road along Straight Creek with an unfortunate regularity. Between 2005 and 2013, more than a hundred elk were killed in eastern Kentucky by motorists, and Stoney Fork was a hotspot of collisions. Elk don't dart into roadways as erratically as whitetail deer, "But they're so damn hardheaded they just stand there and look at you," Dan Crank says. More important, they're several hundred pounds heavier. Just outside Stoney Fork there were a number of grisly accidents, including the time a pickup truck crashed into an elk and flipped over. But the most notorious incident may have been when an animal crashed through the windshield of a driver's vehicle, and "left a bull

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elk thrashing and kicking in the front seat of her Geo Metro." The driver had somehow escaped with only cuts and bruises. "I feel like they don't need to be here," she said. "They're a danger to us, and we want them gone." The county sheriff agreed: "Without question they are a hazard to the traveling public."

When Fish and Wildlife pitched the idea of restoring elk, they appealed to Kentuckians' sense of history—these animals had been an important component of the eastern wilderness, and this project was an opportunity to regain a piece of that squandered heritage. But as romantic and as noble as that sounded, things in east Kentucky had changed dramatically since 1850: Straight Creek no longer flowed through a big-game paradise, and the sparsely settled country Thomas Walker and Daniel Boone had described had vanished with the elk, bear, and bison. Eastern Kentucky may have been among the most rural and least-populated corners of the state, but it was not frozen in time. To be sure, the strip mines had created a novel opportunity for massive grazing animals; but the rest of east Kentucky, and these bottomlands where the elk had clustered, were filled with people living modern lives, traveling fast in two-ton vehicles.

To get elk out of someone's yard or fields, the department gave residents noisemakers to haze the elk. They tried rubber bullets. Many nights, biologists slept in their trucks and shot cracker shells at the elk whenever they appeared. But none of it worked. The only thing that moves an elk, once it is habituated to people, is gunshot. Years earlier, the department had used just that: When a group of bulls had refused to leave a farmer's field, Charlie Logsdon had shot the two biggest bulls, and the rest of the animals had vanished. The decision had garnered some grumbling from sportsmen around the state, but for the local man experiencing troubles, it had worked. In a similar vein, the department allowed Stoney Fork residents to acquire a permit to shoot an elk if it was in the act of damaging property—but only for cows and only once a year. When that failed to curb complaints, it increased the number of elk that could be shot in areas of Bell County with an additional quota hunt. But its efforts continued to fall short of satisfying Stoney Fork residents. They didn't want to shoot a few cow elk; they wanted all the animals gone, and they wanted them gone for good. As Bell County's judge executive once said, "Fish and Wildlife treat these elk like they're sacred cows, quite frankly."

In other words, the community didn't care about restoring extirpated megafauna. And a disgruntled population could decide to take matters into its own hands. Department biologist Charlie Logsdon was made acutely aware of this ability when he arrived in Stoney Fork to find a resident in her front yard,

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sick and tired of elk, clutching an AR-15. He was reminded of this fact again, when another landowner's son, staring down a big bull in his farm field, asked repeatedly, "Why can't I shoot him? Why can't I shoot him?"

The elk were doing what elk are wont to do: Where there was good food, they ate it. The elk would stay on the surface mines as long as people didn't shoot them or chase them away—but only so long as the nutrition was good. The animals, both as individuals and as a herd, would make decisions; they would weigh the risks of a given place and then go about making the best of it. If local people weren't willing to accept the elk, the department could relocate the animals, or it could let people in Stoney Fork handle it their own way.

Stoney Fork residents' resentments weren't limited to elk tearing up gardens and crashing through windshields. In fact, most officials would later tell me that those grievances, though real, were not the root of the problem in Bell County. The real reason folks in Stoney Fork were riled up was because they'd lost their right to ride their ATVs on their neighborhood strip mine—and for that, the elk were to blame.

When the Orr property passed to Begley Properties LLC, department officials said that the new owners would allow the land to remain a WMA only if the agency rounded up and removed abandoned livestock (horses and cattle) and kept four-wheelers off the property—they had liability concerns about four-wheelers running rampant, and running wild, on their property. But extricating ATVs from anywhere they'd become established was not only wildly unpopular, it was next to impossible. A nearby state natural area, a 2,200-acre old-growth preserve on Pine Mountain, had trouble keeping ATVs off their property, too. They put up gates, but riders went there at night, cut up the gates with acetylene torches, and sold the metal for scrap. When the Fish and Wildlife Service announced plans to open a wildlife refuge in western Kentucky, local people were on board, except for a proposed ban on all-terrain vehicles. As one outdoor writer put it, "Many locals see ATV riding as something akin to a birthright." When the department enforced the ban on ATVs at the Begley property in east Kentucky, local people were furious with the department and "their" elk—blaming them for the ATV ban—and retaliated by shooting a number of elk dead. Eventually, the department made the decision to recapture and relocate all 130 elk estimated to live around the Orr property. The helicopter crews were thorough and swift. Some of the elk were released more than a hundred miles northeast, in Pike County; a new herd was established in Whitely County; and fifty were sent back west of the Mississippi to seed a herd in Missouri.

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When I went to Stoney Fork in 2024, the big elk herd was a memory. "They sure are pretty," one woman recalled. Many years earlier, she had taken her kids to see the animals on the day they had been released; she had never had any problems with the elk, personally, but she recalled the vehicle strikes and the damage they had done in a field. Later in the day, as I drove along Straight Creek back toward Pineville, I saw just a single lone elk in a field.

Elk didn't need to be rounded up to be run off. In Knott County, due east of Starfire, another mountaintop removal mine site had become a reliable elk-viewing site—tour guides went there to see a hundred elk in a day (one guide told me that he had once counted nearly four hundred). For many years, the site had been a favorite of ATV riders, but when Knott County started using it for biannual horse rides, the amount of activity skyrocketed, and it eventually became a county-owned adventure park with camping and ATV riding all year long. "There's nowhere for those elk to go that they can rest and recover and get away from people," Dan Crank says. Hunting season was from September to the end of December, but party time was all the time. The elk soon disappeared. (When I camped there in 2021, the only animal I saw was a killdeer; the only mammal I heard was a coyote.)

It was a similar story due north of Starfire, at the South Fork site just above Robinson Forest. South Fork was the state's first mountaintop removal mine site, and where the first elk from Kansas had settled in December 1997. It was a fine site for the elk, and Breathitt County had built a viewing platform there, on a bit of the unmined ridge spared from explosives because it contained a cemetery. You can see for miles up there, but your chances of viewing an elk are now next to zero. It wasn't just because of the ATVs; at South Fork, elk were forced to compete for territory not just with quads and side-by-sides but with feral horses.

What started with a few local people making use of the open grasslands had since ballooned into a feral horse breeding ground. Wild horses, like hogs and dogs before them, were becoming a fixture in the postindustrial ecology of the central Appalachian coalfields: Many thousands of free-roaming horses now roamed the abandoned surface mines of eastern Kentucky, western Virginia, and southern West Virginia. Like the elk, feral horses could become a nuisance when they moved down from the strip mines in winter, after the grasses have been grazed to dirt, and wandered into towns and gardens, eating ornamental shrubs and flowers; or worse, when they lingered in the roads, licking salt.

In 2018, Martin County residents reported trouble with feral horses. They

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called the local animal control office with a warning—if something wasn't done about the problem, they were going to shoot the animals. Before long, someone did: In December 2019, more than twenty feral horses were shot and killed in the neighboring county. The animals, including pregnant females, were hunted down with a small-caliber rifle; some were found with grass still in their mouths, while others appeared to have been shot as they scattered. After the shooting, a bill to convene an Abandoned Horse Task Force was introduced into the state legislature but ultimately failed to pass. Meanwhile, due to the rugged terrain, the carcasses of those twenty horses were left to be consumed by scavengers.

The dead animals were a reminder that if local people were unhappy with their wildlife situation, even one so beloved in the American mind as free-roaming horses, they had lethal means of demonstrating that displeasure.

Even in the best of circumstances, even where ATVs and feral horses weren't a nuisance, the reclaimed mine sites wouldn't be high-quality habitat indefinitely. As the fertilizers waned, and as aggressive species outcompeted the more favorable grasses and forbs, a mountaintop removal site grew into something far less desirable for game species and game hunters. After ten years, the cool-season grasses started to disappear, and the rocky soils supported just a few dominant species, with sericea lespedeza, fescue, and autumn olive leading the way. This transition from verdant grassland to scrubby thicket was happening at nearly every mountaintop removal site. Unlike in the early years of elk reintroduction, there weren't new mountaintop removal sites opening year after year; not only had the coal market crashed as power stations switched to natural gas, it was also beginning to seem as if the mountains had given up all they could—just about all of the coal that was profitable to extract through mountaintop removal coal mining had either already been extracted or was under permit to be extracted. Not that coal mining had ceased in east Kentucky—lots of coal was still being sent overseas, and lots was still being consumed in the United States—but compared to the boom times of just a decade earlier, production was far smaller. And it was the fresh, hydroseeded, heavily fertilized strip jobs that had attracted, retained, and made visible the most elk.

In some locations, Fish and Wildlife has attempted to manipulate these environments into better elk habitat. One such area, the Paul Van Booven Wildlife Management Area, is located on the western edge of Starfire. For many years, it was open to bow hunting only, and county leaders had built an elk

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viewing platform there because the animals had been so reliably visible. But over the years, the site had grown to be of little value to the elk because it's a monoculture of autumn olive. This exotic shrub was deliberately planted during reclamation because it was the rare plant that would grow rapidly in the crushed-rock soils of a mountaintop removal site. At first, wildlife biologists were encouraged because it provided cover and browse—but before long, autumn olive matures into dense thickets that are of diminishing value to wildlife as they close and exclude nearly all other plant diversity. Elk do eat the plant's leaves, twigs, and berries—they seem to relish the plant, and they spread its seeds throughout the region—but even they find a dense autumn olive thicket difficult to maneuver through. Furthermore, when the berries aren't ripe, when the browse isn't tender, there's little else of value in these monocultures. The department has tried to remove these shrubs at Paul Van Booven with fire, but the thickets retain too much moisture for fire to carry. In recent years, the department attached a massive chain to a bulldozer and dragged it across the ground to rip out the vegetation, and the bushes were then piled and burned. That opened up space and created opportunities for other species, but after a few years, the autumn olive and the department will be back where they started. The seed bank is largely composed of autumn olive, as it will be for a very long time.

The condition most eastern game hunters desire is known as early successional habitat—the flush of vegetation that grows rapidly after a timber harvest, a fire, a flood, or a windstorm. But those mine lands—or "scrub wastelands," as one forester likes to call them—thick with exotic species, were not on any kind of trajectory to mature into the hardwood forests that had occurred there for millennia. There was no longer any path to ecological maturity. The topsoil, the seed bank, and the small animal life that had been the building blocks of the biome were buried at the bottom of the valley fill. The reclaimed mine sites were not early successional; they were postindustrial *arrested* succession.

The problem of regeneration affected far more than the elk herds. These scrublands were of limited value to whitetails, to forest-dwelling songbirds, to grassland birds, and to the hundreds of plant species that had evolved in these forest communities. As many as 500,000 acres had been devastated by mountaintop removal in east Kentucky and 1.5 million acres throughout central Appalachia, and they were failing to grow back into anything resembling a healthy forest. Margaret E. Palmer, an ecologist whose 2010 paper "Mountaintop Mining Consequences" sounded a long-overdue alarm about the impacts on water quality, says that these watersheds will bear the scars of mining

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forever. "Replanting offers the best hope for restoring stream biodiversity," she said in 2021, "but no matter what you do, it's crystal clear that mining poisons streams and that mined land will continue to release toxins into the ecosystem in perpetuity."

Decades earlier, E. Lucy Braun had called the Cumberland forests the Mother Forest, the place where the mixed mesophytic was at its finest—indeed, where those Appalachian forest communities had originated—and she had sought the preservation of east Kentucky's old-growth forests. That diverse ecosystem, with abundant canopy species and the richest herbaceous layers of any eastern forests, was never coming back.

Try as it might, the department could not please everyone. Sportsmen, groups such as Safari Club International, the League of Kentucky Sportsmen, professional guides and outfitters, and individuals wanted more opportunities to hunt elk. They wanted, it would seem, an abundance of elk that might rival whitetail deer. And why shouldn't they? The elk had no natural predators and little competition from other ungulates, and they were surrounded by ideal habitat with nothing else to utilize it—this was the very same rationale the department had used to sell the community on this project in the first place. More elk and more opportunity seemed like a reasonable request. Adding insult to injury, the department was sending live elk out of state. Because Kentucky's elk and deer remained free of chronic wasting disease, they were the only clean and abundant source of elk east of the Mississippi. The department started translocating its elk to other states, including Wisconsin, Missouri, and Virginia. That ruffled feathers, and a few vocal hunters wanted to know why there weren't more elk tags for Kentuckians if there were enough elk to be sent to other states.

The Kentucky Department of Fish and Wildlife Resources was stuck between a rock and a hard place. It was being asked to move elk, to prevent automobile collisions, to deal with elk in bottomland pastures while simultaneously being asked to provide more elk hunting opportunities, to increase yields, and to *grow* the elk herd. These were the growing pains of a community learning to live again with elk. "The excitement is gone," Charlie Logsdon says. "The newness is gone. You're in the nuts and bolts of wildlife management." The department's response to the problems—and the public's acceptance—would decide if elk had a long-term future in central Appalachia.

Eastern Kentucky was facing big questions: What was to become of the region with the decline of coal? Could it sustain itself as a big-game paradise?

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As an ecotourism destination for wildlife watchers? Or would the hundreds of thousands of acres of reclaimed mine sites be better used as open range for horses and adventure trails for all-terrain vehicles? And who would decide all of it? For more than a century, coal companies had called all the shots, and the consequences of that arrangement were sure to linger on the land for generations to come. But as the coal companies retreat and their hegemony wanes, who will decide? Bureaucrats in faraway capitals? Or the people that live there?

The elk, of course, were not privy to those controversies. They were impacted by decisions made in commission meetings, or by individuals behind the handlebars of an ATV, but they found ways to go on living anyway. They had lived there for thousands of years. The forests they enter today are not the old-growth ecosystems the original eastern elk called home, but the forests that remain are rich in species, nutrition, and opportunity. Despite the scale of surface mining, 84 percent of eastern Kentucky is still forested. Elk are adaptable—they thrive in environments as diverse as the high desert of Arizona and the prairies of Minnesota—and their ancestors had migrated through the tundra and down to nearly every nook and cranny of temperate North America. Nor had the species changed much in the process. They are resilient, and they were thriving even in the midst of America's most massive surface mining complexes. Whether they occur in herds of two hundred or twenty, the individual animals are healthy, and their numbers suit the land.

One spring, as I watched the rain rush off the bare earth of the Starfire mining complex, with the tree line of Robinson Forest towering above, I heard the story of east Kentucky's oldest elk. A twenty-two-year-old cow, she was still producing calves more than a decade after most elk stop giving birth. She had been about four years old when she was brought from Utah, and she'd found this strange land to be more than capable of meeting her needs. She's probably been shot at. She is sure to have been exposed to brainworm, but she has never succumbed—she is likely to have developed antibodies that kill or subdue the parasites. She has calved, and to her calves she has passed on the genes and survival skills that enable her to linger on the landscape a little longer than the others.

And make no mistake, hunters are looking for her.

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CHAPTER 9

The Forests and the Elk

In 2024, I traveled to Bell County to visit a 12,000-acre wildlife preserve that's being developed on the site of a reclaimed mountaintop removal coal mine, Boone's Ridge. A two-story, 80,000-square-foot welcome center stands at the heart of the property. The tract of land had first been conceived of as an industrial park, but the idea had languished as so many other postmining land use ideas had. Most recently it had been the Wilderness Trail ATV Park. To access the site, I drive across the Cumberland River on a massive three-lane bridge, a piece of infrastructure that feels as out of place and overbuilt as it is notorious—the "Bridge to Nowhere," locals call it—built by the state after it had bought the land for the would-be industrial park for a combined total of $10 million.

Once over the Cumberland River, the road follows up the contour of the hill and then levels out abruptly—suddenly, I'm on top of yet another mountaintop removal mine. There are stunted trees everywhere, struggling to grow in the compacted rock. It's as open as any wide western mesa—except for the horizon, where the ridges of the Cumberland Mountains are clothed in the lush mixed mesophytic forests that have grown there for millennia, a diverse canopy of oak, hickory, pine, broadleaf magnolias, tulip poplar, and so many other species. The ground below me is black from a recent burn—the land manager is maintaining the open habitat that is favorable not just to elk but to quail, turkey, and a host of ground-nesting songbirds. Just before I pull into the construction parking lot, I see a lone elk grazing near a scrub line. I look at the ground; elk droppings are as common as clumps of grass and as black as the charred duff.

Boone's Ridge is the brainchild of David Ledford, the former regional director of the Rocky Mountain Elk Foundation. For more than a decade he has worked to make this 12,000-acre preserve a reality, ultimately securing a $12.5 million grant from the federal government. Just as important, he's se-

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cured big animals: In 2017, the department moved a couple hundred elk to Boone's Ridge. There's no hunting up there, so the elk have stuck around and multiplied. In the fall, bulls lock horns and battle for mating rights; they bugle and prance and form harems with the cows. Up there, it's like the halcyon days of elk recovery—a visible abundance, a chorus of bulls, a proper wildlife spectacle. Elk aren't the only abundant species, either. Black bears have fully recolonized this part of Kentucky, having made their way over from the Virginia mountains, just over the ridge. There are wild turkey, quail, grouse, whitetail deer, bobcats, coyotes, and an astonishing number of grassland birds. Migrating waterfowl stop over on the old ponds, which are filled with fish and, at the time of my visit, a cacophony of spring peepers. The whole scene is impressive, sprawling. It feels like a manifestation of something Doug Hensley might have dreamed up twenty-five years ago.

Boone's Ridge sits several hundred feet lower than the mountaintops that once towered there; streams and hollows were filled in with the miners' overburden, so that now the topography is all one broad flat expanse. Looking up, I feel as though I'm in a giant bowl: above, two parallel ridges, Pine and Cumberland mountains, look down upon us. For tens of thousands of years these ridges have been refugia, they've functioned as corridor to many hundreds, if not thousands, of species of plants, to large mammals such as elk and bear, wolf and panther, to passerine birds such as the cerulean warbler and the black-throated green warbler, to Indiana bats and eastern small-footed bats. There are pine barrens and oak forests in these ridges, upland bogs and caves; in the streams and rivers there are endangered species such as the Cumberland elktoe and the Cumberland darter.

A few miles south, the Cumberland Gap is the only break in this southern monolithic ridge, and it was a corridor for people as early as eight thousand years ago, and far more recently, an eastward opening for the American bison. The diversity of life in these ridges, and the hills around us, could fill its own book. Despite centuries of exploitation and loss, this is a global biodiversity hotspot. But its future has yet to be decided; it can be either saved or lost.

Boone's Ridge will celebrate wildlife as it exists in Kentucky. But if it is a monument, it will be to mine lands, not to the indigenous Appalachian forest.

It's been nearly thirty years since the first seven elk were let loose at Starfire, and most of the project's architects are no longer involved in the day-to-day management of Kentucky's elk herd. In 2014, Tom Baker, who had been instrumental in orchestrating the Rocky Mountain Elk Foundation's involvement in

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the project, passed away after a long illness. Dave Maehr, the conservation biologist who directed the University of Kentucky's elk research, died in a tragic airplane accident while surveying black bear populations in central Florida. Doug Hensley is no longer directly involved with the Kentucky Department of Fish and Wildlife or the elk program. These days, Hensley thinks that the elk population is stable but maintains that if they'd not hunted so many animals early on, there'd be twenty thousand elk, or twice as many as there are now, in east Kentucky. "I know they got wilder, and I know they're harder to see, and when they hear a vehicle, they'll run off," he admits. "But I believe if they'd have stayed the course, we'd have twenty thousand elk out there right now." When I asked about the social carrying capacity of living with 20,000 elk, he responded with characteristic confidence: "Four million acres. That's plenty of carrying capacity." Despite all that, he looks back fondly on the experiment. "From the time we put the first elk on the ground, till probably 2013, that was some of the best years of my life. I enjoyed doing that more than anything in the world."

John J. Cox was a graduate student of Dave Maehr when the Kentucky elk project began. Twenty-some years later, he directs the university's wildlife program. Cox is a little more ambivalent about what success means. "Despite the successful repatriation of several wildlife species to Appalachia during the past century, the region still contains 8 of the top 15 states with species most vulnerable to extinction," he wrote in 2011, at the height of the Kentucky elk program. "Habitat loss and fragmentation, pollution, and exotic species now represent the major threats to regional biodiversity." He warned that land managers, especially of nature preserves and public lands, might find elk to be a burden. Without any natural predators, an overabundance of elk could increase fragmentation of intact forests, and accelerate species loss, not only in edge communities but also in the increasingly rare interior forest communities, too—particularly if the mine sites become inhospitable to elk and the animals are forced to find a living elsewhere.

After the first decade of elk replenishment in east Kentucky, the impacts were already clearly visible. At Starfire and other study sites, the elk created wide movement paths as they entered the forest edge. Erosion was evident, too, "where soils have been excavated by trampling hooves, particularly on steeper slopes," Cox wrote. "Piles of elk feces frequently dot these trails and form concentrated pools of nutrients and plant propagules that are carried

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into surrounding forests where erosion channels have become sufficiently deep and furrowed. Additionally, elk browse lines in edge areas have become apparent, and tree saplings in mined areas frequently exhibit arrested growth patterns from having been repeatedly browsed." Meanwhile, elk were spreading the seeds of invasive, exotic plant species into nearby forests, so that even the intact systems—even high-quality natural areas—were colonized and disrupted. Elk affected forest succession and soil development in ways that exacerbated the already negative impacts of surface mining and reclamation. There was a real threat of those novel and exotic scrublands expanding ever outward and harming native biodiversity. In 2006, Cox coauthored a paper with Jennifer Schneider (along with Dave Maehr and several others), and they encouraged managers to maintain a population of elk that would not compromise the forest community and the potential for it to be restored. "Certainly, elk should not be used as a rationale for expanded surface mining, but simply as a grassland-compatible ungulate that can prosper in a highly altered and disturbed landscape." In the years that followed, however, that was more or less what happened. The return of elk was one of the good things that mountaintop removal coal mining had brought to east Kentucky, and some folks wanted more of both.

The attention that the elk of eastern Kentucky demand has begun to obfuscate the larger ecological crisis of the region, and that is the devastation of the Appalachian mixed mesophytic ecosystem—the richest, the most intact, and the most diverse forest community in the East. Several counties in east Kentucky had been stripped to such an extent that nearly a quarter of the land is now covered by active or reclaimed surface mines. Generations of Kentuckians have grown up with these land conversions as a common and preferable mode of living in the mountains. For tens of thousands of people, mountaintop removal coal-mining areas, among other strip-mined landscapes, have come to define the Cumberland Plateau.

"It's unfortunate that we have entire swaths of our Appalachian forest that have been leveled, reclaimed in a way that it's no longer forest," says Jeffery Larkin. "Those offer tons of other problems to many other species, whether it be aquatic, or forest. That must be clear. But, with that said, those landscapes are here. And those landscapes are incredibly expensive to reforest. Much more expensive than we have any sort of resources available to do. So I am in part very grateful when I hear a dickcissel, a Henslow's sparrow, a

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grasshopper sparrow, a horned lark, meadowlarks, bobwhite quail, things that require grasslands, [habitats] that are currently being [plowed] under again to plant for corn and soybeans.

"We got to take the good and the bad with those kinds of landscapes," he concludes. "Certainly wouldn't promote any more of them. But they're there, and elk as a species benefits from that, there's no doubt."

Now that the elk are there, we have decisions to make about how we will manage the land—especially these million acres of mountaintop removal coal lands. Without intervention, they're rapidly filling with invasive, exotic species, and are an active threat to native ecologies. Should we make more attempts to restore them to hardwood forests? Not only have forestry reclamation scientists begun to say it's possible, but folks in organizations such as the Appalachian Regional Reforestation Initiative and Green Forests Work have decades of results on tens of thousands of acres throughout the Appalachian coalfields. Or should we keep these mine lands—more than a million acres—in a state of arrested succession to benefit elk and other game species? Is that even possible? Will the majority of these mine lands turn into autumn olive-fescue "scrub-wastelands" despite our best efforts? These are the questions that ecologists, and ultimately the coalfield residents, must answer.

In the central Appalachian coalfields, elk have now been restored beyond Kentucky, to reclaimed surface mines in Virginia, West Virginia, and Tennessee. Elk ranges and populations have expanded in Pennsylvania and Wisconsin, and the animals have likewise held strong in Michigan. In North Carolina, the Cataloochee Valley herd, in Great Smoky Mountains National Park, has begun to spill out of the valley and onto state and tribal lands, with one lone elk straying as far as South Carolina. Just over the Mississippi, restored elk herds now occur in Missouri as well as Arkansas, both of which are now large enough for hunting. Habitats in the East are now managed explicitly for elk not just on the reclaimed mine lands of east Kentucky, but also in the George Washington and Jefferson National Forests of Virginia, in Kentucky's Daniel Boone National Forest, and on tens of thousands of acres of state game and national forest lands throughout the region. Which begs a new question: In managing the East's public lands for elk, are we doing the most good for the most species? Or are we benefiting a charismatic few? The answers to these questions will, of course, vary on a case-by-case basis, but we should be asking these questions now, and for many years to come.

Another possible outcome is that years from now we won't think too much about the wild elk or the folks who placed them here. Charlie Logsdon, one of

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the first Kentucky biologists to work on the elk project, has fond memories of working on the project. But when he reflects on what success means, he tells me, "If it's a success, it'll be a hundred years from now, and those animals are still on the ground, and nobody knows our name." Perhaps we'll do that. We'll forget that they were ever gone, like the whitetails and the black bears before them, and the elk will be a native and integral component of the Appalachian fauna.

But what relationship will the next generation of east Kentuckians have with the land? Will they have any memory of the ancient forests' grandeur and diversity, of the multitudes of species that once populated the entire region and still cling to existence in out-of-the-way pockets? Or will the depauperate, terraformed mine lands become the symbol of the Appalachian coalfields? The restoration of elk to eastern Kentucky is a vital and righteous resurrection of the land's wild heritage, but if we are to consider the entire ecosystem—as we are increasingly called on to do—elk are only a piece of the puzzle. If we are to become true stewards of the wilds of Appalachia—if we are to fully embrace our role as conservators of this region's rich biological heritage—we must acknowledge that our work is far from complete.

Elk belong to these eastern mountains. And like all other living things, they belong in community.

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PART II

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CHAPTER 10

The Land, the Grassy Lakes, and the Tall Grass

I have come to northern Indiana, to the heart of corn and soybean country, to look for a herd of bison. I arrive in November, after the harvest, when the black soils of the region have been exposed. The roads that take me there seem to go on forever in straight lines, propelling an unending stream of tractor trailers and commuter vehicles. We are seventy miles south of Chicago, and land use in this rural county is driven by efficiency and productivity; the soil is rich, and every square inch is devoted to commodity growing. It's an unlikely place to encounter an icon of the American wilderness. When I get out of my car, the air is cold, the winds howl, and traffic roars. I can't imagine finding bison there.

But Kankakee Sands, the place I've come to explore, is radically different from the monocultures and commodity farms that surround it. An 8,000-acre nature preserve, Kankakee Sands contains stunning stretches of tallgrass prairie, rich wet prairie, dry sand prairie, remnant oak savannas, and sprawling wetlands; it is home to more than 600 species of plants, 240 species of birds, more than 70 species of butterflies, and over 900 species of moths; there are Henslow's sparrows, least bitterns, ornate box turtles, regal fritillaries; and there are several disjunct insect populations that occur on the site's sand dunes, the shores of Lake Michigan, and nowhere else in between. The value of this preserve is immense and quantifiable.

While the statistics of this nature preserve are stunning, I'm soon enthralled and confronted by the reality of the life and death in front of me. As I move about the landscape, I hear the sharp, anxious chirping of a killdeer. As my footsteps crunch through dry grasses, I flush a whitetail deer out of a willow thicket, and watch it bound into a stand of Indian grass, and quickly disappear. Elsewhere, in the thatch, I find the carcass of a six-point buck, its head, antlers,

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and front legs intact but the rest of its body thoroughly scavenged. Coyote scat litters the trails and the tops of sand hills, and I can imagine their loping gait as they patrol the prairie. There is color yet—off in the distance, the bright red bark of dogwood shrubs that line the various waterways, and the purple of berry canes that stand out among the yellows and browns of autumn grasses. I look down from a gentle sand hill, and watch a hunter, clad in blaze orange, scouring the grasses with a birddog by his side. This place is a breath of fresh air, a welcome respite, a place to stretch my legs and experience the vanishing ecosystems of the Midwest, and those are all good things for the birders and the hunters. But for wildlife, for plants and animals, Kankakee Sands is far more than a balm for the soul; it is a lifeline. Places like this will be critical if ecosystems are to adapt to the changing climate, and if the Midwest's biological heritage is to survive the unrelenting development of today.

Kankakee Sands is both a place of hope and the outcome of desperation.

In the 1980s, many years before Kankakee Sands became a nature preserve, the Prudential Insurance Company had put the majority of the land into row crop agriculture. On the surface, the sprawling farmland had little ecological value. But to the north and south, there were four natural areas—the nearly 10,000-acre Willow Slough Fish and Wildlife Area, which contained nearly 2,000 acres of open water and marsh; a pair of oak savannas; and the Beaver Lake Nature Preserve. These natural areas were the last of their kind—remnant prairies, savannas, and wetlands—but their capacity to harbor life was limited by their size, and by the fact that they were islands in a sea of corn. Like fragmented islands of biodiversity everywhere, these natural areas were failing to conserve the totality of northwest Indiana's native grassland flora and fauna. The latter preserve, for example, had been set aside in the 1940s as the Beaver Lake Prairie Chicken Refuge because it supported a rare population of greater prairie chickens (*Tympanuchus cupido*). At the time, the county's grassland matrix supported as many as two hundred of these beloved native birds, whose mating rituals are one of the iconic spectacles of the North American prairie, and whose flesh was a welcome addition to the family pot. But as more adjacent land was plowed—and as people shot and killed the final birds—the nature preserve became insufficient; by 1972, the birds had vanished from Indiana. The Beaver Lake preserve, even at 640 acres, was just too small for the biological requirements of prairie chickens. Over time, "Prairie Chicken" was dropped from the name of the preserve. The conservation community pivoted, prairie chicken was removed from the list of native species to

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be encountered there, and the next generation of Newton County residents grew up with no memory of these unique American birds. Conservationists have struggled to maintain prairie chickens in all but a few grasslands east of the Mississippi, as the baseline for wild nature has continued to shrink.

But for these ecological communities, there was good news ahead. Prudential had never been truly interested in agricultural commodities—there had been stirrings that the land could become a third airport for the Chicago region, but when those plans fizzled out, the company put the land up for sale. For conservationists in Indiana, the sale presented an unprecedented opportunity; there were few landholdings of that size in the state, and this one happened to be surrounded by high-quality natural areas.

The Indiana chapter of the Nature Conservancy had been eyeing the property for years, and in 1996, they would purchase the entire 8,000-acre swath from Prudential. The former farmland was to become a habitat corridor connecting the existing preserves, giving native plants and animals an opportunity to extend their range and multiply—something they hadn't been able to do in many decades. TNC would do so by restoring the farmland to native prairie, creating a contiguous natural landscape whose sum was greater than its parts. It was a rare opportunity to put into practice what conservationists had been debating at conferences and in academic journals for years.

The movement to restore eastern grasslands had begun decades earlier, when visionary ecologists had first started planting facsimiles of the ancient prairie. With more than 99 percent of eastern prairies lost to the plow, the cow, and the ditch, restoring those ecosystems required building them from scratch.

The restoration at Kankakee Sands would not be the first attempt to restore tallgrass prairie east of the Mississippi; nor would it be the first to propose bringing back bison—but in sheer size and scope, and because of the ancient and recent history of this piece of land, it's one of the most audacious restoration projects anywhere in the world.

Until very recently, the land was the site of Indiana's largest lake. Beaver Lake, as surveyors named it in 1834, was shallow and sprawling, covering more than 36,000 acres; it swarmed with insects, and it was thought to harbor disease and pestilence. Beaver Lake belonged to the Grand Kankakee Marsh, a wetland ecosystem that covered more than a million acres—the largest inland wetland in North America—and it was as despised as any of the things that bit and stung. Around 1850, as a young America pushed into the lower Great

Lakes, this land was ditched and drained for farmland; the Kankakee River, the beating heart of the Grand Marsh, was channelized and shortened by over a hundred miles. Farmers valued the native soil, but the rich community of life, humming and writhing and battling for existence above the soil—the various forest, marsh, and prairie ecosystems—was an overburden. In the process of recovering that soil—as relentlessly as any seam of Kentucky coal—the biological community would be just as carelessly discarded. By the end of the century, nearly all of the water was gone, and with it, the countless species it supported.

Americans have drained, blasted, and leveled many significant landscapes, but the disappearance of Beaver Lake is among our most astonishing achievements.

The Nature Conservancy's goal was not to restore Beaver Lake. That would have required flooding the US highway that runs north to Chicago and south to Terre Haute. But what they accomplished was every bit as impressive.

After thirty years, the Nature Conservancy's gamble has paid off. Thanks to the 8,000-acre wildlife corridor it created, the natural lands of this area now total 25,000 acres—a significant chunk for northern Indiana farm country. Kankakee Sands is big enough, for example, that the land managers can allow beaver to colonize the land and flood hundreds of acres ("a beaver lake" if not "Beaver Lake"). Rare butterflies, such as the regal fritillary, raise broods in the reconstructed prairie, and although they're declining across the nation, they're locally abundant. The natural lands are big enough now that the Nature Conservancy could consider reviving the older name of the Beaver Lake Prairie Chicken Refuge and bring back these iconic birds. By 2016, its directors had come to believe that it was big enough to satisfy the needs of the biggest animal on the prairie: the American bison.

On the day of my first visit, refuge manager Tony Capizzo greets me with a warm smile; clad in a heavy-duty utility jacket, he is young, enthusiastic about his work, and a capable field practitioner—after grad school, Capizzo started at Kankakee as a restoration intern and quickly worked his way up to running the show. We talk about the endangered species living there: the ornate box turtles, slender glass lizards, northern leopard frogs, red-headed woodpeckers, and regal fritillaries. As we walk the prairie, Capizzo stops mid-sentence to identify a raptor soaring above us, a northern harrier, a target conservation species that summers in Canadian prairies, and winters in parts of the Midwest. It is listed as an endangered species in seven states east of the Mississippi.

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With the near-constant wind on this treeless landscape, the harrier hovers, patiently hunting prey. Occasionally, these birds will nest in the open ground at Kankakee Sands, but its needs are very specific and aren't always met. Where does this particular harrier go when the Kankakee prairie isn't just right? My guess is as good as Capizzo's. If the prairie were to fill with shrubs and trees, the northern harrier, along with dozens if not hundreds of other prairie obligates—the plant and animal species whose biology require grasslands and cannot function in a forested landscape—wouldn't find a home there or hardly anywhere else in the region. "As you get further east, they have less and less available habitat, just through the general process of forestation that's going on," Capizzo says. "They don't have much space elsewhere."

The predicament applies to many species, including the regal fritillary, the short-eared owl, ornate box turtle, and Henslow's sparrow. The grasslands of the East are among the rarest and most degraded of any American ecosystems—and because they made great places for humans to settle, to build towns and cities, and to farm, the grasslands have all but vanished. Those that remain are often neglected, are filling with brush and trees, and fail to function as the vast open ecosystems they once were. So I ask Capizzo: With all that's stacked against them, why bother at all? He answers with certitude: "I feel that there's intrinsic value in having these species continue into the future, and keeping this part of our natural history alive. And in order to do so, they need the space to exist—somewhere." For the northern harrier, and dozens of other species, Kankakee Sands has become that place.

For more than twenty years, land stewards such as Capizzo have been gathering and sowing seeds, removing drainage tiles, filling ditches, cutting trees and other invasive species, all in the quest to reconstruct native prairie on the bottom of an ancient lake. Because this required sourcing native plants that few others valued, TNC established a nursery on site. The prairie reconstruction movement had matured into a formal discipline by now—known as restoration ecology—and TNC had the wind at their backs. They moved quickly, mechanizing with tractors and trucks, and accomplished in a few short years what might have taken their predecessors decades. In Newton County, the Nature Conservancy has manipulated and molded the land with an intensity that would rival any industrial agricultural operation.

Yet there are also structural elements in this landscape that have not been wrought by human hands, but rather the intricate precision, and the brutality, of wild nature. At the base of a plant called wool grass, Capizzo shows me where a species of ant builds its nests, one grain of sand at a time, over and

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over, tussock after tussock. In the sand prairie, he points out a series of small mounds created by the digging of plains pocket gophers, an official "species of concern" that reaches its eastern limit in Indiana. Both examples are interesting but relatively minor disturbances compared to what we observe next: into the contour of a sand hill, a depression has been carved out of this gentle rise—no grasses or flowers grow there, only sand—the product of wallowing bison.

I train my binoculars on a herd of bison a few hundred yards away. Just then, several bison begin running toward us. The staff has just finished its annual roundup to inspect the animals' health, and because that involves a bit of bribery, they run toward us, expecting treats. (In a few months, they'll resume ignoring Capizzo's presence.) Those several bison are now joined by the entire herd, moving quickly, with intention and curiosity. The bison slow to a stroll and stop short of us—and then one of the large bulls slams to the earth to engage in the iconic move that creates the sandy dints. As he rolls and rubs and a cloud of dust encircles him, his legs, which now look comically short, stick out into the air; he scratches and rubs his neck and chest, and gyrates like a pig in the mud—except that this is no diminutive species of livestock, of course; the writhing beast weighs nearly 2,000 pounds. The remainder of the bison stare, just as quiet as Capizzo and I. For a moment, I wonder if we are in any danger being so near. Most Americans don't have a chance to get this close to bison, and when they do, it's often a bad idea.

But if viewing bison had been my only goal, I needn't have gone all the way to Newton County, Indiana. I could have driven to a number of bison farms within a couple-hour radius of my home in Pennsylvania. There's even a few behind a fence in my local county park—I could go there and see these massive creatures, watch them contentedly grazing in pastures. But as a vision of wildness, it would be a mirage, not just because of the fences but because of context. What makes the animals at Kankakee Sands special is that they have been reunited with the entire prairie ecosystem—at Kankakee Sands, bison graze not on Eurasian pasture grasses, as they do in most livestock operations, but rather on the native tallgrass prairie on which they evolved.

Prior to their reintroduction in 2016, bison hadn't roamed an Indiana prairie since the last one was shot nearly two hundred years ago; one of the last was killed right there in Newton County in 1824. Unlike elk, the restoration of bison in the East—and anywhere else in the United States, for that matter—has not been driven by traditional sportsmen's movements. The protagonists of bison reintroduction, east of the Mississippi, have been botanists and ecologists.

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They have not been interested in harvesting these animals on a hunt; they want bison for what they do to the land: how they shape and, if they are correct, heal ecosystems. Although Kankakee Sands welcomes quail, pheasant, and deer hunters, it is not a hunting preserve. Bison are allowed there because their grazing can promote and secure diversity. To a large extent, the conservation of the bison is secondary to that of the biological community they support.

In central Appalachia, elk found a home because the land had been altered and degraded. But in the movement to restore bison to the East, restoration of the land is paramount. In that regard, there's a lot of work to be done; we've done a great deal of damage over the past two hundred years, and the extent to which it is repairable has yet to be determined.

The upper Midwest, known to Americans in the early 1800s as the Northwest Territories—the future states of Ohio, Indiana, Illinois, Michigan, Wisconsin, and eastern Minnesota—was littered with great swamps and sprawling wetlands. Minnesota is rightfully known as the land of 10,000 lakes, but the rest of the Northwest Territories, including Illinois, Indiana, and Ohio, places today associated with flat, dry, sterile fields of corn, was just as wet—and anything but sterile. Massive ice sheets had long before swept away all previous landscape features, but as those glaciers had receded, they did so at an uneven pace, leaving behind a tortured and dynamic landscape. "Sand bars, spits, and even small rocky islands (formed in part by limestone outcrops), together with the sandy beaches, remained after the water's subsidence to lend some variety to the otherwise almost featureless lake plain," wrote the geographer Martin R. Kaatz. These wet areas were not neatly confined to the shores of Lake Michigan and Lake Erie. Wetness oozed and percolated for hundreds of miles. The saturated landscape, often blocked by those ridges of sand, held water and drained slowly into the Great Lakes, or tributaries flowing south toward the Ohio and Mississippi Rivers.

One of these massive wetlands, the Great Black Swamp, covering much of northwest Ohio, southern Michigan, and into northeast Indiana, was at least 40 miles wide and 120 miles long. These swamps were as foreboding a wilderness as any that the settlers had encountered. "We went through deep swamps and troublesome marshes," wrote a traveler in the 1780s. ". . . After we had come many miles over plains where there was nothing but water, so that nowhere a dry spot was to be found . . . and afterward through a long swamp of several miles, where also no bit of dry land was to be seen, and the horses at every step must wade in the marsh up to their knees." An 1822 congressional

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report described the Black Swamp as an "extensive morass . . . extending so far southwesterly as to interrupt all communication by land between the settlements in Michigan and those of the interior of the United States." The land was untidy, irregular, and entirely wild. Westward, after the Great Black Swamp, were the Limberlost Swamp and Loblolly Marsh, the Grand Kankakee Marsh, the Calumet Wetlands, and the Winnebago Swamp; even the city of Chicago would rise from another soon-to-be-notorious swamp.

The swamps were not a place for homes and beds and settlements, and certainly they were a torturous terrain for travel, but they were not in fact wastelands, despite what the settlers said. Indigenous people lived on the well-drained ridges, and had utilized these swamps for many thousands of years. The Illinois people, among others, hunted waterfowl in the wetlands, harvesting sandhill cranes and herons, ducks and geese; they harvested wetland reeds for their cabin exteriors and foraged edible roots, greens, and berries. At Beaver Lake, where the Kankakee Sands preserve now occurs, islands in the shallow waters served as seasonal camps, a place people returned to year after year for thousands of years. (One of those islands, Bogus Island, remains at the heart of the bison pasture of Kankakee Sands; no longer surrounded by water, it rises above a sea of grasses and wildflowers.)

The abundance of game was undeniable, even to the settlers who were otherwise disenchanted by wetlands. "The wildfowl was so incalculably numerous that it is scarcely possible to give you an adequate idea of their numbers," an observer wrote of the Calumet swamps in 1822. "The bay was literally filled with game . . . and they simultaneously rose, and at times absolutely obscured the sun. . . . There were swan, pelican, geese, brandt [*sic*], canvasbacks, redheads, mallards, teal of every variety, and ducks of every kind which breed upon this continent." The Kankakee Marsh was so rich in animal life that decades later, even after years of degradation, it was referred to as "Chicago's food pantry," and it, too, was filled with the meaty game birds that had nourished the people of a richer, earlier continent.

In the early 1700s, few whites, beyond French fur trappers and the occasional missionaries and traders, made it to these sprawling wetlands. But Americans were eager to push west. The Proclamation Line of 1763 that had kept whites from settling west of the Appalachians was soon replaced with new boundaries farther west. After the Battle of Fallen Timbers in 1794 came the Treaty of Greenville, and the boundary was pushed to the western edge of present-day Ohio—all of the lands, that is, except for the lands of the Great Black Swamp.

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Then, after the War of 1812 and the defeat of Tecumseh, the Shawnee chief who had formed an intertribal confederacy to resist settlers' encroachment, came more treaties and more westward settlement.

Increasingly, squatters arrived in the Indian lands of Indiana and Illinois. In 1821, Chief Metea, a Potawatomi whose home village, Muskwawasepotan, was on the St. Joseph River on the northwestern edge of the Great Black Swamp, gave an impassioned speech protesting these incursions at the signing of the Treaty of Chicago. "Our country was given to us by the Great Spirit, who gave it to us to hunt upon, to make our cornfields upon, to live upon, and to make down our beds upon when we die," he said. ". . . We have now but little left. . . . I do not know how to bring up my children, if I give it all away." But the Americans would not be swayed by any such pleas. In 1830, President Andrew Jackson signed the Indian Removal Act. Brutal conflict had preceded that moment and would continue for several years more. In 1832, a leader of the Sauk tribe, Black Hawk, led a group of Fox, Sauk, and Kickapoos into battle; they crossed the Mississippi from the Iowa Indian Territory, back into Illinois, in an effort to reclaim homelands taken in the disputed Treaty of St. Louis, in 1804 (the largest Sauk village, Saukenuk, had been at the mouth of the Rock River, where it empties into the Mississippi, and had as many as 4,000 inhabitants). After four months, more than a dozen battles—and the deaths of seventy-seven Americans and as many as six hundred Native combatants—Black Hawk surrendered, and the war was over. Soon a brutal and unforgiving policy of Indian Removal commenced throughout the East. South of the Great Lakes, a succession of treaties would see that Indigenous people were dispossessed of nearly every bit of their land, culminating in August 1846, when over three hundred Miami Indians were removed from Indiana, sent on a forced march known as the Trail of Death. Some tribes remained in the northerly sections of Wisconsin and Michigan, but on the southern banks of the Great Lakes, only the Pokagon Band of Potawatomi in southwestern Michigan was allowed to stay—on a bit of oak savanna, hickory forest, and wetlands near the Dowagiac River.

The sprawling marshes and the prairie uplands could now be exploited.

Settlers described the swamps variously as "hideous," "wastelands," and "useless." They were in the way of progress—and they had to go. As early as 1820, Congress had decreed that the Black Swamp could be "made subservient to all the purposes of profitable agriculture" by drainage. Florida and Arkansas were eager to drain their wetlands, which led to the passage of the Swamp Land Act

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of 1850, under which nearly 64 million acres of "swamp lands" were transferred from the federal government to the states. In the Northwest Territories, Illinois received 1.5 million acres; Indiana, 1.25 million; Michigan, 5.5 million; and Wisconsin, 3.25 million acres. Ten years later, a third Swamp Land Act would nearly finish the job.

It was now the states' job to get the water off the land. For those who wanted to take a crack at draining any particular swamp, the act was both a herculean effort and a relatively simple procedure: Dig a ditch, and let the water drain off. Over time, many hands, many shovels, and many ditches accomplished much—but for decades the work remained piecemeal. After the Civil War, however, things picked up, and advancements in industrial machinery quickened the feat; steam-powered dredge boats dug massive ditches and straightened rivers, and the waters began to rapidly vanish. Just as the railroads had been necessary to reach the deepest coves and hollers of the rugged Appalachian Mountains, that machinery opened the wetland forests to lumbermen, and enabled the harvest of the region's wettest old-growth forests. There was money to be made and wilderness to conquer, and the settlers were going to leave nothing on the table.

Industrialization enabled drainage, and drainage encouraged more industry: By 1880, there were more than fifty factories making clay pipe within the Black Swamp itself. As the swamps were drained, more clay was revealed, which was then dug and processed into more drainage tiles. The factories of a single Ohio county could produce more than 80,000 feet of tile in a single year. Meanwhile, more railroad lines were built, accelerating the timber harvest within the swamps; railroads consumed timber for ties and for fuel. The more lines they built, the more timber they needed, and the more lands were drained. By the early twentieth century, there would be enough drain tiles in Illinois to "circle the globe six times." The Kankakee River, like so many others, was straightened and shortened by more than a hundred miles—the land's beating heart became a ditch. With increased sedimentation and an incomprehensible loss of habitat, the formerly abundant fisheries of bass, walleye, pickerel, catfish, and dozens of other species declined dramatically, and the millions of waterfowl that had once blackened the sky, and that had depended on those wetlands for their annual migrations, now had nowhere to go.

When the water was removed, settlers found bones—of deer and elk and bison, but also musk ox, American mastodon, and the ancient American horse—evidence of a wilderness that had been there not long before. But most of the settlers were not natural historians or archaeologists; they were interested in

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the substance the bones were mired in: the coveted "black, loose, friable loam" of agriculture. At the bottom of the wetlands were some of the best soils in the world. Now that they had them, they were never going to give them up; as the geographer Martin Kaatz noted, "the soil was too fertile to allow it ever again to give birth to the forests which once covered it. . . . Within a few decades the Black Swamp was transformed from a useless, obstructive morass into one of the most productive regions in Ohio and the Corn Belt."

In the nineteenth century, even as the marsh was vanishing, a sport hunting economy blossomed along the banks of the Kankakee. Lodges and hunt clubs hosted presidents, including Grover Cleveland and Theodore Roosevelt, and in 1918, the Izaak Walton League declared its mission to be to restore the Grand Kankakee Marsh. But even that distinguished roster of presidents and sportsmen couldn't stop the drainage, which would continue until nearly every bit of water was gone. Not only were the lands too valuable as croplands, but draining the wetlands was a matter of morality—to leave even a bit of water on the land, according to at least one University of Chicago geographer, was "a matter of ignorance, shiftlessness or folly." (Where the Kankakee River entered Illinois, however, hunters and trappers would have more success in fighting off the dredgers, and the river flows through this state today in a largely natural condition.)

Throughout the region, the few marshes that remained were abused, filled with raw sewage and industrial pollution. For all but the hardiest of creatures, that spelled doom. In 1912, a plant that existed nowhere else in the world—*Thismia americana*, or banded trinity—was discovered by the botanist Norma Etta Pfeiffer in the wet sand prairie adjacent to Lake Michigan. Banded trinity's nearest relatives occurred only in the Southern Hemisphere; its occurrence there was a marvel. But industry and waste were not kind to this plant, and in just two years, it would never be seen again. There might have been other banded trinities, other mysterious species, but that biological heritage is gone. As elsewhere, a number of species surely vanished before we had a chance to get to know them.

By 1922, less than 1 percent of the Grand Kankakee Marsh still existed—and that 1 percent was as good as functionally extinct.

In addition to having been wet and swampy, the Kankakee Marsh was also a grassland. Indeed, one authority of Native American place names cites "Kankakee" as coming from an Iroquois word meaning "among the meadows" (or, as another source has it, "it is open country," from the Miami-Illinois). Many of

the marshes of the Northwest Territories, even the Great Black Swamp of Ohio and Indiana, were broken by wide treeless openings, and filled with tall, rank grasses, and a profusion of wildflowers. Travelers through the wet prairies noted "luxuriant growth of grass and herbs, and an endless variety of beautiful native flowers . . . interspersed with a few small islets, or groves of oak and hickory timber . . . here and there a solitary oak tree or two standing out in the open expanse." French trappers and Jesuits were among the first Europeans to see and describe those wetlands and grasslands. In addition to giving French names to towns and villages—La Porte, Des Plains, and Eau Claire, among scores of others—they named the general habitat covering vast swaths of the continent's interior; *prairie*, a French word for "meadow," would soon come to be the accepted name for the short-, mid-, and tallgrass communities covering more than 480 million acres of North America. East of the Mississippi, the upland prairies were as vast and wide as any ecoregion of the western Great Plains; Illinois, Indiana, and Wisconsin, for example, were estimated to have combined for more than 31 million acres of open prairie.

The tallgrass prairie east of the Mississippi River was an ecotone, an ecological transition zone where the grasslands of the arid West collided and competed with the forests of the East. The divide between those systems was not sharp or well defined, rather it was fluid and ever-changing, its edges transforming like the waves of a crashing ocean, coming and going with the changing tides. "A great edge effect was exerted where tallgrass prairie and forest met, and its carrying capacity for many types of wildlife was immense," wrote Iowa native John Madson, a naturalist who would become one of the great champions of the tallgrass prairie in the late twentieth century. "At the juncture of forest and grass there were long edges of hawthorn and wild plum, sumac, dogwood, snowberry, coralberry, and other shrubs, with rich understories of edible forbs and shade-tolerant grasses. It may have been one of the most productive wildlife habitats in the New World. It swarmed with life. . . . The tallgrass ecotone was the ultimate landscape of newcomers and migrants—westerners moving to the east, and easterners pushing back."

The prairie was wide and hauntingly open, and although it was greatly misunderstood, it was undeniably beautiful. In 1829, the pioneering archaeologist Caleb Atwater traveled through the Rock River Hill Country in northern Illinois, just a few years before the Black Hawk War engulfed the region in a violent struggle. "The surface of the country is undulating sometimes gently, sometimes greatly, and in most places, is covered with a succession of flowers, from early spring, to late autumn," Atwater wrote. "One week, nay even one

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day, you see, far as your delighted eye can reach, flowers of a reddish hue—the blue—the white—the yellow, and of every interesting shade, indeed, follow in succession, day after day, and week after week, ever varying, ever new. . . . Sometimes I traveled, during four or five hours, either by day or by night, across some prairie, without seeing even a bush, or a tree—above me, were the wide spread, and lofty heavens, while the prairie, with its grasses and flowers, extended in all directions around me, far beyond the reach of my vision."

For many thousands of years, the prairie biome had extended deep into the eastern United States, the wet, dry, hill, sand, gravel, and savanna grasslands covering the majority of Illinois and extending through Indiana and Ohio and even into a corner of southwestern Pennsylvania. In 1935, the botanist Edgar Transeau named that extension of the western grasslands into the eastern United States the Prairie Peninsula. It was filled with striking and delicate flowers—many of which were endemics, not to be found in the western prairies. It was also home to massive mammals. Elk thrived there, where the vast open grasslands, interrupted by streams and groves of tree cover, provided everything an elk could ever want. In Iowa, "the earliest settlers united in saying that elk were plentiful . . . found from solitary individuals to 500 in a herd." In 1856, it was said that elk horns could be picked up "by the wagon load." "[The tallgrass prairie] was home base for great herds of elk that would drift out into the grassland for grazing, drawing back into the woodland in midsummer and winter." In *The Elk of North America*, Olaus Murie's 1951 treatise, he also noted that elk ranged throughout Illinois, where "the prairies were once preeminently their home."

But the most iconic mammal of the tallgrass prairie, of course, was the American bison.

Bison ranged from the Mississippi River to the prairies of Indiana and Ohio; they were noted in Pennsylvania and down through the valleys of West Virginia to the wide and fertile meadows of Kentucky and Tennessee. From there, they ventured into the open savannas of the Carolinas, and even as far south as Florida, Georgia, Alabama, and Mississippi. The American bison, like its ancestors, thrived in the diverse habitats throughout the East. But on this side of the Mississippi, they were never more abundant than on the grasslands of the Prairie Peninsula. In the 1600s, when the first written accounts were compiled, French explorers noted that the Illinois were killing at least two thousand bison a year. In the early 1760s, Pierre François Xavier de Charlevoix, a French Jesuit priest, observed Native people hunting bison on both sides of the Mississippi. "The Hunters range themselves on four Lines, which form a

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great Square, and begin by setting Fire to the Grass and Herbs, which are dry and very high: Then as the Fire gets forwards they advance, closing their Lines: The Buffaloes, which are extremely afraid of Fire, keep flying from it, and at last find themselves so crouded together that they are generally every one killed. They say that a Party seldom returns from hunting without killing Fifteen Hundred or Two Thousand." In 1749, the Swedish explorer and botanist Peter Kalm observed that the "wild cattle" of Illinois were abundant and had been there from time immemorial. "They are plentiful in those parts, particularly where the Illinois Indians live," he noted. Herds of four hundred to six hundred bison were not uncommon in Illinois and Indiana.

Fire was used to hunt the bison, and fire gave the animals life. Fire is an essential disturbance in the ecology of prairies; it burns the year's visible growth, the brown grasses and woody stems, and returns this material back to the soil. Fire opens the earth to light again so that in the spring grasses can grow in abundance. In the absence of fire, the eastern tallgrass prairie is rapidly colonized by early-successional trees and shrubs—in this land of tension, fire is a deciding force in the struggle between grassland and forest. Historically, many thousands of acres of prairie burned in any given year—lightning strikes could ignite a dry prairie, and a wildfire could be ignited by cooking fires or other accidental sources. But for the past ten thousand years or more, it's believed that most grassland fires were ignited by Native Americans, who burned the prairie intentionally to drive animals during their hunts, to improve the grazing conditions for these same game animals, and, because fire was so common and potentially damaging, to secure their villages from wildfire. Indeed, as common and as useful as they were, a prairie fire was never something to underestimate. "In November 1836," wrote the Illinois botanist John E. Schwegman, "a fire started at ten o'clock in the morning on the Spoon River [northwest of Peoria, Illinois]. Driven by a strong south wind, it burned all the way to the present site of Rockford by sunset. Traveling about ten miles an hour, its eight-mile-wide front had covered ninety miles in a day. This single fire probably burned close to three hundred thousand acres."

Fire on the prairie was both commonplace and frightening—and it was as essential to the prairie as water was to the marsh. When fire was removed from the landscape, it was yet another cut that bled the grasslands of their vitality.

As the Northwest Territories were opened to settlement, a wave of migrants left New England for what was supposed to be superior farmland. Many took one look at the prairie, saw that it was barren of trees, and believed that it was

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infertile. If the land could not support trees, how could it support crops? It was the woodlands that attracted the settlers, who needed trees for fuel, homes, and fences; wooded areas of the prairie states were adjacent to running water, which was necessary for mills and livestock. Prairies, on the other hand, were trouble. In the winter, the upland prairies were hounded by harsh winds with no trees to break the wind, in the summer they were swarmed with green-headed flies. More important than anything else, the settlers' traditional plows simply could not break the prairie sod. Despite its diversity and abundance, the tallgrass prairie with all its flowers and grasses was to the settler's mind as much a wasteland as the most fetid swamp.

Among those New England emigrants was a blacksmith named John Deere. He was thirty-two years old when he settled in Grand Detour, Illinois. He built a log home along the Rock River (along the same route that Black Hawk's army had taken just six years earlier); and he observed that the plows made in the Northeast were not up to the task of cutting the intense mass of prairie roots. So he made a modified plow in 1838, procuring an old saw blade from a local mill and shaping it into a steel plow. He sold a few of them and made more. By 1846, he and a business partner had sold a thousand plows. Business was booming, and that tool would change America. "It was a walking-plow that could be drawn through prairie sod with a three-horse team," wrote John Madson,

> a handsome implement, light and artistic, with a bright, shinning, tempered steel moldboard. . . . With such a plow the farmer could break the dense prairie sod with amazing efficiency.
>
> As the furrow was cut, there was a constant popping sound, like a tiny volley of pistol shots, caused by the breaking of tough roots and spurs. This incessant cracking and popping had a slight ring to it, amplified by the tempered steel of the polished moldboard.

That incessant ring was the sound of the Industrial Revolution tearing deep into the prairie earth; it rang triumphant. With this plow—the proper tool for breaking the prairie sod—the settlers soon realized that the local soil was far richer than assumed. In fact, it was among the best in the world. It would take a while before science could tell us this about prairie soils, but a nineteenth-century settler didn't need science to tell them this soil was rich—for that, they had the corn. People were already pouring into the Northwest Territories, and now there was even more reason to come. Over the next decade, more than

400,000 people moved to the prairie states. This would have an incredible effect on the eastern prairie ecosystems; like the swamps, they would soon disappear.

By the time John Deere's plow broke the prairie soil, the largest game mammals were already on their way out. Bison in particular were almost gone from North America and had entirely vanished from the East. The last bison killed in Ohio was shot in 1803, in the state's southernmost county, not far from the Ohio River. In Kentucky and Tennessee, they were gone before 1810. A few bison lingered a bit longer in the rugged valleys of West Virginia—but in 1825, the last cow and calf were killed near Valley Head in Randolph County. In 1832, a fur trader, H. H. Sibley, noted what he believed to have been the last pair of bison east of the Mississippi; they were killed on the Trempealeau River in the Driftless Area of northern Wisconsin by a group of Sioux. "They are believed to have been the last specimens of the noble bison, which trod, or will ever again tread, the soil of the region lying east of the Mississippi river." In 1843, John James Audubon remarked of all the killing, everywhere, "This cannot last . . . the buffalo, like the Great Auk, will have disappeared; surely this should not be permitted." But permitted it was.

The last bison to be killed in Illinois is reported to have been shot by Samuel Aimes near the village of Troy Grove in 1837. How the animal had survived that long into the settlement period is nothing short of a miracle. Troy Grove also happened to be just forty miles south of Grand Detour, where, that same year, John Deere was working on prototypes of his famous steel moldboard plows. There had once been tens of thousands of bison in the state, and that area of LaSalle County was within the old Grand Prairie of Illinois; at 22 million acres of tallgrass prairie, it was a vast open land unlike anything else east of the Mississippi; and with its richness and convergences, it was unlike anywhere else in the world. For centuries, it had been good and fertile bison country. But now, with Aimes's bison dead, all that was left of these animals was a scattering of bones. Here and there, carcasses would litter the forlorn stretches of the prairie for a few more years, until the sod busters went through and removed those traces, too.

(Farther west, the killing accelerated. Between 1871 and 1875, four million bison were killed on the southern plains alone. By 1884, there were just three hundred twenty-five free-roaming bison in the United States. As the wildlife biologist and historian Bruce Hampton wrote, "Never before in all history were so many large wild animals of one species slain in so short a time.")

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As elsewhere, the big animals were killed off first. But the killing didn't stop with the bison—John Madson, the great prairie historian, called the period "the Great Dying"—and the prairie chicken, the iconic game bird of the grasslands, would be next. "It was pitiful to see its clinging to its old home in spite of the plow and the reaper," William J. Haddock wrote of its last days in Iowa in 1901. "It is not a migratory bird that could take to new fields on the destruction of its old haunts. It did what it could to exist under the new dispensation, but the struggle was too great for the handsome bird and it has well nigh faded from Iowa forever." The prairie chicken was ubiquitous in many eastern grasslands; in Illinois alone there were millions of them. But it is now gone from the grasslands of Kentucky, Ohio, Indiana, Michigan, Wisconsin, Iowa, Arkansas, and Texas; east of the Mississippi, only Illinois has a few, less than a hundred, in just two counties (the prairie chicken's cousin, the heath hen, which was once found from New England south to Virginia, is fully and forever extinct).

If a bit of prairie lingered, a sentimental few might rush to save it. "I have a plot of prairie kept to prairie for prairie's sake; and no one can dig a plowshare into that sod," wrote an academic and Methodist minister in 1905. "Sacred it shall remain to prairie grass." But preservation was rare. Typically, if a patch of prairie lingered east of the Mississippi, it was an accident. Years later, the remnant prairies would be discovered in surprising places: on the outskirts of cities, in pioneer cemeteries, and along railroad tracks—wherever it was not convenient to build or plow, their survival owing more to luck and happenstance than to any aesthetic or ecological appreciation. Unlike an old-growth forest, there would be no overt signs of antiquity, no centuries-old trees towering a hundred feet high. Decades would pass before anyone, including most botanists, would notice that they existed at all.

Before long, Americans would be unable to imagine that the wild bison had once been native to the East. And without the prairie for it to roam, how could they?

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CHAPTER 11

To Save and to Make a Prairie

To restore a population of animals, you must have land. In the former prairie country of Illinois, where the bison once roamed, most of the land had been given over to corn and soybeans. Massive wild animals and vast acreages of row crops are incompatible.

Delbert Schafer was born in 1931 and raised on one of those farms in the village of Franklin Grove in Lee County, Illinois. His great-grandparents had immigrated to Illinois from Germany, part of the farming influx on the prairie that followed in the wake of the invention of the John Deere plow. By the ripe age of six, he could feel that farming was in his blood, too. The 160-acre homeplace was filled with animals—milking shorthorns, draft horses, pigs and chickens; Delbert's first chores were gathering eggs and slopping hogs, morning and night. In addition to corn and oats, his family raised a garden, canning enough produce to last through winter, slaughtering animals when they needed meat. In the late 1930s, the family got its first kerosene-fueled refrigerator, and Schafer was around nine years old when their home was wired for electricity. In the early years, Delbert's father, Arthur, still planted corn and cut hay with a team of horses; corn was still picked by hand and stored in cribs. But innovations were embraced on the Schafer farm. Arthur was mechanically inclined and bought his first tractor in the 1930s, followed by an oat thresher in 1936 and then a wood-frame, steam-powered corn sheller. He was the first person to bring a welder to Franklin Grove; and in 1950, when corn borers proliferated, he was the first to purchase a highboy sprayer. Delbert followed his dad around like a shadow and shared his proclivity for machines. After high school, he was drafted into the service and trained as a mechanic at Fort Knox before shipping out for Korea. After the war, he struck out on his own, but continued to farm alongside his father too; Arthur harvested corn until the year he died at the age of eighty-nine. "Dad and I always worked together," says

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Schafer, who is now ninety-three himself and still harvesting corn. "Neither one of us had 'retirement' in our vocabulary."

In his lifetime, Schafer would witness the transformation of agriculture in Illinois, from the diversified farm operations of his youth, where a mix of crops, large family gardens, and teams of horses, pigs, and chickens required many hands and daily labor—to the simplified, machine-dominated production of corn and beans. In the decades to come, farms around his would consolidate and grow significantly larger as the population of farmers aged and shrank.

In the 1960s, Delbert had his own opportunities to expand. He hadn't been looking to grow his operations—he was content with his farm and busy with a burgeoning machine repair business—but some boys who'd grown up down the road who'd found occupations off the farm were eager to sell their family farm. It wasn't the most alluring piece of land—much of it was cultivated, but toward the back of the property there was a big gravel hill too rocky to plow—but they made Schafer an offer he couldn't refuse. Over the next decade, he bought three more farms around this corner of Naylor and Lowden roads, where he and others would continue to cultivate corn and beans, and raise cattle on the unplowed, rocky hills. The farms made money, and for over a decade, Schafer never missed a payment.

Schafer could never have imagined, not in his wildest dreams, the role this farmland would play in the effort to bring bison back to the tallgrass prairies of Illinois. If you had told him about it at the time, he wouldn't have liked it one bit. For much of his youth, large wild animals had been scarce in Lee County. Bison, elk, black bear, and wild turkey had been long gone from the state; most had disappeared before his great-grandparents had set foot in Illinois. Whitetail deer, as in much of the East, had nearly been extirpated, too, cleared out in the name of progress.

But change was coming to Franklin Grove. The economics of farming were changing, and so, too, were ideas of land stewardship. Before long, those two things—making money and making place—would come to a head, and the question of the land would be out of Schafer's hands.

Although it was never a sure thing, that picturesque farmland, with its rolling hills and open vistas, was to be made ready for the return of the American bison.

If you were to view Schafer's new farmland through the narrow lens of productivity, you would have to conclude that because the bulk of the place was

poorly suited to row crop agriculture, it wasn't valuable. There were some fine soils in the lowlands, and those were planted to corn and beans, but elsewhere the soil was either too sandy or too wet. The sandy areas were good for grazing, and the wet areas were good for nothing.

But there was another lens through which you could view the land that celebrated its inherent value as an ecological community. If you knew what to look for, there were clues to indicate that the sandy hills and the low-lying wetlands had once been part of the former tallgrass prairie. In fact, despite more than a century of intensive grazing and farming, rare species continued to grow on the hills. But unless you were a botanist, you were unlikely to appreciate the diversity of life cradled within the land. If you were a farmer, you were unlikely to care.

In the 1960s, however, shortly after Schafer purchased the farm from his neighbors, a pair of prairie-minded conservationists, Doug and Dot Wade, stumbled into the landscape. They instantly sensed the value of that farmland and would spend the next twenty years advocating for its protection. Although they had no sense of it at the time, their efforts to preserve the land—a precious remnant of the tallgrass prairie—would someday lead to the restoration of bison to the grasslands of Illinois.

Douglas Wade was steeped in the prairie from his youth. Born in 1909, Doug grew up in Beloit, Wisconsin, just over the state line. There was a bit of prairie left around Doug's boyhood home, and each spring, his local librarian placed a single pasqueflower on her desk to announce the new season—pasqueflowers were among the first blooms to appear in the local glacial moraines, and the librarian knew where a few remained. Dorothy Richman was raised way out east, and hers was a naturalist's childhood, too. Born in 1914, she was raised in the rural community of Sharptown, New Jersey, where she and her father went on woodland walks and where she grew a garden with her mother; in high school, she dreamed of opening a wildflower nursery. The two naturalists met in a botany class at the University of Wisconsin and quickly became an inseparable team. "I always felt lucky that we were interested in the same things," Dot would later say. ". . . He was a better birder, and I might have been a little better at plants. We could go anywhere outdoors, anytime, and have a marvelous adventure together because of our interests."

The Wades happened to have arrived in Madison at one of the most important moments in the history of ecological restoration—though few people, if any, would have marked it as such at the time. Their botany professor, Nor-

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man Carter Fassett, was on the newly created Arboretum Committee. The university had just bought an old horse pasture, which had first been plowed a hundred years earlier, and the Arboretum Committee planned to use it for research and education. But Fassett championed a novel idea: Instead of a traditional collection of trees, the university ought to plant a re-creation of Wisconsin's native grasslands. That was a curious—and controversial—thing to advocate for, considering that for the past hundred years American society had been hell bent on tearing all of its prairies out; most folks in Madison, as in every midwestern city, would have considered a planted prairie an overgrown field of weeds. And who knew if it could be done at all? At the time, the consensus on prairie was that once destroyed, it was gone forever. ("Prairie grass plowed up is eliminated. It grows but once," one naturalist noted. "They die out like the buffalo.")

Overseeing the effort was none other than Aldo Leopold. Over the past two decades, he had been a pioneer of the American wilderness movement and was widely regarded as the father of scientific game management. But as the prairie experiment came together, he was beginning to articulate a new kind of land ethic that would underpin his seminal work, *A Sand County Almanac*. At the dedication of the new arboretum, he described how Wisconsin would have looked in the 1840s, when oak openings and prairie grasses supported an abundance of grouse, and elk, and deer. He remarked how the "unintentional and unnecessary" destruction of our soil was undermining our civilization—that "too much wheat and too many cattle" were carrying "the best parts of southwestern Wisconsin to the Gulf of Mexico." Draglines, steam shovels, even the simple John Deere plow, had become so powerful that "'their use . . . has unintended consequences.' We are tearing things down as fast as we build things up." He warned that "if people continued to 'rebuild the earth,' without a plan, 'without understanding . . . the increasingly coarse and powerful tools which science' had placed at their disposal, they would be doomed to continue in the ruinous process of 'remodeling the Alhambra with a steam-shovel.'" His words that evening carried the weight of the Dust Bowl disaster that was then unfolding—and the message would remain relevant to the kinds of environmental degradation yet to come.

Shortly after the groundbreaking ceremony, a young ecologist named Theodore Sperry was given some shovels and told by Aldo Leopold to "go make a prairie." A crew of Civilian Conservation Corps workers planted seeds and saplings and even transplanted chunks of prairie sod, dug out in blocks from a

relic natural area. By 1941, when attention turned away from the arboretum—and Sperry left to serve in World War II—more than forty-two species were growing in the prairie.

Years later, Curtis Prairie, as it would come to be known, would be recognized as the world's first ecologically restored tallgrass prairie. Decades would pass before it would gain worldwide recognition, but it provided an auspicious start to the conservation careers of Dot and Doug Wade. After Wisconsin, Doug would become a "naturalist in residence" at Dartmouth College (where his colleague the poet Robert Frost dubbed him "the ecology man"); a wildlife biologist for the Pennsylvania Game Commission; a professor of wildlife management in Missouri; an editor of the *Journal of Soil and Water Conservation* in Iowa; and a proponent of wilderness and recreation with the Department of Natural Resources in Regina, Saskatchewan. Finally, in the fall of 1965, he was hired as the director of outdoor education at Northern Illinois University's Loredo Taft campus in Oregon, Illinois. Back home in the tallgrass, the Wades would go hunting for prairie.

In the summer of 1966, Dot and Doug borrowed their son's jeep for an excursion south of town. Driving down Lowden Road, the land began to gently roll; they passed acres of row crops, here and there groves of oaks and hickory. There weren't many homes, and few other travelers had reason to go that way—the country was relatively quiet. Just before the road came to a T, they heard a surprising, one-of-a-kind birdsong: the unmistakable "wolf whistle" of upland sandpipers. It was a rare species—a long-legged bird that sings its rolling whistle while circling in the air—and for the lifelong bird enthusiasts, it was exciting to hear. Before long, Doug realized something else about that bird: Upland sandpipers required a specific kind of habitat.

The Wades pulled over. They got out of the jeep and followed the sandpipers toward a farm field; on the top of a hill were clumps of little bluestem, interspersed with pale, yellow blooms that Dot Wade soon identified as downy yellow painted cup, *Castilleja sessiliflora*, and those flowers only ever appeared on remnant prairie. The Wades grew increasingly excited—could it be that the hill they were standing on had been spared by the plow? On the back side of the hill, there was evidence of an old "borrow" pit, where sand and rocks were mined from the hills—in spite of that, the little knob was exceptional. Looking north, they could see other rolling hills—or knobs, as the Wades came to call them—and it seemed from that distance that they, too, might contain remnant prairie. There were traces of wetlands in the lower areas and, to the west,

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oak woodlands with large, open-grown bur oaks. The land was firmly within the farmscape—livestock grazed on the hills, crops grew in the lowlands, and barns and silos and fencing and homes had been built throughout—yet the little prairie community persisted, a link to an earlier, wilder Illinois.

Discovering a remnant prairie was equivalent to stumbling into an old-growth forest—except, of course, it was a bit trickier to detect. Those fields of diminutive flowers and grasses could hide in plain sight. But as a link to the past, as relic ecosystems harboring the species and communities of a presettlement landscape, they were just as rich and valuable as any hardwood forest lucky enough to have escaped the saw.

The Wades had stumbled into a lost world.

Dot and Doug soon learned that the pastures belonged to Delbert Schafer, who allowed them to explore the property whenever they wanted. Schafer had only recently bought the parcel, and he would soon buy several hundred acres more that contained the rolling hills and remnant prairie the Wades had spotted that fateful summer day. The low-lying areas of the farms had all been plowed and planted, but the knobs were filled with prairie plants and animals.

For years, the Wades remained enchanted by Schafer's farmland. "It was our favorite place to go when we had a free afternoon," Dot recalled. "The prairie . . . is absolutely spectacular." On hikes, Doug would pause to take it all in. "Just look at this," he would say, "there's nowhere in Illinois you can see this far." It was beautiful, rolling land with gentle knobs pushing upward from the otherwise flat Illinois landscape—there were dramatic sandstone outcroppings, exposed rock cliffs like miniature mountain peaks, edges of stone enveloped in prairie grasses and flowers. Those pockets of wild nature contained some of Illinois's rarest plants. "While we were exploring one day, we found this beautiful knoll, separate from the others," Dot said. "I remember I had heard of silky aster but I had never seen it." Over the years, the Wades would record dozens of other prairie plants and birds—which was exceptional, especially considering their location: under ten miles due east of John Deere's original Grand Detour workshop.

These remnant hill prairies on Schafer's farm were like the Prairie Peninsula of old, a meeting place of western grasslands and eastern forests, a convergence of communities, a place of tension, and disturbance. Just as those ancient ecosystems had been in a state of constant flux, there was a fair bit of uncertainty about the future of Schafer's fields. Dot and Doug Wade had to ask themselves: Is it possible to preserve these remnant prairies? Or are we going to watch these grasslands fade away, just like the rest of wild Illinois?

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The Wades were not the only folks hunting prairie remnants on the back roads of Illinois, and for the preservation of wild nature, this was good news. For much of the twentieth century, the grasslands of the eastern United States had been the interest of a small group of botanists and plant ecologists. But by the end of the 1970s, as an environmental consciousness was sweeping over the nation, prairie enthusiasts would blossom into a subculture of the modern environmental movement. Together with academic scientists, this movement would include bird watchers, native plant enthusiasts, and amateur naturalists of all stripes, rallying together to save the imperiled ecosystems. Over the next half century, as those prairie partisans found one another and committed to walking the ecosystems back from the brink, they would redefine what it meant to conserve wild nature.

Few of those devotees would have a greater impact on Illinois's prairies than Robert "Bob" F. Betz of Northeastern Illinois University. A biochemist by training, he had grown up in Chicago, where the children and adults alike had referred to the common weeds of overgrown lots as prairie. It wasn't until 1959, at the age of thirty-six, that he finally saw the real thing. He'd always been interested in plants and animals, so when a colleague invited him on a botanical excursion, to a strip of land along the old Santa Fe Railroad, he went along. The outing was led by Floyd Swink, a naturalist with the Forest Preserve District of Cook County who was becoming one of the leading botanists in the Midwest. A railroad right-of-way might have seemed an odd place to go botanizing, but its flora was among the richest in the state: An easement on either side of the tracks had unintentionally preserved a slice of the old Illinois prairie; because it couldn't be plowed and because railroads often used fire to clear unwanted brush, the old prairie had been able to survive. Seeing it there for the first time—the blooming stalks of six-foot-tall prairie dock, towering clumps of big bluestem and Indian grass swaying in the wind, the myriad colors, shapes, and textures—was a revelation for Betz. From that moment on, he immersed himself in the history and the life of the tallgrass prairie, and dedicated himself to saving as much of the remaining scraps as possible. Betz told himself, "This is what I wanted to study for the rest of my life."

Betz came to realize that there were dozens of other prairies like that railroad remnant and that the state's prairie botanists hadn't discovered all of them yet. But finding remnants is something he would come to excel at. His big breakthrough came on August 7, 1961, in the countryside of Will County. He was walking along a railroad track in the middle of farm country, "and I

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looked down the track some distance and saw to my amazement seven- and eight-foot-tall prairie dock and compass plants, both indicators of prairie. I ran down the track, and there, in a cemetery, was a whole acre covered with virgin prairie." It was one of the most wonderful things he'd ever seen, "a small peek into the past of what the whole countryside surrounding the cemetery must have been like." The small limestone gravestones were engulfed by "towering stalks of compass plant and prairie dock." There was not a single weed in the cemetery; there were purple and white prairie clovers, prairie gentians, lead plant, prairie dropseed, cream-wild indigo, shooting stars, species that occurred in only the finest of prairies. Betz bellied up to the earth, hands and knees among the tombstones and fingers in the soil, hardly able to contain his excitement.

As Betz came to understand it, the graves had been dug into the tallgrass at a time when the diverse and wild prairie was still the definition of the country; after the prayers, after the earth had been tamped back down, the seeds of prairie flowers and grasses had been able to recolonize the plots. As the surrounding prairie had been carved up and plowed under over the next century, that little island of biological diversity had persisted in an ever-widening sea of corn. Betz knew that the cemetery was an accident and a miracle, just like the railroad prairies, and he suspected that where there was one, there would be more. He pored over atlases of Illinois and Indiana and identified forty-four cemeteries that seemed worthy of investigation. Many were mowed short like any common lawn, but often when he got down onto his hands and knees, he discovered a carpet of stunted prairie plants waiting for a chance to break free. Betz, in his infinite optimism, believed that those prairies could be revived.

Shortly after discovering the Vermont Cemetery Prairie, Betz returned to the site with Ray Schulenberg, a plant propagator at the Morton Arboretum west of Chicago; along with Floyd Swink, the three men would later be dubbed the "Prairie Triad." Not only were they on a quest to find the forgotten remnants, they wanted to nurse them back to health. Schulenberg, in fact, had been experimenting with prairie restoration for decades—he'd visited and corresponded with the University of Wisconsin's John Curtis and Henry Greene—and he knew that if that newfound prairie remnant were to have a future, they were going to have to get their hands dirty, pull weeds, and every now and then set it ablaze.

But the fact remained that very few people could understand *why* they might want to do such a thing. Where was the value in those little scraps of the old prairie? For decades, ecologists had tried to justify the preservation of wild

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nature on the grounds of scientific knowledge, arguing that remnant natural areas should be preserved so that we might understand how the environment was changing. But Betz was not afraid to celebrate the inherent value, and the multitude of miracles and mysteries, contained within those remnant prairies. Nor was he shy about appealing also to the goodness of the human spirit. In 1972, he contributed an essay to the introduction of a photography collection by Torkel Korling, *The Prairie: Swell and Swale, From Nature*. "Even if there were no scientific values in a prairie, its aesthetic appeal alone would warrant its preservation," he argued. "It is one of our links with the past—a tie with the natural world. It seems immoral to destroy an integral and important part of the biological world from which mankind arose." His enthusiasm and his boundless energy motivated countless others to go out prairie hunting, and to get their hands dirty, too.

Up to that point, the prairie movement had been small and scrappy, and required a Do-It-Yourself approach. In 1972, Dot Wade established one of the first prairie nurseries in Illinois and was soon growing more than three hundred species at her home that were unavailable in the conventional trade. But every year the movement gained momentum. In 1968, Peter Schramm of Knox College had hosted the first symposium of what would become the North American Prairie Conference in Galesburg, Illinois, and the Wades would soon organize a similar gathering for their own community of enthusiasts, which they called the Northern Illinois Prairie Workshop. The gatherings galvanized the growing prairie constituency and enabled the grassroots conservationists to rub elbows with experts in the fields of botany and ecology. In fact, it was in 1972, at the third national conference in Manhattan, Kansas, that Doug and Dot Wade met their future collaborator Tim Keller, who also lived in Ogle County, Illinois. A soil scientist with the USDA's Soil Conservation Service, he had stumbled upon the Schafer prairie independently just a few years earlier. (For the past decade, he had been on a quest to document the remnant prairies of northern Illinois and had identified at least twenty-five remnant natural areas.) Now, working as a team, the three conservationists formed the Prairie Preservation Society of Ogle County and raised enough funds to purchase an eleven-acre remnant prairie east of the Rock River near Byron, Illinois. The effort was grassroots, and their plan for the land was nothing short of countercultural; they weren't going to farm on it, they weren't going to build houses on it, they weren't even planning to hunt on it—they were just going to let the prairie live.

Of all the remnant natural areas in their region, it was Delbert Schafer's

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farmland that most captivated this small group. In 1970, a pair of botanists had included a sliver of Schafer's prairie in their survey of Lee County natural areas; these botanists noted that a prairie restoration project could be possible there. Others were not so sure. Some prairie enthusiasts took one look at the degraded, sandy hills and said that they were unlikely to recover. Doug Wade was among the believers, however, and he was convinced that if they established grazing exclosures around select areas of the remnant, the prairie community would bounce back with ever more vigor; with Tim Keller now on board, they were spurred to action. Delbert Schafer allowed the group to fence off a four-and-a-half-acre plot and even to burn the enclosed area in the spring. To their delight, as the ashes faded into the soil, the prairie greened up and recovered remarkably well—at least forty prairie species were counted on the prairie that summer, including the endangered woolly milkweed (*Asclepias lanuginosa*), Hill's thistle, and prairie gentian. That simple intervention demonstrated the richness—the worthiness—of that piece of land.

For prairie enthusiasts, it was a time of excitement ("prairie fever," Bob Betz liked to call it), and a time of urgency—remnant grasslands were being destroyed just as fast as they were documented. The land around the Santa Fe Railroad prairie, for example, where Bob Betz had fallen in love with the tallgrass, was rapidly developing, and the remnant prairie itself was soon to be marred by motorbikes and illegal dumping. In Ogle County, just north of Delbert Schafer's gravel hills, a dairy farm with remnant prairie was set to become a housing subdivision: Despite the budding prairie enthusiasm, the average American still thought of those scattered sites as little more than a waste of weeds—and a waste of weeds was not worthy of significant investments. Indeed, the conservation frameworks developed in the early twentieth century—with their focus on game and timber, scenic beauty and recreation—fell short of protecting the nation's immense biological heritage.

Perhaps no one would come to understand these shortcomings—and what might be done about them—more than Rockford, Illinois, naturalist George Fell. Born in 1916, Fell grew up exploring the natural springs and ancient oaks along the Rock River, and he became acquainted with the woodlands, the wetlands, and the hill prairies that dotted the region. He also learned about the natural world from his father, Egbert Fell, a psychiatrist and amateur botanist. Because of the urbanization of northeast Illinois, Egbert collected with a sense of urgency. "I'm looking into the future when all these species of plant life are gone," he once said. "We are mindful of the rapid changes which

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must accompany the passing of time and we believe that those who will come tomorrow will be interested in the conditions of today, so we will try to picture the plant life of our country as it is now—*we will attempt nothing more* [emphasis mine]." Even as a child, he had expressed a similar awareness: At the age of fifteen, when he and a classmate had been "prowling" the meadows of the sanitarium, he had sensed that those hills were the last of a special thing. As the other boy had imagined buffalo over the horizon—a romantic longing for the grandeur of the Illinois frontier—he had pictured not just the large animals but the indigenous land community that had sustained those charismatic creatures: "This is one of the very few places of natural, unplowed prairie left in Winnebago County," he had told his classmate, "and it ought to be preserved."

It was a bold and formidable task, but once he made up his mind that it was to be his life's work, Fell would operate with an intensity matched by few conservationists before or since. He took up the mantle as the study of ecology and ecological restoration was maturing. Its proponents advocated for the preservation, and eventually the restoration, of all interconnected species—not just the game and the pretty flowers, but the big, wild things, too. Eventually, the push to restore bison to the prairies of the Midwest arose from that movement. In the East, as in nearly all of the West, bison were no longer thought of as a game species. Indeed, sportsmen in the Midwest had proceeded without any interest—without any way to see that it was feasible—in restoring wild herds of American bison. The animals were simply too big for the crowded country we had created. But the fact remained that the bison *belonged* there. They belonged as much as the whitetail deer, the big bluestem, and the upland sandpiper; they belonged in the same way that fire and wind and rain belonged.

As an undergraduate in the botany department at the University of Illinois, George Fell's professors included such luminaries as Arthur G. Vestal and Victor E. Shelford, both of whom had studied under the renowned botanist Henry C. Cowles at the University of Chicago, whose work on plant community succession in the sand dunes of Lake Michigan had, for all intents and purposes, established the discipline of ecology in the United States. Yet it was Shelford's role as an activist that would have the biggest impact on the future career of Fell. In 1915, Shelford was a founding member and the first president of the Ecological Society of America (ESA). Two years later, the ESA formed a specialist committee to advocate for the preservation of exceptional natural landscapes—primeval forests, quaking bogs, coastal dunes, and tallgrass prairie—for the stated purpose of ecological study. In 1926, the committee

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published *Naturalist's Guide to the Americas*, a 761-page tome that sought to list all of the known irreplaceable natural areas in need of protection. (E. Lucy Braun's poplar forest in Kentucky would have been its first monument had it not been clear-cut and destroyed.) That kind of activism resonated with Fell, who remained passionate about saving the vanishing ecosystems of the Midwest, especially the imperiled tallgrass prairie.

After earning a master's degree in wildlife management at the University of Michigan, Fell found work with the Soil Conservation Service. But the world of farming didn't hold his attention, not with the ecological crisis now unfolding: The postwar development boom around Rockford, which included new suburbs, new highways, a new airport, and a new municipal dump, was destroying some of his most treasured landscapes. Soon, he began articulating a vision for a statewide nature preserves system to rescue these "orphaned" and at-risk natural areas. Though having few credentials, he wrote a letter to his "Fellow Conservationists" throughout Illinois, explicit about preserving these areas not as parklands, not as stores of timber and game, but rather as living museums of Illinois's biological heritage. The letter caught the eye of the Ecologists' Union, an offshoot of the Ecological Society of America. A few years earlier, members of the ESA had decided that scientists should keep a dispassionate remove from the issues of the day and no longer advocate for preservation of natural areas, even passing a referendum barring members from engaging in preservation activities. Victor Shelford had responded to that "dictatorship of conservation activities" by forming the Ecologists' Union and committed to taking "direct action" to save vulnerable landscapes. Furthermore, Shelford, among the era's fiercest preservationists, was critical of the traditional American land ethic. "From 1600 right down to the present," he wrote, "the belief that all exploitable areas should be settled and developed has been almost a national religion." He knew that the activists needed a new generation to carry on their work. It would be Fell who would lay the groundwork to transform the Ecologists' Union into the most powerful conservation organization in the world, the Nature Conservancy.

He would not do the work alone. He was among the many concerned conservationists of the Ecologists' Union, and his preservation campaigns would soon find support from the likes of the Wilderness Society's Howard Zahniser. In the 1960s, Fell would partner with his college friend Frank Bellrose to help establish a prairie chicken refuge in southern Illinois; and he would later support Tim Keller and the Wades in their efforts to preserve prairie remnants throughout northern Illinois. But his closest partnership was of a more

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intimate nature. In 1946, Fell met Barbara Garst, a student of biology and botany at the University of New Mexico. "Their courtship consisted of driving around the state looking for remnant natural areas," wrote Fell's biographer, Arthur Melville Pearson. After they were married in May 1948, just months before Fell mailed out his "Fellow Conservationists" letter, George and Barbara spent their wedding night in a tent, "on a bed of prairie grasses, surrounded by pasque flowers and the wispy blossoms of prairie smoke." For the Fells, it was a practical and romantic thing to do and symbolic of their entwined devotion to natural areas. They were a team, Barbara Fell later said, and they would do whatever it took to preserve wild nature together.

On January 1, 1950, the Fells took an enormous leap of faith. After the conclusion of an Ecologists' Union board meeting, in New York City, they drove to Washington, DC, with the mission of transforming their organization, a noble if ineffective group, into a new kind of land protection institution that would be called the Nature Conservancy. Over the next half century, it would become the largest environmental group in the world, but its origins in the basement apartment of George and Barbara Fell were exceedingly humble. George and Barbara worked tirelessly for several years with no pay, believing that nothing was more important than their work. "We are living at the time of man's final conquest over the wilderness," Fell wrote in 1950 in one of the Nature Conservancy's earliest brochures. "What we have saved and what we may save in the next few years, will be all the true wild nature that will remain to pass on from generation to generation in the years ahead. *There will never be another chance.*"

In just seven years, George Fell built the Nature Conservancy into a national organization with staff in DC, Missouri, and California and helped preserve sixty-eight natural areas across the nation. But in addition to his single-minded dedication, he was quite stubborn. When his ideas of how to run the organization ran afoul of those of his colleagues at the conservancy, he tried to gain control of the conservancy's board of governors via a proxy war. When that didn't succeed, he resigned.

A few months later, in October 1958, the Fells headed back to Rockford, Illinois, and established a new organization called the Natural Land Institute (NLI), focused on their home state. Fell resumed advocating for a state nature preserves system, and in the summer of 1963, his dream was realized. On August 27, the Illinois Natural Areas Preservation Act was signed into law, a landmark bill that tasked a newly created Nature Preserves Commission with establishing a system of nature preserves to protect the state's vanishing

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natural areas: the bogs, bluffs, savannas, and tallgrass prairies previously overlooked by state and federal agencies. The preserves, which would be located on both public and private land, would be afforded the "highest level of legal protection" offered by the state—and protected in perpetuity.

In the preservation of wild nature, nothing like that had ever been attempted. The focus of the preserves was rare plants and ecosystems exclusively—not timber production or game habitat, not passive recreation such as canoeing, hiking, and picnicking, not even the scenic value of the land. The highest and best use of the land was exactly as it occurred—without any mandate to produce extractable resources or *give* anything more than its existence. The precious life that had taken place there, the communities that had evolved and succeeded there for millennia—and that had been wiped out nearly everywhere else—were primary. Success on the preserves wouldn't be measured by board feet, animal grazing units, or the length of hiking trails; it would be measured by the diversity and complexity of their ecological systems.

The whole thing was exceedingly ambitious. The goal was to save all that remained of wild and natural Illinois—from the rarest individual species to the most endangered communities—and it bestowed upon a new generation of natural areas conservationists the responsibility for the continued existence of every living thing.

It was a new way of thinking that would have a profound impact on the restoration of ecosystems throughout the East.

The prairie hunters of Illinois had identified a great many remnants that would become protected under this new system. But George Fell knew that the conservation movement could not afford to wait around for chance encounters, or to begin inquiries only after land was on the chopping block. Fell and his colleagues were developing plans for an unprecedented survey of every possible natural area, in every township, in every county in the state of Illinois.

In 1975, the Illinois Natural Areas Inventory (INAI) was launched, led by a young botanist named John "Jack" White. White's team of ecologists began by poring over the trove of aerial photography that had been produced in the state over the past several decades. If an area seemed promising, ecologists would then fly over the area in an airplane. If they liked what they saw, they would return to "ground check" the quality of the natural communities. The highest-quality sites were rated Grade A, meaning that the land was close to presettlement, or "original" condition; they were the best of the best. Grade B meant that "conservative" species, those which require highly specific habitat

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conditions, were present, but perhaps in fewer numbers and with some minor disturbances. Preservation of those high-quality sites was the top priority. Grade C sites, a kind of honorable mention, were not included in the inventory.

In 1975, the inventory ecologists arrived at the area of Delbert Schafer's farm on the urging of Doug Wade. The gravel hill prairie, the "knob," on Schafer's Farm would be classified Grade A due to the presence of the state-endangered downy yellow painted cups. To be sure, it was far from a vast wilderness area—at just under five acres, it was small, like all other Grade A prairies in the state—and it was far from untrammeled; in addition to a "borrow pit," cattle were abundant on the property, so much so that the INAI report noted that grazing threatened to destroy the site within a year. Yet despite those abuses, the Schafer prairie's ability to harbor rare prairie species argued for the resilience of the land. Furthermore, there were two other high-quality natural area sites in the immediate vicinity: a sandstone cliff community on an adjacent property, and a high-quality wetland known as Nachusa Marsh, both of which earned Grade A status. Additionally, Schafer's larger expanse of pastureland—the rolling hills where the Wades loved to picnic and botanize—was classified as Grade C, which meant that although the area was heavily grazed, its native soils had never been plowed and the land still harbored native plant communities. Schafer's farm, and the area all around it, had potential.

Soon there was even more reason to care. In 1977, Doug Wade discovered *Lespedeza leptostachya*, or prairie bush clover, growing on Schafer's Grade C prairie hills. The native, thin-leaved clover was under consideration to become a federally listed endangered species—and if the species was not protected there, it was in fact one step closer to extinction. The Endangered Species Act had been signed into law a few years earlier, but it afforded no protection to plants on private property. If a landowner wanted to destroy a population of endangered plants, they were in their rights to do so. Prairie bush clover was known to occur in just four states—Illinois, Minnesota, Iowa, and Wisconsin—and nowhere else in the world. East of the Mississippi River, few populations were secure.

For the Wades, it was thrilling to find such a rare thing on their favorite prairie—and to know that it had survived decades of grazing pressure was encouraging. But the discovery hadn't changed anything about land use—it was Schafer's farmland, and it had to earn its keep with crops and cattle. The

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Illinois Nature Preserves Commission, and George Fell personally, talked to Schafer about selling his properties; Fell even asked him to consider donating his five-acre Grade A gravel prairie. But no deal could be made, and so amid the prairie bush clover and the myriad other prairie flowers and grasses, the cattle kept on grazing.

Schafer's prairies weren't the only conservation priorities. At the conclusion of the Illinois Natural Areas Inventory in 1978, 610 sites had been identified, which meant that only 7/100ths of 1 percent of natural Illinois—the forests, prairies, savannas, and wetlands—had survived the intense period of settlement that had begun in the 1830s. What had evolved there over millennia—plant and animal communities whose origins on the continent dated back millions of years—had vanished in the blink of an eye. The acreage was so small as to be almost insignificant. "That's pathetic and horrifying," one conservationist would later write. "What's more, the precious few surviving remnants were being destroyed and degraded at a sickening pace."

In the early years, if a tallgrass remnant came under some kind of protection, the conventional wisdom had been to build a fence around the perimeter and leave it alone. But over time, it was becoming clear that the health of those preserves was in decline; small sites were filling with invasive species, fast-growing brush was crowding out the sun-loving prairie flowers, and a few rare species were vanishing altogether.

The Illinois Natural Areas Inventory confirmed what the forward-thinking naturalists had been saying for decades: that the wild, indigenous land was vanishing, and if conservationists were going to do anything about it, they would need to act fast.

The environmental awakening of the 1960s caused the American public to accept wild nature not merely as a resource to be exploited but as something of intrinsic value. Because we now understood that the various environmental crises we were facing were the direct result of too much pollution, too much plowing, too many chemicals, and too much concrete, we began to acknowledge that we owed the wild things of the world a little help. The sportsmen of the early twentieth century had felt a similar moral obligation decades earlier—that to restore the wild game populations that previous generations had decimated was their obligation and duty—and this new environmental movement was attempting to apply that same sense of responsibility to the rest of wild nature. Rachel Carson's 1962 book *Silent Spring* sounded the alarm of

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America's overreliance on toxic pesticides, and landmark legislation, including the Clean Air Act of 1963, the Wilderness Act of 1964, and the Endangered Species Act of 1973, soon followed.

The movement to save the tallgrass prairies was an early beneficiary of that energy: If introduced species, fragmentation, and fire suppression meant that it was no longer self-sufficient, the burgeoning community of environmental stewards would look for ways to restore them. It was the cultural awakening—an emergent prairie consciousness—that the first wave of prairie conservationists had yearned for.

One of the most influential prairie stewards to emerge from that period was a young naturalist named Stephen Packard. Born and raised in Massachusetts, he brought something necessary to the environmental movement: the ability to inspire and galvanize ordinary people. In the 1960s, he had immersed himself in the civil rights movement; he had marched on Washington with Martin Luther King, Jr.; and he was deeply involved with the antiwar movement. But by the mid-1970s, he was one of many activists who were feeling burned out. Eventually he went to Chicago and, as he had throughout his life, turned again to nature. He planted a native wildflower garden on the North Side of Chicago and soon came across a copy of *The Prairie: Swell and Swale*, *From Nature*; reading the impassioned words of Robert Betz and seeing the "electrifying" photographs of Torkel Korling was transformational. He couldn't believe that those brilliant prairie ecosystems existed on the outskirts of Chicago. A few months later, he stumbled into an opening adjacent to a bicycle path along the North Branch of the Chicago River—it was, in fact, one of the most diverse remnant prairies in the region, and it was rapidly deteriorating.

Ever the organizer, Packard dived in head first and helped assemble the North Branch Restoration Project, a volunteer initiative devoted to restoring the health of those prairies and savannas. The stewards pulled weeds, cut brush, and took chain saws to unwanted trees; against great obstacles, both political and social, they reintroduced fire to these exurban prairies. A number of ecologists continued to believe that management of any kind was unnecessary and disruptive; others argued that fire would cause major harm to the remnants, including the rare insects and small animals that lived in these spaces. Even when the idea was supported, fire was a logistical challenge; there were farm buildings and highways nearby, and each year an increasing number of suburban homes were closing in on the remnant prairies. But the stewards pushed on. Working with the Nature Conservancy, Steve Packard launched the Volunteer Stewardship Network to connect stewards with one another and

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the technical skills that were necessary to steward natural areas. The greater Chicago region, which had launched the study of ecology just a few decades earlier, was now becoming an epicenter of ecological restoration.

In 1978, the Illinois Nature Preserves Commission, staffed and administered by George Fell's Natural Land Institute, launched a landowner contact program, and Packard worked on that program alongside ecologists from the Illinois Natural Areas Inventory. Their job was to find a way to protect the natural areas identified by the inventory; they sent letters, made phone calls, knocked on doors, and engaged landowners about the species on their properties and how they might protect them. After spending decades on the defensive, the natural areas movement was finally going on the offensive.

Elsewhere in the state, private citizens, public agencies, and others continued to plant prairies, from seven to sixty acres, with similar quality and diversity. These initiatives, though meticulous and groundbreaking, were modest in size—and there had never been anything modest about the Illinois prairie. Bob Betz knew this fact as well as anyone, and he would soon be given an opportunity to experiment with planting the largest expanse of prairie yet.

In 1972, he learned that the Fermi National Accelerator Laboratory (Fermilab), the site of a proton accelerator ring (or atom smasher) in Batavia, Illinois, was looking to consult with the Morton Arboretum about an ornamental planting on a mile-wide section of land at the center of the accelerator ring. But he had a better idea: Rather than showy, exotic species, Fermilab should put the prairie back the way it had been before the settlers had destroyed it 140 years earlier. To his delight, Fermilab's director, who had already brought some bison to graze in an adjacent pasture, was fully on board—and they got started right away.

With more than 650 acres of black silt-loam as his canvas, Betz's Fermilab planting would become the largest prairie reconstruction anyone had ever seen. Because of its size—and because it was surrounded by an atom smasher—the experiment garnered a lot of attention. More than a hundred volunteers helped gather seed for the first year's planting; tractors disked and planted into the earth; and before long, combines harvested prairie seeds from within the Fermilab prairie. After just a few years, Betz could count 115 species of native plants thriving on the prairie, and the site filled with turtles, coyotes, beaver, sandhill cranes, red-tailed hawks, and snowy egrets.

Yet even that 650-acre prairie was insufficient. During one interview, Betz said that he'd like to re-create a prairie as big as 5,000 acres someday. "I like the

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idea of wildness," he told a writer for *National Geographic*. "I'd like to see us restore areas as reserves for our grandchildren. The reserves would be kind of like Noah's ark. Then, if our grandchildren ever wanted to expand the areas of wildness, they'd have these nuclei."

Throughout the nation, forward-thinking conservationists were debating whether it was better to have a single large or several small—S.L.O.S.S., as they abbreviated it—nature preserves, and Robert Jenkins, the progressive new chief ecologist for the Nature Conservancy, was in the bigger-is-better camp. But in the state of Illinois, the local chapter of the Nature Conservancy remained focused on preserving the small, high-quality Illinois Natural Areas Inventory sites; and it was content to buy land and transfer it to the state's Department of Conservation. In fact, the director of the Nature Conservancy in Illinois had begun to look around and wonder if perhaps there wasn't much work left to do in Illinois anymore.

In 1982, Steve Packard was hired by the Illinois Nature Conservancy as director of science and stewardship during what may have been the most exciting era in the conservancy's history—donations were rolling in, and over the next two decades, funds would continue to surge. (The Nature Conservancy would in fact experience double-digit growth for the next twenty years.) For visionaries such as Steve Packard, it meant that the organization might be able to support their wildest ideas.

Packard was confident in his abilities as a restorationist—and confident in his fellow stewards' abilities—and so if the restoration of a large tallgrass prairie was possible in Illinois, he wanted to prove that the Nature Conservancy, with its model of volunteer stewardship, could do it as well as anyone.

In 1985, there was a gathering of minds that would become an inflection point for the future of tallgrass prairie in the East. Steve Packard and TNC Illinois assistant director Paul Dye called a meeting of Illinois conservationists, including John Schwegman, the principal botanist at Illinois Nature Preserves, and Larry Stritch, a US Forest Service plant ecologist. He wanted to discuss the merits of conserving a large Grade C landscape and doing so to benefit the entire ecological community, including large native mammals. Packard's argument was that despite their excellence as plant communities, the state's smaller preserves could not conserve the totality of Illinois's biodiversity—and so long as these sites remained the sole focus of the state's conservation efforts, that was a problem.

Postage-stamp prairies, though they were precious and irreplaceable, fell short of capturing not just the essence but the biological integrity of the origi-

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nal prairie. Those landscapes had once been large enough to support hundreds and thousands of elk and bison; a true prairie ecosystem wouldn't be complete without them.

But it was the prairie birds that were the canary in the coal mine. For much of the twentieth century, a number of grassland songbirds had found a way to exist in hayfields and pastures of Illinois, including bobolinks, upland sandpipers, meadowlarks, and dickcissels. These species require short grasses for nesting and cover, and the typical cool-season pasture met those needs; it was a kind of unintentional surrogate habitat. But livestock and their associated pastures were vanishing from Illinois—and so were the grassland birds. By the 1970s, farmers in the Corn Belt were focused almost exclusively on growing corn and soybeans. The mosaic of row crops, pastures, and woodlots—even occasional remnant hill and wet prairies—was disappearing. Soon naturalists would observe an alarming trend: Grassland birds such as grasshopper sparrows, eastern meadowlarks, and bobolinks had been on a steep decline, dropping by as much as 60 to 80 percent since the mid-1960s. It was even more pronounced in Illinois: "During the same time period, these birds have declined by 75 to 95 percent in Illinois and seven species have been listed as threatened or endangered in the state." Even where hayfields remained, the ability of a prairie bird to nest and raise its young was tenuous; with hayfields cut increasingly early and often, nests were destroyed by farm machinery, and hatchlings killed, before they had a chance to fledge. If a nest did survive, nest predators, including racoons and opossums, whose populations were at an all-time high due to the proliferation of edge habitat, wreaked havoc on the vulnerable ground-nesting birds. (Their rapid decline, noted in the 1970s, was why ornithologists celebrated when grassland birds began to nest on the reclaimed surface mines of central Appalachia.) It was a biodiversity crisis.

Meanwhile, the land itself was threatened from all sides; as farmland was simplified and increasingly sterilized, suburban sprawl was spreading ever outward into the last remnants of natural land. The emerging data on grassland birds underscored what ecologists knew—that our conservation efforts were failing to conserve all of biodiversity—and that bigger was, in fact, better.

As Packard advocated among his colleagues that day in 1985, Illinois's Grade A sites could not function or behave like the prairie of old. Most of them were too small for the biological needs of grassland birds. These remnant natural areas were invaluable repositories of the past, but their future, as dynamic and resilient ecosystems, was bleak.

He had begun to develop a strategy: He wanted to a find a high-quality site,

and he wanted to coax that quality *into* a restored landscape. What if the conservancy could succeed at turning a low-quality site—a large grazing pasture, for example—into a restored, functioning prairie? What if it could expand the site with plantings on a par with those at Curtis Prairie, Morton Arboretum, and Fermilab? "We say we have all the high-quality plant communities, but we don't have the best animal communities," he argued. "What if we considered large Grade C areas that had significant animal populations as another focus of conservation?"

It was uncharted territory, especially for the Illinois Nature Conservancy, and it was not without risk. If large sums of money were to be spent to acquire a degraded prairie, there would be fewer resources available to acquire the hundreds of high-quality Grades A and B sites still in need of protection. Packard's proposal had the potential to hinder efforts to secure high-quality ecosystems.

In 1985, the restoration of degraded landscapes was also an unproven idea, and many conservationists were unconvinced that prairie soils could ever recover from the plow—they believed that planted prairies lacked diversity and richness, and that they did not have the equivalent ecological value of an old-growth remnant. Re-created prairies were *not the real thing*. Furthermore, the Illinois Nature Conservancy did not do restoration work; it wanted to broker deals, put up fences, and move on to the next project.

If Steve Packard's vision for a large preserve wasn't controversial enough already, he was soon reminding his colleagues of the need for something bigger and bolder than simply replanting a prairie. Again, he wanted a grassland large enough not just for birds, snakes, turtles, and butterflies; he wanted it for elk and bison, too.

For decades, wildlife reintroductions had been coordinated by state game agencies on behalf of their constituents, with hunters' and anglers' licenses paying for the officials' salaries and budgets. Only recently had state and federal agencies begun to give serious attention to nongame species. But there was Packard in 1985, in the world of mainstream nature conservation—a conservation establishment driven and directed by botanist and plant community specialists—saying that elk and bison ought to be brought back into the fold not for sport, not even out of a sense of nostalgia, but rather for the health and the future of the ecosystem; that because they had all been members of the evolution of tallgrass prairies, all of the pieces ought to be restored for the resumption of wild nature and evolutionary processes. (He was arguing for what some environmentalists now call "rewilding," a term coined five years after he

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made his bold proposal.) It was as Aldo Leopold had said: "If the land mechanism as a whole is good, then every part is good, whether we understand it or not. If the biota, in the course of aeons, has built something we like but do not understand, then who but a fool would discard seemingly useless parts? To keep every cog and wheel is the first precaution of intelligent tinkering."

Illinois conservationists had become good at saving and assembling the tallgrass flora, but Packard was challenging his fellow plant ecologists not to overlook the prairie's animal communities—even if those animals were, perhaps, large and inconvenient.

Initially, this big idea—to find, purchase, and restore a large, degraded natural area—was met with disbelief and a bit of scorn. Larry Stritch was convinced that degraded lands were not worth the effort. "Forget it, Steve, they're gone, gone, gone!" (Packard recalls Stritch punctuating each "Gone!" with a fist to the table.) "This stuff can't be resurrected in a useful way." Many at TNC, including Packard's immediate supervisor, would have agreed: It wasn't worth the effort or the money and it would be a great distraction from other worthwhile conservation goals. It was the *remnants* that mattered, not some starry-eyed visions of the future. And the idea of buffalo roaming the Illinois prairie? That was a fantasy.

But Packard was not only an iconoclast, he was articulate, persuasive, and determined. "It's hard to avoid the infectiousness of his ideas," Paul Dye recalls. "He's wickedly logical, but at the same time appeals to people's better nature and passions when he thinks about conservation and talks about conservation." After his colleagues voiced their concerns, Packard doubled down on an argument that was rooted in science—the kind of ecological thinking that had been pioneered in northeast Illinois just a few decades earlier: "We want to save ecosystems. Not just rare plants. And it's true that the very best rare plant populations, communities, are very small, but they really won't make it in the long run if we aren't saving ecosystems—if we aren't saving the animals too. So let's try and save some places that are big enough for most animal populations." At a time when Illinois conservation needed a big new idea, this was it.

As the night wore on, Packard recalls the group reaching a "grudging" consensus: Even Stritch, who'd initially been opposed to the idea of sinking resources into a large Grade C restoration, agreed that this idea of conserving a big landscape, even if it was in fact degraded, was perhaps worthwhile—and for all of the reasons that each and every one of these conservationists

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knew—that the prairie was large, that species were declining, and that these ecosystems needed far more space to function and behave as the dynamic communities they'd evolved to be.

So where could they find one of those large Grade C areas Packard envisioned, ripe for restoration and renewal?

John Schwegman, the principal botanist of the Illinois Nature Preserves System, soon came up with a place in Lee and Ogle Counties. It was a string of farms owned by a man named Delbert Schafer. There were a five-acre Grade A hill prairie; a marsh with rich streamside communities; a high-quality cliffside; and a collection of Grade C remnant prairie hills, well over two hundred acres. There was quality there, and size—it was the largest dry upland prairie in the state, and likely the best. The site was not surrounded by suburban development—corn and soybean fields were not wild nature, per se, but neither were they asphalt or concrete—and where there was soil, there was a chance for restoration. This matrix of farm and relic prairie was already supporting numerous rare grassland birds. And the 882-acre Franklin Creek State Natural Area was just a mile down the road, filled with natural springs, hardwood forests, sandstone outcroppings, and a small prairie remnant. It was exactly the kind of place Packard had been looking for. Putting the cart well ahead of the horse, he wondered if they could use the unplowed remnants at the heart of Delbert Schafer's privately owned farmland as a core from which restoration could expand outward.

All of it—the money required, the unproven theories of restoration, the proposal to undo 150 years of agricultural progress, and the all-too-serious desire to reintroduce elk and bison—was a big can of worms. But as the group was about to realize, there wasn't a lot of time to deliberate.

In 1986, the ecologist Daniel Janzen first used the term "the living dead" to describe the isolated remnants of tropical forests. "The living dead," he wrote, are "standing, living and breathing, but as dead as is the litter, since they have no reproductive future." In this metaphor, a rare plant, animal, or ecosystem still exists in the world, but at any moment something might take it out—a disease, a bulldozer, a hurricane—and the species could vanish in an instant. Not only is its death assured, but the mortal wounds have already been inflicted. At that point in time, the remnants of tallgrass prairie were smaller, more endangered, more like the living dead than any tropical forest.

The prairie movement had saved many of the rich and diverse old-growth

remnants. They had named them, bought them, fenced them in, and preserved them. But there were other sites, such as Delbert Schafer's rolling prairie bush clover hills, that did not appear on the list of the 610 best. These anonymous places, harboring native plants and communities, refugia for rare and endangered plants and animals, were still being plowed, quarried, developed, or otherwise removed from the earth without much notice. At times, the places were deliberately destroyed because someone had identified their ecological value; land developers and resource extractors didn't always want to have pesky environmentalists and regulators poking around their property, so they would obliterate the evidence. The owners of one four-hundred-acre expanse near a railway filled it with five feet of fill, intentionally destroying the prairie before conservationists could raise awareness of its existence.

Thus far, Delbert Schafer had been different. For twenty years, Schafer had welcomed conservationists onto his farm and was generous with his land. He had cooperated with the Wades and Tim Keller for the past two decades, giving those prairie enthusiasts free rein to explore, to invite other naturalists, to erect grazing exclosures, and even to set fire to portions of the remnant prairie. It was above and beyond what the typical farmer might have allowed—especially on a working landscape surrounded by row crops and livestock and wooden barns. Forty years later, I asked Schafer what had led him to be so accommodating. "I was raised to not be so possessive," he said. "I'm not a tree hugger by any stretch of the imagination, but it wasn't any skin off my nose."

But in the 1980s, Schafer had had some bad luck. He'd taken out a loan for his machine repair business just as the decade's farm crisis had gripped the nation. He had put up some of his farm holdings as collateral—specifically, all of the farmland along Lowden Road. He had considered other options, including selling just one piece to pay for the others—"But then again, you was selling it at bargain basement prices, because none of the other farms had any money, either." Looking back, he says, he probably should have let go of the machine business to hold on to the land. "I could have liquidated the shop. But my inner core, my nature, I thought that I owed it to my customers to be there, to continue to have parts for them, and service them." Before long, he lost all of his farmland along Lowden Road between Naylor and Stone Barn Road. "I had one more payment," he said, referring to the piece on Naylor Road, "that would have been totally mine." Instead, he lost it all.

Shortly thereafter, his property was sold to someone who had no intention of farming the land, and whose plans for the property could doom the

ecological communities forever: a real estate developer. The old threats to the prairie—the cow and the plow—had been upstaged by suburban sprawl.

Tim Keller and Doug and Dot Wade were not yet aware that Steve Packard and the Nature Conservancy had suddenly become interested in conserving that large Grade C area. Back in Chicago, Packard was not yet aware of the site's significance to the Wades and Tim Keller—nor was he aware that the fate of the land was now in the hands of a developer. (Schafer wasn't eager to broadcast his predicament around northern Illinois.) But shortly thereafter, Schafer bumped into Keller at a function and told him that he'd lost the property and what the new owner planned to do with it. "Man, he got in gear," Schafer says. Back home, Keller jumped on the phone with his network of conservationists, pleading "Time is of the essence!"

The new landowner, Mel Schappert, was not an experienced developer. By most accounts, he was simply in the right place at the right time. Jeff Meiners's family owned a large food packaging facility just a few miles down the road from where Delbert Schafer lived, and Meiners recalls driving down Lowden on the way to work one morning and seeing an eight-by-ten-inch sign with the words "Land for Sale" and a phone number below. He called Schappert, who told him to go put stakes on the land he wanted. Meiners knew the area well. As a teenager, he'd shot his first deer just north of Stone Barn Road; each spring, his father had taken the family on warbler walks through these same hills, and in the evenings they'd go in search of the upland sandpipers and pheasants. "I wasn't in much of a position financially to buy a lot of land," he says. "But I just knew it was *really good land*." So he pounded in stakes for what amounted to 13.5 acres at the corner of Naylor and Lowden, and he would soon be the new owner of a portion of Schafer's old pasture; although he didn't know it at the time, the edge of his property would also include a piece of the Grade A hill prairie. And just like that, Packard's vision of a large preserve was slipping away.

Schappert had the land surveyed and had divided it into ten-acre lots, and several more sites were sold—slices of land that would soon be home sites, chipping away at the vision of a sprawling prairie restoration. Before long, three hundred acres had been sold. When news of the sale—and the value of the remnant prairie—hit the local newspaper, Keller said, "This all should have been set aside as a natural area years and years ago." The Nature Conservancy, the Natural Land Institute, and the Nature Preserves Commission were all scrambling to negotiate with Schappert. For two decades, there had been no

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sense of urgency to preserve those remnant knobs—and almost overnight, it had become a race against time.

Although the details of what happened next are a bit fuzzy, the Nature Conservancy's records indicate that in August 1986, after more than a year of negotiations and false starts with Schappert, TNC was able to purchase Schafer's 130-acre southernmost farm tract—this was the land that Dot and Doug Wade had stumbled into twenty years earlier that contained the five-acre Grade A remnant with downy yellow painted cups. It was important to save that irreplaceable relict of the Illinois prairie; the piece was the highest-quality remnant of the bunch, so it was no small victory. But without the larger landscape—without the larger complex of knobs and unplowed remnant prairie—the vision of a large grassland ecosystem was impossible.

In the meantime, Schappert had grown impatient. (At one point, Schappert even sent in a bulldozer to scrape off the topsoil of one area of the farm so that he could sell it.) Soon there were no more negotiations. Schappert scheduled an auction, to be held at the Brandywine Hotel in downtown Dixon; he was working with a home builder to subdivide the property, and he was going to get rid of all the remaining plots all at once. The builder was going to carve up the land, lace it with roads, and fill it with homes. An advertisement for the auction announced suburban homes with streets named after prairie plants; prospective buyers could build ranch houses on "Compass Plant Lane," two-car garages on "Pussy Toes Place." Meanwhile, Packard had still not secured funding from the Nature Conservancy's board of directors; he had a really good idea for a restoration project, but he didn't have the cash.

Meiners, who'd bought a piece of Schappert's property at the corner of Naylor and Lowden, was there in the room at the Brandywine Hotel. The auction was disorganized and chaotic, and according to Meiners, it was over before it started.

In the years since, the final moments before the auction have become a bit of a legend, but apparently it went something like this: As Packard and Ralph Burnett, the conservancy's real estate broker, waited for the formal approval by the conservancy's board back in Chicago, a new board member, John Santucci, entered the office. Santucci was riveted by Packard's vision for restoring a chunk of tallgrass prairie big enough to bring a herd of bison back to Illinois—and he didn't want that opportunity to slip through the cracks. Since the conservancy's funds weren't ready and time was of the essence, he wrote a personal check for $20,000 and sent Burnett racing down to Dixon, where he

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arrived just before the start of the auction. George Fell of the Natural Land Institute was there with his own $20,000 check, which the group would use for the down payment on every bit of land Schappert had for sale; they were going to leave nothing on the table. A few days later, the Nature Conservancy sent Fell the official purchase funds, and the Natural Land Institute transferred the purchase to TNC.

By the close of 1986, the Nature Conservancy would own 416 acres in Franklin Grove, Illinois. The remnant landscape had been discovered twenty years earlier—but whether it lived or died came down to delivering a check at the eleventh hour.

It had taken the development of an entire ecological movement to save the land—and a huge leap of faith. Now the Illinois Nature Conservancy had acquired a significant chunk of land for an explicit purpose—to restore a massive prairie, big enough for the full and complete diversity of grasses, flowers, and shrubs; big enough for prairie birds and insects, reptiles and amphibians and big enough, perhaps, for American bison.

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CHAPTER 12

Nachusa Grasslands and the Rise of Ecological Restoration

The first time Steve Packard recalls setting foot on the new project site was on a visit with Bob Betz during the growing season. Leaving the Chicago area, they would have driven past farms, small towns, and one-room schoolhouses. The closer they got to the Rock River, the more the land would have begun to roll. Once they got to the place, the farm's sandstone outcroppings and sprawling bur oaks would have caught their eye. It was a good thing that Dot and Doug Wade had fenced and burned Schafer's hilltop when they had—the old prairie remnants were filling with cedar trees and multiflora rose. Yet the land proved rich and full of surprises. Walking among the remnants, Betz and Packard found species that had not been identified by previous inventories. They would have dropped to their knees to observe the prairie bush clover. North of Schafer prairie, they discovered prairie fameflower (*Phemeranthus rugospermus*), one of the rarest and strongest indicators of prairie, perched on a rocky outcrop; they would have held its succulent leaves between thumb and forefinger and found its bright pink flowers in bloom. On another pair of knobs, they found a huge population of the rare and declining kittentails (*Besseya bullii*), a midwestern endemic. (That population of kittentails would soon be recognized as the largest in all of Illinois, and before Packard and Betz had gone out to look, no one had known it was there.) Over time, remnant species continued to appear: a clump of wild quinine at the rim of a swale, blue joint and fowl manna grasses growing in a wet meadow, sweet scented Indian plantain and sensitive fern in a sedge meadow. Prairie smoke, Hill's thistle, and pink milkwort bloomed on the hills alongside little bluestem, prairie dropseed, purple coneflower, and rough blazing star. Downy yellow painted cups, the stunning flowers that had called out to Dot Wade back in 1965, continued to thrive. Those were the joys of saving

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land. They were species—entire communities of plants—that had been nearly driven out of existence. They now had a second chance.

As they got to know the land, Packard felt it needed both an honorable and an instructive name. Naming the place for a single parcel would not work—the vision for the preserve was more than a lone knob or isolated remnant. The neighborhood included marsh, oak savannas, sedge meadows, and the remnant hill prairies—and ecological communities yet to be restored. For a sense of place, he looked to local history. The property was located within Nachusa Township, named for John Dixon, an early-nineteenth-century ferry operator on the Rock River. A group of Winnebago with whom Dixon was friendly had called him Nada-chu-ra-sah, or "Head-hair-white," from which "Nachusa" was derived. Packard felt that Nachusa Grasslands was a fitting name for a nature preserve that would grow to become not just a postage stamp, but an entire prairie landscape.

Dot and Doug Wade appreciated the new name, but more than anything, they were grateful that the land had been saved. Over the next several years, Dot would remain an integral part of Nachusa's transformation. Tragically, however, Doug would not live long enough to see the grandeur of what Nachusa Grasslands would become. In September 1987, he suffered a stroke and died shortly thereafter. Just days earlier, however, he had learned that the conservancy was signing the purchase papers for another tract of land that would be added to the preserve—in fact, it was where he had first discovered prairie bush clover.

Now that the land was saved from bulldozers, it was time to get to work.

Chris Bronny, a schoolteacher and self-taught prairie restorationist from Galva, Illinois, would become Nachusa's first part-time site manager. After reading about Nachusa in a TNC newsletter, Bronny and Packard worked out a deal: Bronny would be given a small stipend to come to Nachusa on weekends and summers to care for the exciting new preserve.

Six years earlier, he had first begun to consider the essence of the old prairie. In the classroom, one of his students had shared an issue of *National Geographic* with an article titled "The Tallgrass Prairie: Can It Be Saved?" One photograph in particular made a lasting impression on Bronny: an autumn prairie in the late afternoon, with little bluestem in copper hue, alongside a mass of the purple-flowering stalks of rough blazing star. "It was like my . . . Damascus moment," he says. "This is what used to be in Illinois? This phenomenal scenic view of grasses and wildflowers? And it just struck me like a lightning bolt." He was soon scouring west-central Illinois for remnants. With

fresh eyes, he wondered about the history of his parents' thirty-six-acre cattle pasture. He tracked down an old Knox County plat map from the 1840s, and sure enough, the property was labeled "The Barrens." He fenced off an acre there to see what might come up with cows removed and was delighted when huge clumps of big bluestem, Indian grass, and Culver's root suddenly re-emerged; somehow, even Turk's-cap lily, a notoriously difficult-to-grow prairie flower, had survived a century of grazing.

Like many of his peers, Bronny kept Aldo Leopold's *A Sand County Almanac* close to his heart, and among the quotes he had committed to memory was this: "What a thousand acres of Silphiums looked like when they tickled the bellies of the buffalo is a question never again to be answered, and perhaps not even asked. . . . Few grieved when the last buffalo left Wisconsin, and few will grieve when the last Silphium follows him to the lush prairies of the never-never land." The sentiment had deeply saddened Bronny, but the emergence of Nachusa Grasslands and Steve Packard's plans to restore a herd of bison transformed Leopold's writing from a eulogy of the tallgrass prairie to a blueprint for resurrection. And that was the most exciting thing in the world.

For two summers, Bronny spent all his free time at Nachusa Grasslands. Some nights, he slept under the stars, in a sleeping bag on the remnant hilltops, with curious coyotes prowling nearby. To be so physically immersed in the prairie was a dream. He worked closely with the longtime stewards such as the Lee County Natural Areas Guardians and the Prairie Preservation Society of Ogle County, gathering seed from other remnant natural areas, a scavenger hunt for the missing pieces of the complex ecosystem. They relied on Floyd Swink and Gerould Wilhelm's landmark book *Plants of the Chicago Region* (the "Green Bible," as it would come to be called) to identify plants and communities, and to understand how they grew together. With this information, Nachusa's volunteers could then scour the other local remnants for the seeds of any plants thought to be missing. There were also invaluable clues in the historical record: In 1839, the state of Illinois had conducted a public land survey to establish the range and township lines of the new territory after it had been wrested from the Sauk and Fox at the conclusion of the Black Hawk War just seven years earlier. A land surveyor had walked along Lowden Road and described what communities were growing, perhaps on that very plot, at the dawn of settlement, before the John Deere plow had broken the sod. "Burr oak barrens E of creek," the survey notes record, "high rolling prairie good soil . . . part sandy poor soil . . . leave barrens and enter prairie." Aerial photography, which had been done systematically by the Illinois Agricultural

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Office, had begun in the 1930s and seemed to confirm some of the same natural communities described by the land survey a century earlier. Subsequent photographs, however, showed how the low prairie had been fully converted to cropland and how, in the absence of fire, the high prairies had filled with brush. Bronny and his fellow volunteers focused on reopening the grasslands to sunlight, hoping any dormant prairie species would reemerge. In the croplands, they would have to grow the prairie from scratch, and there were few, if any, mesic soil remnants in the area to serve as references. As for technique, they made it up as they went, with a fair amount of guessing, trial and error, to see what did well and where.

There was no time to waste. In the fall of 1987, a little over a year after the auction at the Brandywine Hotel, Steve Packard, Chris Bronny, and more than a dozen other volunteers gathered with bags of seed collected from Nachusa Grasslands and the scattered remnants of Lee and Ogle Counties and tossed them into the stubble of a former crop field.

Unsettling had begun.

The establishment of Nachusa Grasslands was a turning point for the Nature Conservancy in Illinois. Nationally, TNC was well on its way to becoming the largest conservation organization in the country (and soon the world), and members of its staff would become leaders in the emerging discipline of restoration ecology. The need for ecocentric restoration had been a focus of conservation for at least a decade or more, but far too often, these ideas remained theoretical. "A lot of people were talking about doing stuff," says Fran Harty, an Illinois ecologist who was at that time an employee of the Illinois Department of Conservation. But with Nachusa Grasslands, "TNC actually did it." The leap of faith that was required to give the green light to Steve Packard's large prairie restoration experiment signaled to others that these activities were not only worthwhile, but that they might just succeed.

But this transformation wasn't without its bumps. Not long after Nachusa Grasslands was established, Packard was eyeing a property for sale just south of Naylor Road, which would have connected the preserve to Franklin Creek State Natural Area. According to Packard, the Department of Conservation (which would become the Department of Natural Resources in 1995), which had been working closely with TNC on land acquisitions, withdrew its support for the purchase; leadership at DCNR had changed their mind and decided that they didn't like the idea of buying all of that degraded farmland around Franklin Grove and would prefer it if TNC would resume focusing

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on the 610 high-quality areas on the Illinois Natural Areas Inventory. There were other scuffles, too. Although the executive director of the Illinois Nature Conservancy, Al Pyott, supported Packard and the Nachusa Grasslands experiment, Packard's immediate supervisor was not so keen on the business of re-creating prairies and didn't want any more money going to cornfields and overgrazed pastures. The supervisor and Packard continued to bump heads, and the supervisor eventually threatened to fire Packard. But the board of directors would eventually recommit to Nachusa Grasslands and to Packard (and the supervisor was soon out of a job). (Packard and Paul Dye had been right about another thing: That big project, and the talk of someday restoring bison to the preserve, were good for business and good for fundraising.)

In the field, where stewards got dirt under their nails and briars in their skin, the work and the art of restoration had never been more popular, and Steve Packard continued to excel at bringing people together. Considering that it was the biggest restoration project TNC had ever attempted, however, Packard needed not just hard workers but also big thinkers. After Chris Bronny took a full-time job at the nearby Byron Forest Preserve, where he continued his work in prairie restoration, TNC reached out to Ed Collins, another young ecologist who was making a name for himself in the natural areas around Chicago, where he worked full-time for the McHenry County Conservation District. Although "ecological restoration" was not yet a term that local conservationists were using with any regularity, the actual work—restoring ecological communities—was becoming all the rage. (Collins's employer had recently adopted one of the first policies in the nation to mandate that all of its holdings be restored to as close an approximation as possible to their original condition.) Collins was at the forefront of the movement in northern Illinois and was soon teaching a dozen or so classes each year on controlled burns and herbicide use. That period was one of the most exciting times in conservation, he says, and it would rewrite how we define conservation. "You had a feeling that you were literally on the crest of the wave, and the wave was building all the time." While he was writing a management plan for Nachusa, he came up with a metaphor to describe the condition of the land: The preserve, he says, was a chocolate chip cookie; the chocolate parts were the elegant, intact knobs, the sandstone outcroppings, and the wetland communities along the streams. "The memory in the ground would just seep up through you, and you knew in an instant, not just from the plants but just from the *feeling*, that you were in ancient stuff." But the matrix that surrounded those chocolate chips, he says, was just plain ol' dough. "You need it to hold the chocolate chip cookie

together. But if you're ever going to have a whole chocolate cookie, you gotta add more chocolate to the dough." He believed that it was inevitable that if they managed it properly, the remnant communities would reclaim the areas around them. "Nachusa had the feeling of being a place that was waiting for the right people to come along, and retire it from farming, and allow it to be what it was meant to be."

Indeed, the right people would soon come streaming in. Among the first was the leading tallgrass prairie entomologist, Ron Panzer of Northeastern Illinois University, who was hired to conduct an insect inventory at Nachusa Grasslands and to make management recommendations for the conservation of those species. In his initial investigation, he identified at least 365 species of insects, including dozens of butterflies—American coppers, cloudywing skippers, monarchs, eastern tailed blues, red spotted purples, pearl crescents, and the regal fritillary, a grassland species that had once bordered the Atlantic but, like the American bison a century earlier and the grasslands themselves, had begun a slow and steady retreat from the eastern United States. Elsewhere, Panzer encountered some moths that hadn't been seen in decades; others, such as the turtle head borer moth (*Papaipema nepheleptena*), had never before been documented in Illinois. Although decades of grazing had degraded the remnant prairies, by virtue of their size, the knobs and hills were still supporting "significantly more remnant-restricted insect species than [the] smaller 'virgin' sites that persist in this region," he noted. For the conservation of biological diversity, bigger was better, and his investigations at Nachusa only served to confirm the point.

Panzer's job, however, was not merely to produce a list of insects; Nachusa also needed to know how to best take care of those precious, rare *living* beings. There was not yet a tried-and-true way to do that kind of thing. Most prairie folks understood that the grasslands had evolved with fire, but whether they should burn the remnants—and during which season and how hot and how often—was not a settled science. A few entomologists remained adamantly opposed to burning remnant grasslands because of the risks to rare animal communities; if a population of rare butterflies, for example, was in diapause (a state akin to dormancy) on a small prairie and the prairie was set on fire, the entire population could be wiped out. They wanted to "do no harm," but they also knew they had to do *something*. This was, of course, a modern dilemma: When the prairie was large, animal populations could always rebound and be recolonized from elsewhere; but in the late twentieth century, when populations were hanging on by the thinnest of threads—disturbances of any

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kind, be it the plow, the bulldozer, or the flame—could spell the end of a rare thing. Considering all of that, Panzer suggested burning at least 25 percent of the Nachusa preserve annually, leaving 50 percent of the upland prairie as a sanctuary or refugium for those rare species. But he also understood that some individuals would have to die if the land managers were going to take actions that would benefit whole populations and entire ecosystems. "Burning, on a scale of zero to ten, is an eight for insects," he had said. "But not burning is an eleven." Burning remnant prairie and knowing that doing so would kill rare insects was one of the tough decisions required by restorations. It would not be the last.

Panzer organized prairie insects into two broad categories: those that relied on remnant prairies ("remnant reliant") and those that did not. Specialist insects, such as the regal fritillary, which cannot survive without their specific host plants (America's native violets, in the regal's case), were typically found on remnant prairie and nowhere else. For many other species, those associations were either poorly understood or unknown. Without the remnants, without these unique host plants, many insects had already vanished from vast swaths of the East. And so Panzer recommended that Nachusa prioritize plantings on known larval hosts; to kick-start recovery, they should stock the grasslands with insects, just as game departments had done with deer, elk, trout, and quail. He shared Packard's belief that you couldn't re-create a prairie with grass and flowers alone. "Plants account for only 10 to 15 percent of the organisms in an ecosystem," he said. "You can't restore the prairie if you ignore at least 50 or 60 percent of the organisms on the original prairie. . . . If we couldn't move the insects, we'd never ever again have real examples of the prairie."

Beginning in 1988, Panzer did just that: He released hundreds of frog hoppers, a few ottoe skippers, a couple dozen prairie dock moths, several hundred leafhoppers, and twenty-five adult pairs of bunchgrass grasshoppers. Some of the insects had been taken from high-quality state nature preserves, where their populations were robust enough to serve as a source, while others, such as the gorgone checkerspot, had been rescued from imperiled natural areas just before bulldozers had arrived to clear a piece of land. The endeavor was no easy task. By 1996, Panzer had successfully reintroduced just six species of insects to Nachusa. As the ecologist Virginia Kline wrote, "Those who wish to bring together the multitude of species represented in a prairie—or any other natural community, for that matter—would seem to have a task exceeding that allotted to Noah, who after all was able to ignore plants (and, presumably, microscopic organisms, insects, and most soil dwellers as well)."

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But it wasn't just insects that Nachusa needed to consider; the large new preserve was being created to allow entire suites of plants and animals to once again function as a whole and complete ecosystem. Steve Packard remained convinced that someday a herd of bison would come to Nachusa Grasslands—and that their presence would be another significant cog in that complex machine of wild nature.

The remaining traces of the old farm life were to be scrubbed out: miles of internal barbed wire fencing, interior roads, fence posts, a grain silo, all were decommissioned and removed. The old farm dump, which now contained a century's worth of glass, aluminum cans, plastic, tangled iron, and a massive pile of barbed wire, came to be known as Trash Knob. Eventually, three dumpster loads of scrap metal were recycled and five semitruck loads of trash were carted away. When it was all cleaned up, the scar of the trash pile was graded with a bulldozer and overseeded with little bluestem, Hill's thistle, and other locally collected prairie species. If the old farm dump could be transformed into a nascent prairie, perhaps there really was hope for the whole experiment.

In the summer, the work was hard and hot, and mosquitoes, ticks, and tenacious invasive species tested the stewards' mettle. But life on the prairie was also encouraging. The remnant communities were proving to be resilient, and as rare species continued to reappear or sprout anew, the volunteers deepened their commitments to Nachusa Grasslands. After just two years, bird's foot violets, larval hosts for the regal fritillary, were expanding out of the highest-quality remnants into adjacent knobs and slopes, and the butterflies themselves seemed more abundant than ever. Fire was effectively setting back brush. The original forty-acre cornfield planting was now home to hundreds of blooming pale purple coneflowers. Smooth Solomon's seal was planted in the savannas; and royal fern spores, along with the seeds of other high-quality wetland species, were introduced to the wetlands they'd begun to restore at the center of the site. Animal surveys confirmed meadow voles, prairie deer mice, northern short-tailed shrews, masked shrews, thirteen-lined ground squirrels, red and gray fox, coyotes, and weasels on the preserve. A breeding bird survey, coordinated by volunteer Ann Haverstock, identified eighty-five species and fifty confirmed breeders; there were upland sandpipers, lark sparrows, an abundance of grasshopper sparrows (the most abundant bird at Nachusa Grasslands), vesper sparrows, six territories of dickcissels, bobolinks, whippoorwills, veerys, loggerhead shrikes, and an Illinois endangered species, Cooper's hawk. Some of these birds were known to be suffering the sharpest

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declines of any birds in North America, yet at Nachusa Grasslands they were present and functioning in the recovering ecosystem.

After the spring and summer rains, the vegetation was tall and thick. Dense grass thickets towered to heights of six feet, and flowers bloomed in abundance; there were the purple-spiked stalks of lead plant and blazing star, pale purple and yellow coneflowers, wild bergamot, hoary vervain, purple prairie clover, wild cream indigo, and prairie gentian. The federally listed prairie bush clover responded well to fire and was discovered growing in additional locations; that state-endangered species was locally thriving, and as one volunteer told Steve Packard, "There's enough prairie bush clover to combine." The prairie dandelion, a state endangered species known to only four sites in Illinois, appeared in the main complex in 1991.

In addition to cutting brush, fire was a primary task. Before long, the stewards were burning up to 320 acres in a single season—some of the biggest prairie fires in Illinois in a very long time. Nachusa neighbor Jeff Meiners, who'd just built a new home at the corner of Lowden and Naylor, said, "It was very disconcerting having a house there at that moment. But they didn't burn anything down."

One of the most important things also growing at this time was the stewardship community. Late in the fall, as the volunteers sorted and processed mass quantities of seed, they cooked stone soup over an open fire. In early spring, Tim Keller led hikes to the wetlands whose participants marveled at the pungent blooms of skunk cabbage. In the summer, they gathered not only to work but to admire the showy summer blooms of blazing stars and pale purple coneflowers; they hiked to the top of Doug's Knob to watch the sun set and view the spotted lark sparrows; they welcomed the fragrance of mountain mint as it brushed against their legs; and as the day's work came to an end, they lingered in the prairie to listen to the whippoorwill and watch for the flash of fireflies. They looked up from the earth to watch northern harriers, American kestrels, red-tailed hawks, and short-eared owls; they listened to the migrating white-crowned sparrows, spotted yellow-rumped warblers, white-throated sparrows, rufous-sided towhees, and sedge wrens. They celebrated the appearance of all the rare things. The long-eared owl, which was endangered in Illinois, was not only documented at Nachusa, it was breeding; in the past thirteen years, a breeding pair had been documented in northern Illinois just twice. The red-headed woodpecker, which was continuing to decline throughout the eastern United States, also found a niche in Nachusa's oak savannas. The stewards were effusive about those victories: "Oh joy! Oh

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rapture! We, who tarried until 6:15 around Coyote Point and the western end of the soybean field, were truly fortunate," Ann Haverstock reported. "A fully bibbed Harris' Sparrow, *Zonotrichia querula*, perched openly in the shrubby border. This bird is considered out of its winter range, but a few are sighted in Illinois each year." The conditions at Nachusa Grasslands were just right for all of them.

A few of the wet areas hadn't been drained until the 1950s, others far more recently; Delbert Schafer, in fact, had still been laying drainage tile just a decade earlier. "Before that it was just bogs and springs," recalled one neighbor who'd managed cattle on that property at various points in the 1920s (he also remembered prairie chickens on the hill prairies, and his mother's walks to gather wildflowers). The good news was that the unplowed soil and the wetland flora it had once contained were resilient. Wherever drainage tiles were dug out, water immediately rose to the surface. Soon native wetland species spontaneously emerged—they hadn't been introduced by any of the volunteers—demonstrating the wetland seed bank's ability to remain dormant in soil for decades. At another location, a backhoe was used to remove two feet of sediment from a constructed pond, and ducks appeared there for the first time in decades.

Unsettling the land was not a source of pride for all. In the local cafés and bars, farmers continued to grumble about this strange project—land was meant to be productive, they believed, and it didn't make sense to let the prairie weeds come back in and take over cropland, nor to push cattle and horses off the hills. For Delbert Schafer, of course, it was far more personal. For many years, he couldn't stand to drive near the preserve. One year, a refuge manager called to ask him for a drain tile map (Schafer was a meticulous record keeper), but he couldn't find it within himself to call back. "I was disgusted," he recalled. "They wanted to know where that drain tile was so they could destroy it." Nachusa Grasslands was not a project of a forlorn hinterland, this was the rich heart of midwestern agriculture—and Schafer still lived and worked two miles away.

The Nature Conservancy, meanwhile, continued to eye more land. In 1989, Steve Packard noted that the "best quality savanna, the best quality marsh, and a piece of high-quality prairie with the endangered woolly milkweed"—Grade A and B sites identified by the Illinois Natural Areas Inventory—occurred on private land adjacent to the new preserve. After six years, those high-quality remnants were still unprotected. Packard and his colleagues occasionally approached their neighbors and told them of their desire to purchase more land,

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should they ever choose to sell. Meanwhile, Packard invited others to come see what Nachusa was all about. At least one set of neighbors, Max and Sally Baumgardner, moved to the area *because of* the natural areas (having bought one of the preauction parcels from Mel Schappert), and they would not only become among the project's most dedicated volunteers, they would donate a thirty-acre easement on their property, adjacent to the preserve. Jeff Meiners would likewise develop a close relationship with Nachusa's staff—he even donated an old pickup truck to the preserve—and whenever Meiners needed seed or equipment to manage his own prairie, Nachusa would be there to help. "I never felt unwanted at all," he said—but he also couldn't help but wonder if deep down the conservancy might have wished that the new homes, carved out of Schafer's old farm tracts, had never been built. But so it was. After all, it was not the wide-open West, it was the farm country of northern Illinois—and to conserve natural areas in that land meant doing that while being surrounded by people.

At the beginning of 1993, an additional 135 acres were added to the preserve, which brought the site to 726 acres, or nearly double the original footprint of the preserve. An additional wetland had connected Nachusa to Franklin Creek, and secured waterfowl habitat, and hunting opportunities, for local sportsmen. For Dot Wade and Tim Keller, who had advocated for the protection of the site twenty years earlier, the growth was unbelievable; the fence they had erected around Schafer's Knob back in 1974 now seemed quaint. For the first time in over 150 years, the grasslands in that corner of the world were not in retreat; they were expanding.

Hanging over everything was this promise of American buffalo. In the pages of Nachusa's newsletter, Chris Bronny's illustration of a herd of bison grazing an Illinois prairie was a featured image. In a 1989 letter, Packard reminded Nachusa's supporters that a primary goal of the project was to restore buffalo and elk to a major part of the preserve. "No Illinois prairie has felt the tread of buffalo for over 100 years," he wrote. "Yet many of the rare plants at Nachusa are thought to depend on disturbance such as the wandering buffalo herds caused. I say 'thought to depend' because no one really knows. The eastern tall-grass prairie was gone as a functioning ecosystem before the science of ecology was born. No one has ever studied it. How much the long-term survival of some species depend on others, no one can say for sure. But we know enough to be confident that it makes a lot of sense for conservationists to try to rebuild at least one eastern tallgrass prairie as complete and intact as possible."

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For a number of volunteers, the promise of bison was part of what spurred their interest and kept them involved. It was what they thought about as they scoured the fields for rare species and as they tossed seeds into the cornfields. "That was kind of the overarching prize of the project," says Chris Bronny, "was bringing that herd of bison in."

To get there, the preserve would need a caretaker working on the project full-time; someone to take hold of the vision and make it their own.

The man who would get that job was Bill Kleiman. An Illinois native, Kleiman was born on the West Side of Chicago, where his father and grandfather had both been butchers; he lived there until he was a teenager, when his family moved out to the western suburb of Wheaton. At that time, much of DuPage County was still in corn but was rapidly developing; cornfields replaced the prairie, and suburbs replaced the cornfields. Kleiman was a strong candidate for the role of land steward. While at college, at Northern Illinois University, he lived at his grandfather's farmhouse, just twenty minutes down the road from the future site of Nachusa Grasslands, so he was familiar with the area. For the past several years, he had been working in national parks and nature preserves in the western states, and was taking graduate level courses in conservation biology. He has the qualities of a natural leader—he speaks in a calm, unhurried manner punctuated by a wry midwestern sense of humor. Underpinning his demeanor is a quiet, reassuring confidence.

Kleiman's experience in ecological restoration came not from a degree program, however—there was no such thing just yet—but from hands-on experience. Before he had moved out west, he had taught biology and freshman physics at a suburban high school in Naperville. One year, he got to looking at a beat-up property, twenty to thirty acres, adjacent to the school, and started to wonder if it wasn't perhaps an overlooked prairie. At first, he and his students just went to pick up litter, but he had bigger ambitions for the lot: If this was in fact a prairie, then he and his students were going to restore its integrity. They started by collecting seed in a local remnant, which they then broadcast into the field. He somehow even convinced the park district to allow a prescribed fire. He also invited the noted Chicago-area botanist Gerould Wilhelm to see their work and offer suggestions. Kleiman had a vision and made it happen.

Prior to the schoolyard experiment, he had not known the tallgrass prairie. In college, he'd read Aldo Leopold and Edward Abbey, both of whom had instilled in him a sense of land and wilderness ethics. But as an Illinoisan, nature was always someplace else. "I didn't really understand what was in Illinois," he says. "I rarely saw much natural area in Illinois. I mostly left it to go find

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nature." It wasn't until he started interacting with the Naperville prairie that he started to appreciate the local grasslands and oak woodlands. Naperville was just south of Bob Betz's prairie reconstruction at Fermilab and the impressive West Chicago prairie remnant; just a few minutes to the northeast was Morton Arboretum's Schulenberg prairie and, just to the south, the Springbrook Prairie Forest Preserve. The Nature Conservancy's Volunteer Stewardship Network was thriving, and its activities were written up frequently in the *Chicago Tribune* and other local media. Little prairie remnants, and restorations, were all around.

Working with the land got into Kleiman's blood. Soon he took a leave of absence from teaching, and he and his wife, Susan, moved to Colorado. He eventually got a job with the Nature Conservancy and then with another preserve in Wyoming. In 1993, he went back to Illinois for an interview with Steve Packard. At one point during the conversation, Packard asked what Kleiman thought about grazing the prairie with bison. Kleiman's response was "You can do that"; convincing as ever, he had apparently given the right answer. But he likes to say that he can't remember if the response was a statement—"You can do that!"—or a question—"You can do that?" Regardless, he got the job, and he and Susan, an environmental educator, moved to Nachusa, where they would live and raise a family for the next thirty years.

Eventually, Kleiman would have to make up his mind about that bison question: Could he, in fact, do that? But first he'd have to figure out how to manage a nature preserve—one that was quickly becoming the flagship operation of the Illinois Nature Conservancy.

Kleiman arrived at Nachusa Grasslands in October 1993, just before the fall burn season. He went through equipment, determining what was needed, what could be repaired or modified. And then he allowed himself to get lost in the landscape. By the start of 1994, Nachusa would grow to nearly a thousand acres, including eleven unique natural communities. "Truly this preserve could be seen as a jewel of the prairie state," he wrote in his welcome message, "a wilderness returning, where being lost is a measure of its grandeur and rarity."

As preserve manager, he would have hundreds of jobs and two main directives: to care for the remnants and to create new prairie.

In the early years, he and Susan lived in a small yellow house just off Lowden Road; the "Little Yellow House on the Prairie," as it was affectionately known, doubled as the preserve headquarters. Their living room was the office, and

stewards gathered around a small oval table to discuss weeds that needed to be managed, which seeds were ripe for picking, and which units needed to be burned (the topics of weeds and seeds dominated). Over the next several years, more than five hundred acres would be added to the preserve—woodlands, degraded savannas, cornfields, and even high-quality remnant prairie—and they continued inventorying what species occurred on the preserve. In the summers of 1996 and 1997, the botanists Gerould Wilhelm and Linda Masters visited the preserve and documented 150 species new to Nachusa; exciting species, including pink milkwort (*Polygala incarnata*), yellow monkey flower (*Mimulus glabratus*), green orchid (*Habernaria lacera*), and prairie willow (*Salix humilis*) continued to appear before stewards as they went about their work. Those plants weren't merely curiosities, they indicated success; for the first time in over a century, the ecological conditions of the prairies were improving.

In 1996, Nachusa initiated the reintroduction of the prairie fringed orchid, a federally endangered species, and one of the rarest in the eastern prairies, in collaboration with the US Fish and Wildlife Service. By 2000, there were six hundred species of native plants documented at Nachusa Grasslands, and rare animals, like the western hognose snake, continued to be discovered. Before long, Bill Kleiman was refining his sense of the overarching purpose of Nachusa Grasslands—to be sure, there were targeted efforts to sustain conditions for particular threatened species, whether it was Blanding's turtles, regal fritillaries, prairie bush clovers, or prairie fringed orchids—but Nachusa was also attempting to restore a bit of *wildness* to the preserve, so that the land community itself could sustain the rare species. After all, the preserve was to be more than a living museum. "We are not attempting to return to 1830," he wrote, "we are attempting to return the processes that ran the landscape before this time."

In 2001, after a multiyear fundraising campaign, Kleiman put his stamp on Nachusa Grasslands with a handsome new headquarters facility, an 1868 stick-frame barn that would simultaneously increase the group's capacity for restoration (they could now properly store hand tools, gas-powered equipment, tractors, and chemicals), while also signaling that the preserve was entering a new era of professionalism. In a surprising turn of events, Delbert Schafer, who was deeply involved in historic preservation efforts around Franklin Grove, volunteered to haul the barn to Nachusa Grasslands from its original site. (Over the years, Schafer's feelings about the place have softened. "It's just water over the dam," he now says. "Life goes on." He and his preser-

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vation society have sold kettle corn at Nachusa's annual celebration for many years.)

Just as important as infrastructure was culture. A few years earlier, Bill and a volunteer steward named Jay Stacy had discussed the importance of a midday meal. Because Nachusa's stewards had come to be self-directed and independent, Bill and Jay thought a lunchtime gathering would be a good way to get everyone together. Instead of working through the day without taking a break (as hardworking stewards were wont to do), anyone on the preserve should gather for about forty-five minutes each day for lunch. In addition to getting to know one another through small talk, the stewards could share notes about their work and offer tips—which persistent weeds they ought to watch for in which management units; which plants were coming into seed, and where to find them—learning from one another's successes and failures. "It's just a time every day where we're reminded we're on the same team," Stacy recalls. Before long, the volunteer stewards were breaking bread with visiting scientists and ecologists from around the world, folks who'd come to see the good work of Nachusa Grasslands and how the stewards had rebuilt a prairie.

Nachusa Grasslands was a trailblazer in many regards, but it wasn't the only tallgrass prairie restoration to push the envelope at the turn of the century. During the 1990s, there was a surge in the size and scope of grassland restoration throughout the Midwest, and one of the biggest projects was taking shape just west of the Mississippi River. In April 1991, the US Fish and Wildlife Service had acquired 3,600 acres in Jasper County, Iowa (after plans for a nuclear power plant fizzled out, Representative Neal Smith had insisted that the land be used for conservation purposes). Initially, it was unclear what kind of management the service would pursue, and one early proposal was a waterfowl impoundment. Biologist Pauline Drobney, however, was among the project's first staff members and was part of an advisory team pushing for something entirely new: ecological restoration of the former tallgrass prairie. Scattered among the vast tracts of farmland were approximately eight hundred acres of "really beat up" prairie, savanna, and sedge meadow remnants—and those communities would be the reference, and blueprints, for putting the ecosystems back together. One year earlier, she had been a founding member and the first president of a new organization called the Iowa Prairie Network (IPN); among its causes was the use of local ecotypes in the roadside prairie plantings now required by a new state law. "It was a time of awakening," Drobney recalls, and the northern Illinois projects—Bob Betz's Fermilab prairie,

Steve Packard's work with volunteer stewards, and the Schulenberg prairie at Morton Arboretum—were fueling the momentum. Just as the Walnut Creek National Wildlife Refuge was getting under way, Drobney visited Nachusa Grasslands. "We were all trying to learn from each other," she says. Back in Iowa, she would be leading the Fish and Wildlife Service in a kind of project the federal government had never attempted before—the wholesale reconstruction of a tallgrass prairie, and on a scale that was far bigger than anyone, anywhere, had ever attempted. "For people who weren't there at the time," she recalls, "I think it's kind of hard to imagine how revolutionary this was." In a few short years, the Neal Smith National Wildlife Refuge, as the refuge would eventually be renamed, would find its footing and develop into a flagship project not just for the Fish and Wildlife Service but for the entire ecological restoration movement.

Back east, there were two other projects about to come online that were every bit as bold as the one in Jasper County, Iowa. In 1996, the Indiana chapter of the Nature Conservancy had purchased just over 7,000 acres of farmland in Newton County for the bold new Kankakee Sands project. If it succeeded, the project had the potential to become the largest assemblage of grasslands east of the Mississippi.

Its success, however, would depend on the speed with which another project advanced, just an hour to the west, in Joliet, Illinois. On February 10, 1996, President Bill Clinton signed into law the creation of the 18,000-acre Midewin National Tallgrass Prairie, the first of its kind in the nation, on the site of the former Joliet Army Ammunition Plant. At its peak during World War II, the arsenal had employed over 10,000 people and produced more than 926 million bombs, mines, detonators, and boosters—but it had been underused since the 1970s. Sprawling over more than 40,000 acres, the US Army had recently declared that more than half of the land was in "excess" of its needs. For Illinois's conservationists, that amount of undeveloped land presented a massive, and unprecedented, opportunity. A coalition of conservationists, who had begun to realize the value of the landscape when upland sandpipers had been discovered there in the 1980s, put together a plan to preserve the property's existing grasslands and to restore vast swaths of the former tallgrass prairie. The governor supported the project, as did Representative George Sangmeister ("without question, this is the greatest opportunity the state of Illinois will ever have to expand its inventory of natural areas," he said); and eventually, under the leadership of Larry Stritch, the US Forest Service, which conserved not just forests but grasslands too, was willing to accept the land transfer from

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the US Army. The name Midewin, a word derived from the Potawatomi Grand Medicine Society, would most often come to be defined as simply "healing," and that would be a fitting moniker; the place needed a lot of work. In addition to deconstructing abandoned munitions factories and locating stores of unexploded ordnance, there was only a scattering of high-quality prairies among its acres of cattle pastures and brushlands (including a few dolomite prairies, the rarest prairies on the planet). Success was far from certain, but the stage was now set for a grassland restoration in the eastern United States on a truly massive scale.

The long-abused eastern prairies were having their moment in the sun. What had once been considered a waste of weeds was now worthy of the most sophisticated, the most detail-oriented restoration efforts ever attempted. Those landscapes, which had been plowed and drained, which had been munitions depots, and narrowly escaped becoming nuclear power plants and international airports, were now to be given over to wildlife, and restored to wild grandeur. The symbolism of trading weapons and industry for biological life was profound, and evidence of a major shift in cultural values. Those were not minor concessions of land; they were huge swaths of valuable real estate, and they would soon be thick with tall grasses and prairie flowers.

The visionaries behind all of those projects—Neal Smith, Kankakee Sands, Midewin, and Nachusa Grasslands before them—were united in the belief that if they could make a prairie big enough, then they should bring back the American bison.

As the experiment approached thirty years, Nachusa's footprint had grown to nearly 4,000 acres, and it had succeeded beyond all expectations—using the metrics of the Floristic Quality Assessment, plantings at Nachusa Grasslands had come to rank as high as any restorations in the world. That success was thanks to the commitment of volunteer stewards who spent hours at a time, on their hands and knees, collecting the seeds of finicky prairie flowers. The prairie's marvelous display of blooms elicited passion and wonder; more than seven hundred plant species were soon to be documented on the preserve, a dozen of which were elsewhere threatened or endangered.

But for tens of thousands of years, prairie plants had not been specimens; they had not been individuals requiring care and management. In addition to having their own intrinsic value, those plant species, wondrous individuals formed in the crucible of evolution and over the course of eons, had also been part of the food chain. They had been the sustenance of tiny insects and

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large mammals alike, an interconnected and ecologically complex biome composed of many thousands of species. For Nachusa Grasslands to become large enough for robust populations of rare plants, rare insects, *and* the largest herbivores of the tallgrass prairie to thrive was the next step in the preserve's development. To restore the complex interplay of plants and animals was why the conservancy was there in the first place.

A sense of wildness was already written into the land. Hundreds of bird species and many thousands of insect species swarmed and swirled and made a great chorus upon the prairie. Badgers hunted prey and dug dens deep down into the prairie earth. They covered rare plants in mounds of sand regardless of how precious any individual species may have been (they didn't know anything about coefficients of conservatism; they knew about living and dying and they knew how to make a good living in the land that the stewards had restored). Whitetail deer sheltered in the savannas and bedded down in the tall grasses. They ate forbs. They ate whatever they wanted and came and went as wild animals are supposed to do. Beavers dammed creeks and increased the spread of the wetlands. Wild turkey gobbled, coyotes hunted, and marsh hawks screamed.

But despite that success, indeed, despite the excitement and wildness, Nachusa Grasslands, and every other tallgrass prairie east of the Mississippi, was still missing perhaps the most iconic element of the prairie: the American bison. The continent's largest grazer—the animal that had evolved to eat all of those grasses and forbs—belonged there, too.

Indeed, the next step in the progression of the experiment at Nachusa Grasslands called for all of those acres of re-created grasses and wildflowers, whose seeds had been painstakingly harvested, dried, sorted, labeled, and then mixed and sown; whose plantings had been weeded, tended, burned, and monitored; where insects had been translocated and released, lived, bred, and died; where stewards got down on their bellies in the muck of a summer wetland and hand-pollinated rare orchids—all of that, they now believed, needed to be eaten, trampled, roughed up and rearranged by 2,000-pound beasts.

After nearly thirty years, it was time to see if Steve Packard had been right about this bit of knobby land west of Chicago; it was time to see if there was enough space and resilience there, in the former cornfields of Illinois, to allow for the return of bison.

The evidence had been mounting for decades.

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CHAPTER 13

The Decision

In the 1960s and '70s, Dot and Doug Wade visited the knobs that would become Nachusa Grasslands several times a week, searching for rare prairie plants, harvesting seeds for propagation, and compiling plant inventories. They also came to enjoy the day and each other's company. "We'd have a blanket on the ground and a picnic lunch with puccoons flowering," recalls their son, Alan Wade. But if the Nature Conservancy went through with its plans to introduce a herd of bison, those days of leisure might be over.

In fact, Dot Wade, the founding mother of Nachusa Grasslands, was adamantly opposed to the idea of bison running loose on the preserve. "My mother hated the idea," recalls Alan. "She was emphatic, not wanting buffalo." She had nothing against the animals themselves, and she understood that bison were part of the prairie system and responsible for the condition of prairies, but she thought the preserve was too small and was afraid that with a bison introduction people would lose access to the prairies; she worried that the places she and so many others had come to love would suddenly be off limits. How could they study the prairie—how could they explore and come to know it—if the grasslands were given over to those massive beasts?

Among the volunteer stewards, the sighting of a rare bird or insect was a cause for celebration, but there was less of a consensus about how to feel toward large animals, especially bison. In the early years, Steve Packard recalls that the Lee and Ogle Counties prairie folks thought the idea was "insane." There wasn't much support for the bison idea among other conservationists in the state, either: At the Nature Conservancy, at a time when many of Packard's colleagues were still focused on protecting the small, high-quality remnants of Illinois prairie, they were hesitant about going full steam ahead with a large-mammal reintroduction project. And bison, as many understood the issue, had the potential to do more harm than good. "They saw grazing as one of the biggest threats to a prairie," Packard recalls. "There was no sense

at the time from anyone that bison would be a good idea. I don't remember anyone saying they thought that was interesting."

Bringing severed ecologies back together was no easy task. Not only were the biological communities fragmented, so too were the spheres of conservation. In the 1980s, restoration ecology was still an emerging discipline, and the bulk of its practitioners were plant people, many of whom had less expertise with animals, especially the big ones. In the meantime, a kind of sister discipline, conservation biology, was also developing (the Society for Conservation Biology was formed in 1985, and its journal, *Conservation Biology*, followed two years later), and its practitioners were largely focused on animals. Furthermore, the language and the big ideas of these subdisciplines differed in significant ways: Whereas restoration ecologists discussed coefficients of conservatism, ecological succession, and floristic quality, conservation biologists theorized about keystone species, umbrella conservation, and trophic cascades. Restoration ecologists often found themselves working on the minutiae of a particular, manageable site; while conservation biologists necessarily focused on larger landscapes and habitat corridors, tracking the movements of wide-ranging animals. To study a species of interest, the restoration ecologists could get down on their hands and knees and explore the diversity of life in a square meter; conservation biologists, on the other hand, stole glimpses of their subjects through the windows of an ultralight aircraft. There were occasions for collaboration, and individual projects might have a good deal of overlap between conservation biology and restoration ecology, but just as often they were separate and discrete. (If the era's tallgrass prairie planters could be accused of sometimes ignoring animal communities, the reverse was just as often true of wildlife biologists: A "good" habitat, they might conclude, could be lacking in richness and diversity, and it could be dominated by exotic species, so long as it favored a particular species of animal.) But Steve Packard's vision for this experiment had always been to bring these worlds together.

At Nachusa, some folks worried that large mammals could turn the place into a kind of zoo. If too much emphasis was placed on bison or elk, the focus could shift away from the conservation of rare plant communities—and, as many in the movement saw it, the conservation of rare plant communities was the entire purpose of a tallgrass prairie preserve (after all, elk and bison had no shortage of admirers, while the grasslands still had comparatively few). But Packard never let go of his vision, and he continued to remind Nachusa's supporters that bison were part of the reason that this new, and expanding, nature

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preserve was established. In 1993, when Steve Packard interviewed Bill Kleiman for the land steward position at Nachusa Grasslands, he had asked him what he thought about grazing the prairie with bison, and the notion that bison might someday return to the plot of land remained front and center throughout the early years of Nachusa Grasslands. For every skeptic of the idea, there was another person who would become an enthusiastic supporter of bison reintroduction—the mere mention of bison was what had drawn them to Nachusa in the first place—and that kind of bold mission was what kept them so devoted to the project. Still, even among the most adamant bison believers, there was an understanding that a herd would not materialize overnight—they were going to have to do a lot of groundwork and land restoration first—and that as much as any single charismatic species mattered, it was in fact the totality of life—the diversity and quality of this tallgrass ecosystem—that mattered most. Bison were iconic, but they were just one piece of the puzzle.

Long before there was any talk of translocations, Nachusa had already become a refuge for wildlife. Dot and Doug Wade sensed this when they discovered upland sandpipers there in 1965. The margins of Delbert Schafer's farmland—the areas that were too rocky or too wet to plow—harbored populations of shrews, and voles, and muskrats; Blanding's turtles and hognose snakes found refugia in the unplowed corners. As the preserve expanded, so did the number of animals within its habitats. There were six species of bats; there were otters and mink and fox; there were more than 180 species of birds, thousands of species of insects, more than forty species of butterflies, and over a hundred species of native bees. And if they weren't there prior to 1986, other animals soon found the place; by the early 1990s, badgers were denning on site. "Here at Nachusa Grasslands, we are confident in the 'Build It and They Will Come' theory," one volunteer noted. Although that theory might have worked for prairie birds and enterprising mammals such as the badger, the stewards were well aware that some species would require a little more coaxing. In 1996, Bill Kleiman and a group of volunteers formed the Rare Animal Recovery Effort (RARE) with the intent of restoring the various insects, amphibians, reptiles, fish, and even prairie chickens that had once called the prairie home. Later that year, they acquired nine Franklin's ground squirrels and released them near a fen (that effort, like the ill-fated fish and game projects of the early twentieth century, did not immediately lead to a robust population, and in subsequent years there would be only a couple sightings of the secretive rodent). With its diversity of habitats, Nachusa had the capacity to support a plethora of wildlife, and Kleiman was working to maximize that potential.

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Early in 1996, three years into his role at Nachusa Grasslands, Kleiman presented a proposal to the Illinois board of TNC for bringing bison to the preserve—a herd of twelve bison for a trial period of five years—to "help answer science questions such as whether or not a synergy exists between a prairie and bison." The proposal was unanimously approved (John Santucci, the Illinois trustee who had written the personal check for $20,000, to save Nachusa from the auction block, was as enthusiastic about the idea as anyone; he led the board on a feasibility study, touring western preserves where bison were now present, and argued that not only could it be done but that an Illinois herd could be a significant fundraising draw as well). Back at Nachusa, however, there was hesitancy on the part of Kleiman's fellow stewards, who were worried that keeping a herd of bison would distract them from their primary duty of restoring the preserve's native plant communities. And so the proposal was shelved. The stewards continued their work of ecological restoration, and the question of bison ("You can do that?") remained unanswered.

The fact that a nature preserve in northern Illinois could consider adding a herd of bison to its land was a kind of victory for these animals—only a century earlier, the species had been on a path toward certain extinction. In 1884, there had been a low of approximately 325 bison in the United States, the majority of which were captive, and there were no more than 25 wild bison anywhere in the country. (Only a few decades earlier, there had been a staggering 40 million bison grazing the continent.) But by the 1990s, as Nachusa Grasslands considered the role of grazing in their tallgrass prairie, the American bison population had risen to more than 200,000 animals, and the species was once again considered secure.

The initial recovery was thanks to the efforts of conservationists such as Ernest Harold Baynes and William Temple Hornaday, of the New York Zoological Society, who along with President Theodore Roosevelt had formed the American Bison Society in 1905 and rallied public support and attention for the species at the time of its greatest need; it was thanks to the foresight of bison collectors such as Charles Allard, Michel Pablo, and Austin Corbin, who had saved and reared the last of the animals on private ranches. Before long, those collectors were sending animals back to the land. In 1907, the American Bison Society sent animals from the Bronx Zoo to the newly created Wichita Mountains Wildlife Refuge in a pair of Arms Palace horse cars, the first of several reintroductions that would bring the animals out of captivity and onto

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refuges and parks throughout their former range. The society would go on to successfully lobby for the creation of the National Bison Range and, with a nationwide fundraising campaign, paid for a herd to populate that new refuge on the Flathead Indian Reservation in western Montana. At Yellowstone National Park, where the country's only free-roaming bison still lived, the animals were afforded protections in the form of the Lacey Act of 1894 (and a subsequent Lacey Act of 1900), a law that regulated the sale of wild animals and finally gave teeth to fledgling antipoaching efforts. For how dire the situation had been, the subsequent turnaround was rather quick. As early as 1916, the American Bison Society had declared that "not only is the American bison no longer in danger of extinction but it is firmly established in all parts of the country," and by 1935, it would proclaim the bison officially recovered and disband itself (around the same time, Yellowstone National Park found itself in the strange position of having too many bison and would begin culling a couple hundred animals from the herd on a regular basis).

Americans were proud of the recovery; they had pulled the buffalo back from the brink of extinction after shoving it there a generation earlier. Those who wanted to see them for themselves could drive out into the countryside and see them in numerous national parks and wildlife refuges in the western states. In the 1930s, the Pine Ridge Sioux and Crow had begun restoring bison to their reservations in South Dakota and Montana, and those animals now numbered in the hundreds. As the refuges and national parks filled with bison, they were sent to state parks too, and increasingly the animals were placed in settings far to the east. In 1969, a herd of nineteen bison were shipped from North Dakota to the Kentucky-Tennessee line, where they would graze on a hundred-acre pasture at Land Between the Lakes. In 1975, ten bison were even sent from Oklahoma to a state park in north-central Florida. And they reappeared in Illinois; the Wildlife Prairie Park, which opened just outside Peoria in 1978, offered residents of the Prairie State the opportunity to glimpse black bear, wolves, and the American bison (closer to Chicago, they could see bison at Fermilab and take a peek at Bob Betz's re-created tallgrass prairie). Viewing those large animals on their native eastern soil helped people imagine the kind of place it had been not long ago. Throughout the nation, private bison ranchers were also cropping up. The media mogul Ted Turner bought his first bison in 1976 and in a few years would come to own the largest bison herd in the world (private ranchers, in fact, would soon come to hold the vast majority of the world's bison). From

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the Great Plains of Montana to the piedmont of Virginia, bison were well within reach as specimens to view and to eat, and the threat of extinction no longer loomed. Bison were abundant in our parks and our imaginations, and they became icons of conservation, symbols of a wild and free America. In their destruction, we had seen America at its worst; in their return, America at its best. As long as people could see that the animals still existed, they were assured that so, too, did some kind of wild America.

It was a pretty good story, but many decades would come to pass before we'd begin to realize this fact: To save the American bison, we'd entered them into a Faustian bargain. We would restore a fraction of their former abundance, but almost nowhere would they be allowed to roam free; nearly every herd of bison would be confined behind a fence. We did that at first to secure the population from harm; we kept doing it to protect the cattle and the range of private ranchers; and we kept on doing it decades later because we could not imagine sharing the land with bison any other way. Fencing bison—and only bison—had become the American way.

By the end of the twentieth century, more than 200,000 bison were owned by private ranchers, while a humble 20,000 occurred on public land for the American public to view and enjoy. If Nachusa Grasslands never introduced a herd of bison, it was unlikely to have an impact on the security of the species. But what Bill Kleiman had in mind for his Illinois preserve was different from an endangered species recovery. His interest in bison was not to conserve the species nor to bring it to the preserve as a showpiece; it was the animals' ecological function he was after. He wanted bison on his prairie as a management tool of ecological restoration. That was a relatively new idea—and it hadn't been attempted on a nature preserve east of the Mississippi.

The restoration of bison to the tallgrass prairies—the reunion of that native grazer to the diverse and expansive grasslands—could not begin in the East. The remnant grasslands were just too small. Conservationists were going to attempt that first where they had the space, where significant acreage of native grasslands still existed, and that was only in the West. The mixed and shortgrass prairies had fared better than their tallgrass counterparts to the east. To be sure, settlers had cultivated the land wherever it would yield to the plow and turn a profit, but these western prairies still existed to the extent of 30 percent and 50 percent, respectively, of their former range (as compared to the estimated 4 percent of the fragmented remnants of tallgrass prairie). The West

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had its big sky, it continued to hold America's biggest wild animals, and it still had big prairie.

But even out there, there were significant barriers to bringing the bison home: Yes, there were vast grassland expanses, but landowners and lessees that controlled these habitats weren't eager to make room for additional grazers. Indeed, settlers had filled the former bison range with livestock just as soon as the indigenous herds had been killed—in fact, one of the motivations for killing off the bison in the first place had been to make space for domestic animals. The ranchers didn't want competitors on the range, and in the twentieth century, they had come to fear the diseases that might be walking in on the hooves of wild bison. Which meant that the idea of free-roaming bison, in the contemporary world, was a nonstarter—and anyone proposing such a thing was likely to be run out of town. So long as these conditions prevailed, the ecological restoration of bison would necessarily take a different, and truncated form—and this would set it apart from all other large animals on the continent.

This didn't stop people from trying to protect their home on the range. Since the 1920s, conservationists had been pushing for a prairie national park in the Great Plains—if bison could not roam free, a national park could preserve their sprawling habitat and fence them in—but for decades this effort likewise came up short. Western ranchers didn't welcome the idea of an increased federal presence, and a grassland park wasn't high on the list of demands of the American public. But an increasing number of conservationists knew that those grasslands were floristically rich, diverse, and worthy of preservation, especially as rangeland continued to be overgrazed and degraded and as the plow line steadily advanced westward; if the western prairies weren't protected soon, they might end up like the tallgrass to the east.

If the federal government wasn't capable of taking decisive action, nongovernmental organizations would once again have to pick up the slack. In the 1970s, the Nature Conservancy was still relatively small, with little presence or membership in the plains states. Low membership meant low funding, and that, of course, made it hard to buy land. Furthermore, natural areas in the West weren't limited to the remnant scraps Illinoisans such as George Fell and his Illinois Natural Areas Inventory colleagues were scrambling to buy; the western prairies sprawled for thousands of acres, and they were expensive. But the effort would soon get a massive boost from the philanthropist Katharine Ordway, the heir of the Minnesota Mining and Manufacturing (3M) fortune.

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Ordway had grown up in St. Paul, Minnesota, where she had fallen in love with the region's native tallgrass prairie. In college, she had studied botany and art and in graduate school biology and land use planning. Like other naturalists, she watched with heartache as the grasslands and other natural areas were plowed and otherwise developed. But she would soon be in the singular position of being able to do something about it. When her father passed in 1948, she inherited millions of dollars and would devote herself to preserving midwestern natural areas and her beloved prairies in particular. By the time of her death, in 1979, she would aid in the protection of more than 31,000 acres, becoming "one of the greatest private contributors to natural area conservation in American history, second only to John D. Rockefeller, Jr."

In 1975, the Nature Conservancy was able to purchase its first truly large grassland preserve: the Ordway Prairie,* just west of Leola, South Dakota; it was 7,600 acres of high-quality rolling hill prairie, dotted with prairie potholes, open lakes, and marshes. It supported thousands of ducks of myriad species, and bitterns, herons, cormorants, ferruginous hawks, plovers and phalaropes; there was even a small herd of wild pronghorn antelope, the easternmost population of this plains species. The Nature Conservancy had never managed a place that big, and truth be told, it didn't know how to. It was to be a place of research with two main goals: to maintain a high-quality prairie and to restore the wildlife that would have been native to the area. Its first manager, Paul Bultsma, led an inventory of butterfly and grasshopper species (among other things, documenting the threatened Dakota skipper); he reintroduced Canada geese; and he began to implement prescribed fire, which was still controversial in the Dakotas at that time—and considered downright dangerous by Ordway's ranching neighbors. Aware of how the Nature Conservancy could be perceived—a 7,000-acre property coming off the tax rolls and being lost to agriculture, its grasses set on fire—TNC committed to making voluntary payments in lieu of taxes. But in order to make these payments, the preserve would need to *earn*, so Bultsma leased the prairie to cattle ranchers. It was a win-win: The cattle grazing paid the bills, and for the prairie system, it mimicked the kinds of disturbances that the grassland relied upon.

But cattle, of course, were not the indigenous prairie grazers, and the goal of the preserve was to restore the wildlife that had been native to the shortgrass prairie. So in 1977, Bultsma leased the Ordway Prairie to a rancher who would

* Later to be known as the Samuel H. Ordway Jr. Memorial Prairie, named in honor of Katharine's cousin, who was also a devoted conservationist.

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run not just cattle but also thirty head of bison. It was just an experiment—Bultsma would compare the ecological differences in the grazing of cattle and bison—but it was the first time that a nature preserve had introduced a herd of bison not for the sake of the bison, nor for the sake of the viewing public—but to restore the ecological disturbance of the prairie's most significant grazer. Without much fanfare, a new era of ecological management had begun.

As the bison grazed the Ordway Prairie—for the first time in over a century—additional big prairie was coming under TNC's stewardship. In eastern Kansas, the 916-acre Konza Prairie Biological Station, a tallgrass preserve that the conservancy owned in partnership with Kansas State University, had recently swelled to a whopping 8,100 acres after a land swap (made possible by an additional $3.6 million gift from Katharine Ordway, then the largest in the conservancy's history) that had included the ranch adjacent to Konza. As the initial footprint hadn't provided enough "elbow room" for bison, the extension was a game changer—more than a hundred wild prairie chickens could be found on the property, and mountain lion sightings were not uncommon—and Konza's manager, the plant ecologist Lloyd Hulbert, was soon making plans to introduce bison, elk, and pronghorn antelope. "We want to get as close as we can to what conditions here were like 500 years ago," he said. In a few years, TNC would also come to own a 5,000-acre prairie in North Dakota; and in 1984, it became the steward of a truly massive spread, the sprawling, 54,000-acre Niobrara Valley Preserve in the sandhills of north-central Nebraska.

With those large preserves, the Nature Conservancy continued moving into the unknown. At Konza, it had an invaluable partnership with Kansas State University, but elsewhere, the management plans were less well defined. The conservancy, to its credit, was hiring the right kind of people to figure it out—young, idealist conservationists who were committed to addressing the shortcomings of mainstream conservation. In 1982, after six years in Leola, South Dakota, Bultsma left the Ordway Preserve; his replacement was Al Steuter, an ecologist who'd just earned his PhD in range science from Texas Tech. Working with him that summer was Bob Hamilton, a graduate of Emporia State University. They had both come of age in the post–*Silent Spring* era, a time of both great environmental crises and hopeful environmental awakenings; Steuter, too, was a veteran of the Vietnam War. "It was a very dynamic time," he recalls. "There were enough cases of human impacts gone wrong, relative to the environment, that people started worrying. There were people arguing that this is in our best interest to keep as many species around as we can, because we don't know what importance they may

have, either now or in the future." They were also beginning to talk about landscape resiliency, and the opportunities and the interactions of the myriad small animals, insects, birds, and native plant communities—they were thinking about the interactions of those species with one another and with large grazers such as bison, elk, and pronghorn antelope; how grazing interacted with fire, drought, and other ecological disturbances; and how these processes shaped and defined a healthy prairie. Those were heady times, and the young ecologists were given thousands of acres and told to figure it all out. As another conservancy manager, Glenn Plumb, recalled, they were trying to conserve the wildlife of the prairie, and they were doing that with the tools of a rancher: "We were cowboys trying to figure out how to make a ranch pay."

Their first summer on the job, Al Steuter and Bob Hamilton had a breakthrough. They'd spent a few days at the conservancy's newest property, the 5,000-acre Cross Ranch Preserve, near Mandan, North Dakota; their regional supervisor, Mark Heitlinger, was in from Minnesota. After a day of work, the three men were overlooking the South Unit of the Cross Ranch Preserve, a big expanse of grassland, with rolling hills and big canyons running toward the Missouri River. The picturesque scene reminded Steuter of a Charles Russell painting, a remnant of wild America except for the cattle that were scheduled to graze the place. It was understood that American prairies ought to be grazed by large ungulates—that was part and parcel of their evolution and maintenance—but as they gazed upon the picturesque spread of remnant natural land, they realized that cattle weren't right for that nature preserve. What they really ought to do was restore the native grazers, not just on the occasional preserve but permanently. Bison *belonged* there. They were native to the prairie and putting them back was appropriate. For ecologists such as Steuter and Hamilton, it was clear: Bison had evolved with the prairie, the prairie had evolved with an overwhelming abundance of large grazers, and restoring that ecological disturbance would be good land management. Steuter recalls the moment as the genesis of the conservancy's commitment to bison. "We don't want to do this work unless we can do it with bison," the three men had concluded. "All we have to do is size it right and manage it right, and we can do it with the native grazers."

But there was more. They didn't want to rotate the animals with interior fences; fencing and intense management wouldn't be appropriate for a place like that. Steuter had a hunch that the bison would be naturally attracted to the fresh flush of new growth in burned areas, which produce high-quality forage, and that they could move the animals not with fences, but with fire.

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At the time, grazing and fire were separate fields of study, but he sensed that they were tandem ecological forces, and he wanted to put them back together. It was a compromise; the bison would be confined behind a fence, but they would be managed more like wildlife, and less like livestock.

Finally, Steuter didn't want to have someone else's bison come and go; he wanted the preserves to own the bison, and he wanted them to be on the ground year-round.

That was not a decision to be made lightly. Bison were iconic—they would draw a lot of attention, both good and bad—and they were also wild animals. Containing bison on the preserve was more challenging, and more controversial, than cattle. There were no state chapters of the Nature Conservancy in the Dakotas then, and a decision of that magnitude would need to go through both the Minnesota regional office and the national headquarters in Washington, DC. Back in Minneapolis, Mark Heitlinger was willing to go to bat for the bison; he and Rex Boner, the director of land stewardship for the Midwest, worked hard to convince the national organization that this was a good idea. They were among the first generation of land stewards identifying as restoration ecologists (they were contributing to a new journal, *Restoration & Management Notes*, which would later become *Ecological Restoration*), and together they were defining the new science. They were willing to accept the risks of becoming bison stewards—facing disease outbreaks, startup costs, and strained relationships with neighbors—because they believed in the vision and the purpose of the work.

After two years of planning, they were given the green light; in 1985, the first Nature Conservancy–owned herd of bison headed to the Ordway Prairie in South Dakota. Steuter had arranged for a PhD student from Texas Tech, Glenn Plumb, to compare the ecological differences of cattle and bison grazing on this remnant mixed-grass prairie. (Plumb, who would later become the chief wildlife biologist at the National Park Service, had argued that the conservancy should own these animals—after a lessee's bison tested positive for tuberculosis—and he was given the money to establish a small herd.) When the first trailer of bison were turned out onto the Ordway Prairie, it was a turning point for prairie stewardship: Bison would become a management tool for the native prairies, and the bison themselves, unlike the roaming herds of the past, would settle in for the long haul.

In 1984, Steuter had the opportunity to become steward of the 54,000-acre Niobrara Valley Preserve in northern Nebraska; and after a year, he had a herd of bison on the ground there, too. At the same time, Hamilton had

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just introduced a herd to the Cross Ranch Preserve in North Dakota, so there were now three TNC-owned bison herds on three different preserves in the mixed-grass prairies. As the tandem forces of grazing and fire once again mingled, Steuter and Hamilton were pioneering the science of conservation grazing, where the goal was not the fattening of livestock, but rather achieving maximum biological diversity. "I think of it as kind of designed or managed chaos," Bob Hamilton says, "where the underlying principle, of course, is to maintain a patchy landscape with all these different habitat opportunities for all different species . . . this bold new idea was, let's throw the two ecological forces back together—this fire-grazing interaction—let's throw them back together and see what happens." In the years to come, ecologists would call this kind of management patch-burn grazing, and its principles—whether carried out with cattle or bison—would become standard practice in grassland restoration. But in 1984, it was still just a hunch that if they brought the original elements together, the system would sort itself out.

Up until 1987, bison were still absent from the native tallgrass prairie. At that point, the only place where significant expanses of tallgrass remained was in the greater Flint Hills of eastern Kansas. This ecoregion covered nearly 4 million acres; if just 4 percent of the tallgrass remained nationwide, roughly 80 percent of that was in the Flint Hills. Those prairies still existed not because of any conservation efforts but simply because the soil was too rocky and poor to plow—imagine 4 million acres of Nachusa Grassland's rolling, rocky hills—and consequently nearly all of it was devoted to livestock grazing. It was a special place: Farther east, livestock grazed upon "improved pastures" dominated by exotic, cool-season pasture grasses—but the cattle of the Flint Hills were reared on the native vegetation of remnant plant communities. The Flint Hills were unique in another regard: Not only were the tallgrass prairies intact, but the local ranchers had maintained their quality with annual burns. Somewhere along the line, the ranchers had realized that fire made better forage, producing an earlier green-up in the spring, so they'd been burning the prairies as long as anyone could remember. By the time conservationists came to value the area, plant ecologists had begun to realize that the ranchers' fire, along with their cattle, had maintained the diverse communities of the Flint Hills.

But they hadn't yet seen it done with bison. For the past decade, Lloyd Hulbert had been saying that as soon as the conservancy could raise enough money to build a fence around its 8,000-acre Konza Prairie, they would restore

a herd of bison. Hulbert had said the bison—and the elk and the pronghorns—would lend an element of realism to the Konza experiments: "In the long run, the addition of these animals would be of great value in land management studies." In 1980, Konza became a UNESCO biome reserve, and that same year, it was established as one of the first Long-Term Ecological Research sites funded by the National Science Foundation. After ten years of preparation and the implementation of numerous ecological studies, the fences were up and the bison were on their way—soon, the impacts of bison, which hadn't been felt in tallgrass in over a century, would be restored to the prairie. A year later, Bob Hamilton moved from North Dakota down to Oklahoma to take on another new TNC property, the nearly 40,000-acre Joseph H. Williams Tallgrass Prairie Preserve. In 1993, after five years of preparation, Hamilton released three hundred bison onto the sprawling prairie in Osage County, Oklahoma.

With bison now grazing on a growing number of preserves throughout the Midwest, Steuter, Hamilton, and the myriad researchers at Kansas State and within the Nature Conservancy were soon confirming with scientific studies what they had sensed all along about bison and prairie: Bison were hardier in harsh winter conditions—they were the surviving members of a genus that had evolved and migrated through the Arctic tundra, after all—and they were less likely to loaf and linger in wetland areas. As studies would soon demonstrate, bison were more likely to selectively graze on grasses, and pass over many of the conservative forb species. The social tendencies, the movements, and the behaviors of bison had evolved within those prairies; they were indigenous to this place—and the cattle, despite the ways in which they could be beneficial, were not. And so as the conservation movement was reassembling the prairie communities—and as it acquired larger and larger tracts—bringing back the bison continued to make good sense.

In 1996, bison were taken to a tallgrass prairie east of the Missouri River, the newly established Neal Smith National Wildlife Refuge in Jasper County, Iowa. Ecologically, the prairies of the Flint Hills and Iowa were both classified as tallgrass, but east of the Missouri, the prairie soils were richer, wetter, and trending toward the Prairie Peninsula ecotone of the East. Relocating bison to that kind of landscape was new and different. The Iowa refuge contained a few degraded remnants, but it was largely composed of new and yet-to-be-planted prairie reconstructions, and the restorationists leading these efforts hypothesized, and hoped, that the bison would help control or even eliminate exotic, cool-season grasses and that as a result native species would increase; they hoped that the prairie plantings would become more botanically diverse and

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in turn support a greater diversity of butterflies, bees, and specialist grassland birds. And they hoped that the presence of bison so close to Des Moines would draw people to the refuge and build support for the experiment in ecological restoration.

It was a pivotal time for both the prairie and the bison, and the braided recovery would continue to transform the bison themselves. Conservationists were now less inclined to talk about bison as an endangered species or as individual targets of conservation needs; instead, they began to describe bison as ecosystem engineers, as providers of ecological services. The icon of the American wilderness was being transformed yet again, and this time it was a tool of the landscape manager—a conservation panacea.

The revival of a wild, unsettled America, however, was not something that all Americans had agreed upon. In rural areas, there had long been fear and resentment toward the federal government whenever there was talk of establishing a national park or national forest—a fear based on the fact that the government had seized private land in the past. Even though eminent domain was now an option of last resort, there was still a fair amount of distrust toward big, federal projects. In the 1970s, when the government had started looking for 320,000 acres across three parcels in the Kansas Flint Hills, tensions had arisen between those who wanted to see the prairie preserved in a national park and those who most certainly did not. The antipark movement of the Kansas Grassroots Association let it be known that they wanted no such federal presence in the Flint Hills (among the antipark bumper stickers that proliferated in the area were "Preserve Prairie Privately," "Help Stop Tallgrass Takeover," and "Keep the Grasslands Free"). "To be right honest with you," one Flint Hills rancher said in 1980, "ranchers aren't much interested in having the government interfere with them. Ranchers are an independent bunch. What bothers us most is the use of eminent domain. We feel it's wrong for one group of people to take land from another." That kind of opposition would keep the National Park Service from making headway in the Flint Hills, and when it eventually established a preserve in 1996, it wouldn't be called a national park and was far smaller than the 320,000 acres it had once envisioned (the Tallgrass Prairie National Preserve was established under a unique public-private partnership, and of the eventual 10,000 acres, the National Park Service was limited to just 108 acres). Meanwhile, the emergence of the Nature Conservancy as a significant conservation force added an additional wrinkle to the drama. TNC was not the federal government, but perhaps it was worse: a

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global environmental group beholden not to the American public but to the whims of wealthy donors. But as a private entity, the conservancy had also worked exclusively with willing sellers, and by voluntarily paying their taxes, they hoped to be viewed as good neighbors.

In the world of grassland restoration, however, some of the most intense backlash would not be directed at the federal government or NGOs but rather toward a pair of humble academics. In December 1987, a paper was published in an obscure urban planning journal, *Planning*. As the paper made its way through both academic and laymen's circles, it caused a tremendous stir. The title of the article was "Great Plains: From Dust to Dust," but the idea it promoted would come to be better known as "The Buffalo Commons." In this paper, the wife-and-husband team of Deborah Epstein Popper and Frank J. Popper, geographers at Rutgers University in New Brunswick, New Jersey, argued that because significant areas of the Great Plains were rapidly depopulating, and because of the environmental degradation that poor agricultural practices had wreaked upon the plains, we ought to intentionally depopulate the place, reconceptualize the western prairies as a sprawling wildlife park, and commence with grassland restoration. In this argument, the Poppers didn't pull any punches. "We believe that over the next generation the Plains will, as a result of the largest, longest-running agricultural and environmental miscalculation in American history, become almost totally depopulated. . . . We are suggesting that the region be returned to its original pre-white state, that it be, in effect, deprivatized." Predictably, that kind of talk did not go over well in the local communities the Poppers described, especially as they used data to make their case: They pointed to the facts that towns were already dying and that overgrazing and poor management of soils had already degraded the land. "A vast, beautiful characteristically American place will go the way of the buffalo that once roamed it in herds of millions," they wrote; the federal government, they said, ought to manage an orderly retreat of private landowners, they believed, and the land should be allowed to return to the bison.

The Poppers weren't the only folks making such arguments, but their proposal was the most radical—it spanned nearly all of the Great Plains from Canada to Mexico—so it was their proposal that made the biggest splash. In the Flint Hills, there were suspicions that the federal government would seize private land for a national park—and there were the Poppers, saying it was a great idea. The Poppers suggested that some tracts of land should be given back to several Sioux tribes in South Dakota—but the vast majority of it would be turned into "the world's largest historic preservation project, the ultimate

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national park." "On the land side, the government will take the newly emptied Plains and tear down the fences, replant the shortgrass, and restock the animals, including the buffalo." For some Americans, it was a wonderful, inspiring idea. The Poppers even went on a speaking tour throughout the Great Plains and beyond (perhaps no urban planners in American history had ever been so in demand). But for others, the message was akin to treason, an attack on private property rights, or a secret Communist plot—and the Poppers were forced to cancel at least one public engagement after receiving numerous death threats. The Buffalo Commons proposal was merely an academic exercise—it wasn't a proposal or project that any government agency was interested in—but it had struck a chord.

The fallout from the Buffalo Commons saga occurred at the same time that TNC was embarking on projects that were suspiciously similar to the thing the Poppers were advocating for: acquiring farmland, restoring prairie, and stocking it with the extirpated bison, elk, and antelope. The bison on the conservancy's preserves weren't free roaming, but places like the Niobrara Valley Preserve and the Konza Prairie bore an uncomfortable resemblance to the kinds of activities the Poppers were in favor of. In the Nebraska Sand Hills, where Al Steuter had recently introduced a herd of bison and where he was burning thousands of acres of grassland in a single season, he was met with skepticism and hostility. Fire was still controversial on the western plains, and in his Nebraska community, ranchers still viewed fire as destructive and dangerous. Some of his neighbors went so far as to tell him they were going to run him out of town. But Steuter, who was not an urban planner and who had grown up in a Nebraska farm family, kept his head down and focused on his work. ("It takes a certain amount of skills to be able to live with your neighbors and also do stuff that's controversial," he admits.)

In addition to the backlash directed toward the Buffalo Commons proposal, there was a segment of society that was eager to lash out at environmental protection writ large, including a number of private landowners and pro-development interest groups who felt increasingly burdened by environmental regulations. In the meantime, conservationists were simultaneously attempting to reconcile an industrialized, working America with an ecologically sound, and biologically diverse, America. (Was it even possible to have both of those things?) At its core, the fact that Americans weren't united in their beliefs about good land stewardship meant that it was hard to both propose ambitious conservation projects *and* please everyone.

Whether it was the restoration of free-roaming bison, or the revival of an

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ancient swamp, a number of Americans saw the recovery of wilderness as an end to their way of life. Back in Illinois, Delbert Schafer had come to terms with the loss of his farmlands in Franklin Grove, but there were others in Lee and Ogle Counties who looked at valuable cropland growing "weeds" and thought it was an abomination. To the grassland ecologists, restoring bison meant the healing of a landscape. But to farmers and ranchers, the restoration of prairie and bison meant undoing decades of hard work.

In the 1980s, when the Nature Conservancy began introducing bison to their grassland preserves in the West, such a thing was unthinkable for the high-quality prairies east of the Mississippi; in Illinois, for example, the remaining tallgrass prairies were too small to meet the needs of those social, herd-forming, voracious animals. Furthermore, the botanists who had devoted themselves to rescuing the vanishing flora on those scraps of land understood that cattle grazing had been one of the most destructive forces of native vegetation in the remnants—as indeed it had on those relatively small, botanically invaded, eastern grasslands. Many of the remnants were adjacent to highways, on the outskirts of Chicago, or else postage stamps of natural land, pioneer cemeteries adjacent to railways. The mean size of a remnant prairie was probably around five acres. A herd of bison would be a sight to see, but it couldn't, and shouldn't, be done.

But the wholesale re-creation of sprawling eastern prairies had created new opportunities. Nachusa Grasslands, and places such as the Neal Smith National Wildlife Refuge, were demonstrating that if done well, and if done in concert with adjacent natural areas, a prairie reconstruction made remnants and their endangered species and their communities more abundant and more resilient—more like the prairies they'd read about in history books or seen out west. More often than not, a big prairie leads you to think about big animals. The newly established Midewin National Tallgrass Prairie in Joliet, Illinois, would come to be nearly twice the size of the Ordway Preserve in South Dakota and nearly twice the size of the Konza Prairie in Kansas; there was not yet a significant high-quality prairie at Midewin, but its potential encouraged conservationists to dream big. As early as 1994, the folks who were pushing for a large grassland preserve at the former Joliet armory included in their proposals a herd of "watchable" bison, and the reintroduction of bison would soon be identified as one of the primary goals of the project. At the same time, plans were under way for the Kankakee Sands experiment in northwest Indiana—and in one of its earliest feasibility reports, the conservancy noted

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that in addition to providing habitat connectivity between existing natural areas, a restoration of this scale could provide space enough for both the prairie chicken and the American bison.

Because of restoration, some eastern landscapes were now big enough that they could inspire the idea of bison. The idea of grazing as a conservation tool—as a prerequisite for prairie conservation—was moving eastward.

It was this same busy year, 1996, that Bill Kleiman had been given approval for a bison experiment, which he subsequently put on hold. But he hadn't stopped thinking about grazing. For some years, he and others had noticed that the preserve's population of the federally threatened prairie bush clover was on a decline. They'd survived there with grazing—perhaps even benefited—for decades. As his team had come to understand, grazing clears out the grasses and gives the bush clover the space it requires to thrive. In 2000, he brought a single Jersey cow to that remnant area of Nachusa Grasslands; a simple electric fence was erected on one of the remnant knobs where the prairie bush clover grew, and the lone cow was allowed to graze there for the season. The next summer, there was a marked increase in prairie bush clover; the impact of grazing had been immediate.

But it was bison, not cattle, that remained a core part of Nachusa's identity. In 2006, Nachusa Grasslands produced a T-shirt—a stylized sunset over the tallgrass prairie, superimposed with the outline of a bison and, in the top right, two words: "The Vision."

In 2008, Kleiman hired a restoration ecologist to work alongside him at Nachusa, and this addition would bring a jolt of energy to the question of bison. Cody Considine was a charismatic outdoorsman who had grown up just down the road in Dixon, Illinois. He had visited the preserve on several occasions with his uncle Damian, who was a dedicated volunteer steward; and attended a few Autumn on the Prairie events, where he remembers hearing that bison might someday come to Nachusa. His father and uncle had instilled conservation values into Cody through hunting, camping, and hiking; his father's lamentations over the loss of wetlands, at watching bulldozers clear the natural areas he'd once cherished, had had a strong effect on Cody. After college, Cody interned with Nachusa as a seasonal crew member, and was captivated by the physical work and the big ideas of restoration ecology; in grad school, he studied the fire history of Pembroke Savanna in northeast Illinois, down the road from the massive Kankakee Sands project in Indiana. "I fell in love with restoration," he says. "The idea of taking cornfields and

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putting them back into wildlife habitat—I can't get over how cool it is. I still can't get over it."

Considine was also familiar with the emerging role of grazing on prairie plantings. Among his graduate advisers was Sara Baer, one of the leading grassland ecologists, who operated a lab at the University of Kansas. Baer conducted her PhD work at Kansas State University on the Konza Prairie, where some of the most significant research on the interactions between fire, grazing, and tallgrass prairie had been coming from. From Konza, Oklahoma, and a few other long-term ecological studies, it had become accepted as a matter of fact that a healthy prairie needed to have the disturbance effects of grazing. "They're essential for the functional components of that system to do what it does," Considine says. "It needs that kind of grazing disturbance." As they continued managing Nachusa Grasslands, Kleiman and Considine were both thinking about bison—seemingly everyone in the prairie world was. And then, sometime around 2009, Kleiman approached Considine. "If you're ready for bison, I'm ready for bison," he said. "Let's do this." In the pages of *Prairie Smoke*, they began to make not-so-subtle declarations: "In the years to come bison will roam again in the Rock River Valley, and people from all over the world will come to see them"; and again in 2010: "Over the decades, disturbance from large ungulates like buffalo will disrupt the conservatives and create openings for the return of the adventives—recreating the endless cycle of prairie renewal." They weren't yet specific about when that might occur, but their statements served as reminders to their supporters and fellow stewards: Bison were part of the project's vision, and they were bringing this back to the fore.

As preserve manager, the decision to bring bison to Nachusa Grasslands was Kleiman's to make. But like so many other decisions, he would not make it alone. He started talking to his team, which had never been stronger. Volunteer stewards were at a golden age—they'd been working long enough that they'd hit their strides. They were responsible for some of the highest-quality work not just at Nachusa, but anywhere in the world. Now it was Kleiman's job to ask them what they thought about mucking it up—to put a 2,000-pound grazing, wallowing, defecating, herd-forming, wild mammal in the middle of their painstakingly curated tapestry. The best available science argued that not only was grazing good for the prairie, it was essential. In early 2012, the Illinois board of trustees had approved the Nachusa Grasslands bison plan. Based on the size of the site, the proposal called for just twelve to fifteen bison—not quite a thundering herd but bison nonetheless.

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For several years, Bill and Cody, and several volunteer stewards, made a point of visiting every conservancy-owned bison herd throughout the country. They wanted to see what bison and prairie looked like together, and they needed to learn the technical details of bison management, fall roundups, veterinary care, and population dynamics. Two years in a row, they traveled to the Tallgrass Prairie Preserve in Osage County, Oklahoma, and assisted Bob Hamilton on a bison roundup. (As Glenn Plumb puts it, Hamilton had become "the premier, world-class prairie manager at Tallgrass Prairie. He's the guy that figured out large landscape-scale conservation: grazing, fire, prairie conservation—not just the science, but the stewardship of it.") In Oklahoma, the Nachusa stewards immersed themselves in nearly 40,000 acres of tallgrass prairie—and they were going to bottle the essence of the place and try to release it in Illinois.

But the positive linear progression of grazing and grassland management would soon hit a stumbling block in the tallgrass prairies of Missouri. A number of grassland conservationists had come to believe that experiments with grazing had gone too far.

In 2005, the Missouri Department of Conservation (MDC) began a patch-burn grazing program at five prairies across the state, including two high-quality state natural areas, the Niawathe and Taberville prairies. Following the protocols established at preserves in Oklahoma, Kansas, and Nebraska, MDC would burn a section of the prairie and then allow it to be grazed intensely for a period of time. Missouri was not doing it with bison—not every nature preserve had the capacity to do so—but rather with a large number of cattle. But it wasn't the animals that would soon become controversial, it was the scale. Missouri's remnant prairies were far larger than those of Illinois, but they were tiny when compared with those farther west; Niawathe Prairie Conservation Area and Taberville Prairie Conservation Area were just 319 and 1,680 acres, respectively, whereas the grazed prairies of the Flint Hills ranged from 8,000 to 40,000 acres. Those prairies, like those to the east, were simply too small for that number of cattle—and a group of experts would soon argue that an ecological travesty was now under way.

A number of Missouri's grassland ecologists had seen enough; the cows were irreparably damaging the prairies, they concluded, and should be removed immediately. In fact, they feared that it might be too late. In November 2010, the eminent conservation botanist Don Kurz disseminated a forty-

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five-page paper arguing that the experiments had been conceived in haste, they had irreparably ruined these two irreplaceable remnant prairies, and the patch-burn grazing program must be immediately suspended. Additionally, an introduced bison herd at Prairie State Park was feared to be damaging a floristically rich portion of that state-designated natural area. In January, the controversy reached the local papers: The Niawathe Prairie Conservation Area had been Missouri's flagship tallgrass preserve, Kurz told reporters, but it had been "devastated" by grazing.

Kurz knew his stuff. After more than thirty years inventorying the state's natural areas, he knew as much as anyone about the flora of Missouri. He had gotten his start in Illinois, working as an ecologist for the pioneering Illinois Natural Areas Inventory, and had been hired by the Missouri Department of Conservation in 1981 to lead a similar inventory for the state of Missouri. He was responsible for a county-by-county investigation to discover the state's remaining high-quality natural areas—including a full inventory of the state's tallgrass prairies—which informed the subsequent effort to preserve these invaluable natural areas. While the Missouri Department of Conservation maintained that patch-burn grazing was the best method to manage prairie, a number of Missouri's most respected conservationists were unequivocal—several of their state's most treasured natural areas had suddenly been destroyed, and they must act now, before further damage was done. In March 2011, Paul Nelson, a Missouri forest ecologist with the US Forest Service, presented his case to the Academy of Science of St. Louis: "Missouri's remaining high-quality prairie patches are likely too small to experiment with patch burn grazing," he concluded.

The controversy had begun to reveal an ideological divide and a growing rift in regional conservation. In the western prairies, where there was far more natural land, conservationists could think more about processes and disturbance—and the combined ecological forces of fire and grazing. In the eastern grasslands, however, natural areas hadn't been large enough for conservationists to witness, much less maintain, most of those landscape-scale disturbances—so the fields of study that emerged in these areas had focused more on composition and the preservation of individual species. Missouri, geographically and philosophically, was stuck in the middle; its prairies were floristically rich and they were rare enough to warrant careful stewardship, yet they were big enough to seem to need grazing. But dissenting ecologists disagreed with the premise of need: The Taberville and Niawathe Prairie

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Conservation Areas had maintained a high floristic quality for decades, they argued—so why was there suddenly a need to stock them so high with cattle? Those old-growth prairies, the ecologists argued, were a stable system.

The stated goal of the cattle grazing program was to create a diversity of structure, or grass height, for the benefit of a suite of grassland birds. There was also a growing sense that prairies *had* to be grazed—whether with bison or with cattle—without regard to the peculiarities of a given site. The patch-burn grazing proponents wanted to treat Missouri's prairies like a larger western grassland, whereas the local plant ecologists wanted to preserve the prairies as stable, old-growth systems. And the landscapes were stuck in the middle.

The botanists, folks such as Kurz and Nelson, weren't arguing for the complete absence of human influence. They knew the places needed fire, and perhaps they *could* be grazed; Nelson, in fact, had been instrumental in bringing bison to Missouri's Prairie State Park in 1984. But not only was confining cattle in a small area and grazing it intensely an uncertain way to mimic past bison disturbance, they argued, it was irresponsible stewardship to conduct such experiments on the few high-quality prairies Missouri had left. "Prairie ecosystems are being compromised by emphasizing a few birds without adequately understanding the impact that patch-burn grazing is having on over a thousand other prairie species," Kurz said.

Another plant ecologist I spoke to, Justin Thomas, said he felt the Department of Conservation's patch-burn grazing program was an upland game bird project masquerading as ecological restoration. "The patch-burn grazing program in Missouri is driven a hundred percent by upland gamebird, whether it's Quail Forever applying pressure or just local people in Missouri saying 'Hey, I used to be able to hunt quail,'" but there aren't any anymore. Thomas, a field botanist with a focus in taxonomy, believes that land managers are increasingly de-emphasizing, or even failing to recognize, the floristic quality of landscapes. "People try to see nature through the organisms they like, [but] . . . we don't define ecological systems by birds. We don't define ecological systems by grazers. We define ecological systems by the plants that occur there, because that's where life starts. That's the only thing that puts any energy into the system." "The identity of the system—how we literally identify the systems—are the plants that make them up," he concludes. "And that's where we should be focusing. We should be focusing where it all starts."

Much of the research that the Missouri Department of Conservation cited and relied upon was coming out of the Tallgrass Prairie Preserve and the Konza

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Prairie Biological Station, both of which, Don Kurz noted, were Grade C prairies. He argued that a century of moderate to heavy grazing, as well as decades of aerial broadleaf herbicide spraying, had created an unnatural baseline that had not been taken into account in the ongoing research; up until TNC had bought the preserve, ranchers had sprayed herbicides over the prairie to kill off undesirable (from a cow's perspective) wildflowers. In other words, what patch-burn grazing proponents were holding up as a model of conservation in the western edge of the tallgrass was not a high-quality remnant system but rather a degraded postsettlement landscape. Was it possible that some rare species, endemic to the region, had been extirpated or driven to extinction? After a hundred years of intense, confined grazing, after decades of herbicide treatments, it was too late to know. Ultimately, Kurz argued, patch-burn grazing wasn't appropriate for *smaller* and *eastern* prairies. Niawathe Prairie Conservation Area, for example, was not a degraded pasture, it was a high-quality Grade A remnant. "These remnants are priceless examples of an imperiled ecosystem and an example of the state's natural heritage," he said. "They must be protected and not used in short-term experiments."

Other ecologists, including the Nature Conservancy's director of conservation in Missouri, Doug Ladd, agreed; Missouri was not the Great Plains, and the rush to implement patch-burn grazing in these high-quality prairies was both irresponsible and poor stewardship. He urged decision makers and land managers to consider the *global* rarity of species on a site, before making management decisions, and to ask: To what degree can this be replaced? He also noted that while the research coming out of the Great Plains was valuable, "extreme caution should be exercised when attempting to apply it to more fertile, fragmented, and diverse prairies in a different biome." Furthermore, he worried that nuance was being removed from management considerations and that a one-size-fits-all prescription was being implemented in some of Missouri's most important natural areas.

The Missouri Native Plant Society, along with Kurz and Nelson, came out publicly against MDC's patch-burn grazing. Even Chris Helzer, TNC's most vocal promoter of patch-burn grazing, admitted that his first impression of the sites, finding them grazed so aggressively, had been disturbing. "What I was seeing at Taberville made me wonder whether MDC had pushed the prairie a little further than was prudent," he wrote. Eventually, the Missouri Department of Conservation halted its grazing program on certain preserves. But not before, as a number of botanists had already argued, irreparable damage had been done. Elsewhere, the cattle continued to graze, and new programs

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were initiated: In the fall of 2011, thirty bison were taken to the Nature Conservancy's Dunn Ranch Prairie, a former ranch undergoing ecological restoration, "as a management tool to help maintain a biologically rich landscape."

In his official response to the Missouri grazing controversy, Ladd emphasized the uncertainty—and the incompleteness—of prairie restoration. "This renders the remaining high quality remnants irreplaceable examples of the most imperiled habitat type on earth, and I submit that as resource managers we have a sacred obligation to pass these down to future generations as functional, diverse habitats," he wrote. "While grassland birds are a critical conservation concern . . . they must be a secondary priority to existing high quality prairie habitats, especially since they are not obligately dependent upon them." About the high-quality remnants, of which there were precious few, he urged managers not to throw caution to the wind and recommended that experimental management should be undertaken only if it could be unequivocally shown to have no deleterious impacts on the ecosystem's diversity and sustainability, "since once lost these cannot be regained. To do otherwise is a lapse for which future generations would suffer."

When I spoke to Ladd in 2023, he said that part of the problem was the old problem: Land managers continued to devalue the old-growth grasslands, treating them as little more than fodder for cattle and cover for game birds. Too many professionals were too focused on courting ranchers and producers, trying to demonstrate conservation ranching for their neighbors (as Justin Thomas wrote, "working landscapes are an easier sell to a capitalist people . . . than liberated landscapes"). There were plenty of old fields and pasture in Missouri, he argued, for MDC to carry out demonstrations; experimenting with the few high-quality remnants—"wondrous and indescribably complex systems that result from countless thousands of organisms interacting with each other, shaping and in turn being shaped by this and the physical environment"—was incredibly irresponsible. Losing sight of that perspective and judging the success merely through measuring the height of grasses simplified the otherwise wondrously complex tallgrass prairie: "If we disenfranchise the complexity of organismal diversity that makes a prairie a prairie," he wrote in 2011, "we risk society's loss of an irreplaceable natural asset." The remnants, which accounted for just 1 percent of the former vast prairie, were too small and too precious for indifference not to matter.

Although the extent of this damage—and the extent to which it is *real*—has yet to be determined, the controversy laid bare something important about

grassland conservation: There was not yet an overwhelming consensus, not even among our best and brightest prairie ecologists, about how to care for these natural areas.

Back east, Bill Kleiman and his colleagues discussed the controversies unfolding in Missouri, but they were not a primary concern. They had their own work in front of them, and their plates were as full as ever. By 2014, Nachusa Grasslands had grown to nearly 4,000 acres—and with every acquisition, there were more grasslands to plant, more seeds to collect, and more weeds to control. The work was endless, and sometimes daunting, but it was not without rewards, and everywhere they looked they could see some kind of success; the remnant habitats were growing richer in species, and the former crop fields were now as diverse and functional as any number of remnants in the region—seven hundred species of plants now occurred across the preserve. Bill and Susan, living at the heart of the preserve, could not step outside their front door and not hear a rare grassland bird—species that were declining globally were locally abundant. In the previous year alone, 6,500 pounds of seed had been harvested on site. The more they learned about the diversity of life at Nachusa Grasslands, the more they realized how critical this preserve was: After a rare midwestern caddisfly was discovered there, in 2002, INHS came to investigate and found hundreds more along a creek—and that was the only place they were known to occur in all of Illinois.

As an experiment in restoration, the quality at Nachusa Grasslands ranked among the best in the world. Chris Helzer, the director of science and stewardship for TNC in Nebraska and one of the most influential thinkers in the sphere of American grassland conservation, told me that Nachusa Grasslands "is the coolest prairie I've ever seen." He marvels at the massive prairie dock, which does not grow in the western prairies; the thimbleweed, which he'd never seen grow so large as at Nachusa; and the many showy white, yellow, and purple flowers. "The diversity and beauty of their restored prairies is unmatched at any site I've been to," he has written. ". . . The abundance of showy flowers is almost overwhelming in some of the restored prairies." The value of Nachusa Grasslands was something you could sense and feel when you walked among its rolling hills—tall grasses towering over your head and captivating flowers blooming around your feet—indeed, it was something laypeople could verify with their own eyes. (Its value was also quantifiable, with the floristic quality ratings of several reconstructions ranking as high as even "aboriginal remnants.") What began in 1986 as a last-minute attempt to save a scattering

of remnants and a gamble to amplify their capacity by reclaiming cornfields into prairie had paid off.

Nachusa Grasslands had all the hallmarks of a wild Midwest. At dusk, deer bound over Franklin Creek and paused at the high point of the hills. Late in the night, coyotes yipped and howled as they fanned across the landscape in search of prey. Bobcats and badgers hunted prey and denned on site. Hundreds of species of birds came and went—they migrated in from the Arctic, from the pampas; they bred and reared their young. In the spring and fall, fires consumed as many as five hundred acres—burning fast and fierce, just as they had for thousands of years. Surely a herd of bison would fit right in.

There was a chance that the introduction could backfire. The eastern prairie fringed orchid (*Platanthera leucophaea*), for example, was one of the rarest flowers in the world, and one of the factors in its demise is thought to have been overgrazing. Researchers in the West concluded that the western prairie fringed orchid, another endangered species, was likewise devastated by overgrazing and trampling by cattle. Could an introduced herd of bison destroy the population? Or was it actually the other way around? Maybe the orchid would thrive with grazing. Ecologists say this species requires disturbance—it occurs in early-successional communities—and its seeds require sunlight to germinate. Could a herd of grazing bison invigorate it further? The state-threatened Hill's thistle, with its purple-pink bloom, likewise thrives with fire disturbance—but overgrazing was considered by many ecologists to be one of its main threats. Would bison grazing, by reducing the stature and dominance of the tall grasses, also benefit this sun-loving, endangered thistle? Or would the combined grazing of whitetail deer and the introduced bison drive it toward extirpation?

Bill Kleiman had been through all of this. He was aware of both the risks and the benefits. "Today, the upland sandpiper cannot be heard," he wrote as the push to bring bison to Nachusa came to a head. The upland sandpiper was what had first alerted Doug and Dot Wade to the remnants that would become Nachusa. But the species hadn't been seen at Nachusa in fifteen years. Perhaps bison could restore the grass structure that they required and usher them back. Kleiman also argued that bison would protect Nachusa's investments—by keeping the dominant grass species in check, and allowing the more conservative forbs, the prairie bush clovers, the Hill's thistles, the prairie fringed orchids, to increase. If Kleiman had any doubts, he never let on; he looked at the science coming out of the West, and he looked at the land he was charged with protecting and made a decision from a place of confidence.

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Nor was he on an island: Bison, on natural area preserves east of the Mississippi, was no longer a fringe idea. Over in Indiana, after six years of patch-burn grazing, the ecologists at Kankakee Sands liked what they had seen with cattle: The aggressive native grasses were declining in dominance, and a diversity of structure had resulted. Now they were set to bring in a small herd of bison. It wouldn't happen right away—just as at Nachusa Grasslands, they'd have to build fences and secure funding—but they were approved for Kankakee Sands. The Midewin National Tallgrass Prairie had also decided to introduce bison under a program they were calling "The Bison Experiment." As they were actively restoring tracts of prairie, they wanted to observe bisons' effects on four different treatments and compare them to cattle grazing—the bison would be a tool for the conversion of cool-season nonnative pasture to tallgrass prairie. The movement to place bison on eastern tallgrass prairies was coming to a head.

But Nachusa Grasslands would be first, and it would have the most at risk. Unlike the other two sites, it conserved high-quality old-growth prairie remnants that ranked with the healthiest prairies in the country. It was a jewel, a beacon of restoration, a biodiversity hotspot where new species continued to be documented and rare species thrived.

Nachusa Grasslands was also a place where it felt good to be a human among the tall grasses, the riot of blooming colors, clear creeks, the sprawling wetlands, the carpets of flowers that were at turns dainty and delicate and scrappy and prickly. Would letting 2,000-pound animals run roughshod over the meticulously restored landscape reduce it to a common livestock pasture? Nachusa's stewards had coaxed the eastern prairie fringed orchid to a population of three hundred blooming stems in part by hand-pollinating the plant with toothpicks, on hands and knees, crawling on their bellies over a wet and humid wetland in June, plagued by ticks and mosquitoes and snakes, for years. They had planted some seeds by hand and worn rubber gloves so that seed predators wouldn't detect their scent; planting porcupine grass required the stewards to get down on their knees, and lupines were planted one by one next to corn root balls so that the seeds might be protected from erosion. Not long ago, they'd placed nylon stockings over the blooms of Hill's thistle to prevent birds from eating its seeds, so that they could then propagate and spread seeds in suitable habitat. All of those precious species finally thrived at Nachusa. And what would bison do to them?

None of Nachusa's active stewards were against an introduction of bison. There was uncertainty but not opposition. Bernie Buchholz, one of the

volunteer stewards at Nachusa and the founder of the preserve's Friends group, was under the impression that Bill Kleiman would not move forward with bison if his fellow stewards were not on board. Kleiman spent two years "incessantly talking about it" with his colleagues, the volunteer stewards and the staff, asking questions at their communal lunches, after workdays and meetings, talking about what it would mean to bring in bison. "I think he genuinely wanted to know what we thought, but he was also trying to get us to think about how this was going to change what we do," Buchholz says. "What's it going to be like to work around bison? Are you going to be unhappy if you go to a particular area to pick seed, and it's important, and you can't pick seed because the bison are there? Are you worried for your safety?" Others wanted to know if the introduction was going to draw resources away from Nachusa's main work, which was its world-class quality prairie re-creations? Would bison turn the place into a kind of zoo? As Kleiman tried to wrap his own head around the potential outcomes, he wanted the stewards to be prepared. The stewards didn't indicate that they were concerned about the bison overgrazing, and potentially extirpating, any specific species—if anything, there were several target conservation species, like prairie bush clover and Hill's thistle (and birds like the upland sandpipers) that were considered grazing positive. A visiting researcher, Pati Vitt, had been monitoring Nachusa's prairie bush clover population for years, and she was excited about the introduction. Out West, she had seen firsthand how bison graze, observing the differences between cattle and bison, and said that she had every reason to conclude that bison grazing would increase the population viability of *Lespedeza leptostachya*.

Neighbors, on the other hand, were dubious about bison. Many local people had been skeptical about Nachusa Grasslands from the very beginning. Over time, the Kliemans and their colleagues had won over most of the skeptics, but bison were a new, and strange, and potentially dangerous proposal. A cattle farmer across the road was worried that bison might break down fences to get into his herd or potentially introduce disease; and Jeff Meiners, the preserve's next-door neighbor, says he heard grumbling about it at the local bars and cafés; local folks knew he was a supporter of the grasslands, and they wanted to know "What are those guys doing?" Some folks thought the whole thing sounded like a publicity stunt. Regardless, could they actually pull it off? "You're talking about putting a fence around thousands of acres of land, and not just a barbed wire fence—you're talking about a *fence* that'll hold a bison in," Meiners says. "I mean, it was a very aggressive project. Very ambitious."

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In 2012, just months after TNC had accepted the plan for bison introduction, Bill Kleiman and the Illinois Nature Preserves Commission began working to dedicate a thousand acres of Nachusa Grasslands as a state nature preserve. Up for consideration were the main core unit of remnant knobs and all of the planted prairie in between. It was a full-circle moment: Forty-eight years after Dot and Doug Wade had discovered the Schafer Prairie, it was finally going to become an official nature preserve in the state system designed by George Fell. But Nachusa was going to be unique: The proposal to accept Nachusa Grasslands into the nature preserves system included an allowance for bison grazing, which was something that no other Illinois nature preserve had ever been allowed. Prior to going up for a vote, commission staff discussed the Missouri controversies—and the potential for degradation at Nachusa—but they concluded that the two approaches, patch-burn grazing with a high density of cattle, versus Nachusa's lower stocking over a much larger area, was apples to oranges (if they had proposed cattle for their grazing program, on the other hand, it would have been a no-go for the commission). John Nelson, who was the commission's field representative, says the commission was impressed with the amount of research Nachusa had done on both proposals and the amount of monitoring it was committed to doing once bison were introduced—and that gave it the confidence it needed to take "a leap of faith, knowing that the Missouri controversy was not applicable to Nachusa." In January 2013, a thousand acres of Nachusa Grasslands—and the entirety of the future bison grazing units—were formally accepted as an Illinois State Nature Preserve. The preserve would now be afforded the strongest protections of any land in the state. And they were going to have their bison.

To be sure, Nachusa was going to be careful. Bill and Susan Kleiman had dedicated their lives to this place, and they had no intention of doing something so reckless that it might destroy or desecrate that work. Friends of Nachusa Grasslands began raising funds for the project, and it would award research grants to study the reintroduction; Nachusa had raised $6 million for the reintroduction. It had decades of data, so it could compare the changes and impact that bison would have on the floristic quality of the various units; it increased its science funding tenfold to monitor the impacts of long-term grazing and hired a full-time science coordinator. It erected twenty-two bison exclosures on both remnants and plantings so that it could compare grazed and ungrazed sections of the prairie.

Neither Bill nor Cody nor any of the volunteer stewards was a bison rancher.

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But not knowing something had never stopped anyone at Nachusa from diving in headfirst. For the past four years, Bill, Cody, and several other stewards had been traveling to Nebraska, Iowa, Missouri, and Oklahoma; they had met with Al Steuter and Bob Hamilton to learn the ins and outs of bison roundup, corral setups, and how to use fire to move bison around the landscape. They also learned what they could not do, and that once the bison were on the ground, the animals were going to make their own decisions about where to go and what to do—as Steuter once quipped, "You can make a bison do anything it wants to do." For example, if a bison wanted to wallow on a remnant knob, directly on top of a population of prairie bush clover, fame flower, or Hill's thistle, they would. If a bison wanted to feast upon each and every prairie fringed white orchid, which had been hand-pollinated in a planted prairie, they were going to. We didn't know if they would do any of that, of course, and it was important to remember that we knew very little about how a herd of bison would behave on an Illinois prairie.

But we would soon find out.

By the end of the summer of 2014, the first five hundred acres of bison fencing was up. The corral was complete. All that was left now was to go get the animals.

The first Nachusa bison would come from Broken Kettle Grasslands, a TNC preserve in northwest Iowa, where bison had been introduced just six years earlier. As the herd was rounded up for its annual checkup, animals slated for Nachusa were separated. Twenty-one bison, including a rowdy pair of bulls, were loaded into a pair of livestock trailers, and driven east (one of the bulls, proving just how wild and ornery a bison could still be, jammed his horns into the aluminum trailer puncturing several holes). After six hours, the truck crossed over the Mississippi River and into Illinois. For Cody Considine, it was surreal: "Here we are driving through a sea of corn and beans that was once prairie, towing an iconic American animal that almost went extinct," he wrote, "heading for a new beginning where bison and prairie may once again thrive together." The caravan reached Nachusa Grasslands just after 10:00 p.m., but when the drivers entered the preserve, the bulk of the bison, on the larger semi, could not be convinced to leave the trailer. Although it was cold, and hard winds were blowing, a large crowd of supporters and media had assembled. Cindy Crosby, a natural history writer and Nachusa Grasslands steward and science monitor, was there that night, watching patiently behind the newly erected bison fencing. She said that the bison were the missing piece of

the prairie puzzle: "More than 700 species [at Nachusa] but we didn't have the big piece, and tonight it's all going to change. Nothing is going to be the same as it was yesterday."

After several hours, there was still nothing to see, and most folks had gone home to their beds. Later, when the bison did begin to exit, a bull they'd christened Chain Breaker was first. He bolted out of the trailer with all the fury and power he'd displayed in Iowa, and then when he spotted a bale of hay, he stopped on a dime. It was time to eat.

By morning, the bison were out, grazing upon the five hundred-acre bison unit, which contained one small remnant knob and a sprawling expanse of planted prairie. The big bluestem and the Indian grass stood six feet high; everything that flowered had gone to seed. At this time of year, the various prairie grasses are not at their most nutritious, but these dry prairie grasses would do. In fact, they'd sustained bison for millennia.

The bison were given a warm welcome in Illinois—the *Chicago Tribune* covered their arrival as though it were the return of the city's most famous native son, and at the close of 2014, its editors saluted their introduction: "Our gratitude and congrats to The Nature Conservancy and its donors."

But not everyone was happy to see the bison at Nachusa Grasslands. In January 2015, just a few months after the bison arrived at Franklin Grove, a conservation conference was held in Chicago. During the conference, Jack White, one of the region's most respected botanists—indeed, one of the most important figures in the history of natural areas preservation in Illinois—presented a poster and distributed a paper he had written titled "An Appeal for Informed Skepticism." "Many prairie enthusiasts are caught up in the excitement of 'bringing home the buffalo' at The Nature Conservancy's Nachusa Grasslands and they welcome the event without question," the paper opened. "Here I present a differing view."

In the 1970s, Jack White had been responsible for designing and implementing the Illinois Natural Areas Inventory; he had managed the army of botanists who were surveying all of Illinois in pursuit of the preservation of the state's vanishing remnant natural areas. In later years, White would be described as "the foremost authority of the historical ecology of Illinois." So what he had to say carried a lot of weight. The conference room was packed to standing room only.

White had first come to the area of Nachusa Grasslands in 1975 while formulating methods for the Natural Areas Inventory; he visited the pastures that

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Dot and Doug Wade and Tim Keller had hoped could be saved. In the 1980s, as the chief ecologist at the Nature Conservancy, he oversaw work in all fifty states and nine countries; and at that time, he lent his support to Steve Packard when he asked TNC to gamble on an experiment of restoring Delbert Schafer's prairie, and planting his croplands—an experiment that explicitly called for the restoration of large mammals. In the 1990s, White led tours of Nachusa Grasslands during its annual Autumn on the Prairie festival. He knew the site well and had witnessed its transformation over the past forty years. But he had grown skeptical of the idea that bison would be good for the prairie; in fact, with the Missouri grazing controversies top of mind, he thought the experiment might turn out to be destructive. He took issue with the conservancy's bold claims. "A Conservancy fundraising letter proclaimed that 'the prairie will come alive' after bison are put there," he wrote. "Such hyperbole is not well informed."

He believed that Americans should provide more habitat for bison; likewise, that we ought to manage some grasslands for the declining prairie birds that required shorter grasses. And he knew we needed to manage the prairies for the conservative forbs that were often outcompeted by the dominant grasses of an ungrazed prairie. "Occasional, judicious grazing may, in some cases, help maintain the diversity of plants in a prairie," he allowed. But a permanent herd of bison at Nachusa Grasslands? That was too much. Nachusa contained *remnant*, he stressed, and that old-growth, all-important prairie—the holy grail of Illinois conservation—should not be subjected to experimental grazing. "Next to plowing, grazing has destroyed more Illinois prairie than anything else," he noted.

Missouri's disastrous foray into patch-burn grazing, White believed, should have been all the evidence these grassland ecologists needed to see. Like Doug Ladd and Don Kurz, he took issue with the gospel of grazing emanating from western research institutions, and specifically the degree to which their findings were applicable to eastern prairies, which were often richer in species diversity than those out west. The richness of Illinois soil meant that it was even more vulnerable to rapid colonization. Furthermore, White questioned whether bison grazing was, in fact, a keystone disturbance on the Illinois prairie.

East was not West.

For some people, White's ideas about grazing seemed antiquated, and his fear of what Nachusa was doing echoed the fears and outrage that prescribed fire had produced a generation earlier. In the broader world of prairie conser-

vation, grazing and grasslands had become synonymous—to achieve a healthy prairie, there *must* be grazing. But uncertainty was what he saw. "We don't know how often the American Bison roamed across Nachusa Grasslands in the past, but confining a herd there will result in grazing intensities that are probably more than a thousand times greater than ever experienced," he wrote. "Bison at Nachusa will have more impact on the prairie in a day, a month, or a year than free-ranging bison ever had in a year, a decade, or a century." He recalled the controversy in Missouri, and feared that a similar story was about to play out at Nachusa Grasslands.

In sum, he was not convinced of an ecological justification for the introduction. Bison were part of the ecological community—there was no doubt about it—but in a modern, fragmented, and greatly diminished prairie, their introduction to one of the rarest plant communities in the world might do more harm than good. "The impacts of bison will be varied and complex," he concluded. "I expect that the most obvious result will be an increase in invasive, alien, cool-season grasses. . . . I hope I am wrong."

Bill Kleiman was in the conference room when White presented the paper (Bill, in fact, was giving the keynote speech later that day). "I know Jack, I like Jack, he's a fixture in Illinois conservation," he says. "And when he gets an opinion, he can articulate it pretty strongly—and he did, and we listened." Not that the substance of White's argument was news to him; he was aware of the critiques, he'd looked at the evidence, and he had already come to the conclusion that the potential upside outweighed any potential risk. But if White had reservations, Kleiman says, he felt it was a message that could have been delivered a little bit sooner—the bison were already on the ground, and they were unlikely to be going anywhere anytime soon: Nachusa had invested a lot of energy, money, and emotional work to get these animals into Illinois, and they were going to see it through.

To be sure, there would be challenges ahead: Nachusa wanted a large enough bison herd to create a proper grazing disturbance, and large enough to satisfy both genetic diversity requirements and the social needs of these herd-forming animals; but they also needed to make sure that the herd never got so large that it might actually overgraze and damage the prairies. And while they managed the herd of bison, they had all of their original duties—managing weeds, collecting seeds, planting new prairie, overseeding old prairie, cutting trees and brush, maintaining equipment, and maintaining relationships with volunteer stewards, donors, and the local community—to do. Nachusa was

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going to be carefully monitoring every aspect of the prairie, and it was hiring a science director to oversee all the efforts. Over the next few years, it wanted to grow the herd to a hundred animals. In the new year, as many as thirty more bison would be coming in from the west, and in the spring, a crop of calves was expected to be born. After ten years, Nachusa would consult its monitoring data and the general health of the prairie and evaluate the experiment.

Although Jack White had made his passionate plea for informed skepticism, much of Illinois's conservation community supported the project. Perhaps a few ecologists had adopted a wait-and-see approach to the experiment, but it was just as likely that they believed this group would make the right decisions: Over the years, Nachusa Grasslands had earned a tremendous amount of trust and goodwill. At the end of the day, the pendulum had swung: Grazing was good, and bison were righteous.

The bison made it through that first winter. They grazed the dry and brown grasses. After the last snows melted, after the spring fires reduced the brown litter to ash, a flush of new green growth burst forth from the corms and roots that extended deep into the earth. In April, as pasqueflower and pussytoes and shooting stars bloomed, the first bison calves in more than a century were born in the Rock River Hill Country, their red coats camouflaged among little bluestem—evidence, of a kind, that the animals belonged. "We're not going to get involved at all," Kleiman said of the calves that spring. "We're just watching from a distance like everybody else." Summer was coming, with its riot of blooms, buzzing insects, and birdsong—and Nachusa Grasslands was going to learn what that symphony was like when paired with a herd of bison.

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CHAPTER 14

The Return of the Grazer

I stand in the Nachusa bison pasture with Bill Kleiman in November 2019 after it was grazed for five years. There's no fence separating us from the animals, and when stewards are out there doing their work, there's no fence between them, either. "You have to look up more," he says. "You don't want to stumble upon one." Five years is not a long time in the scheme of biological evolution or landscape ecology, but long enough for patterns and routines to have emerged. In many places, the grasses are quite short; there are bison paddies throughout; habitual travel routes have sliced bare traces through the fields, trampling semipermanent pathways. My first impression is that this prairie looks a lot more like the grazing lawns of a typical cow pasture, especially this time of year when there's little in the way of blooms. But if you know what to look for, as Kleiman does, it's clear that we're in a tallgrass prairie. He estimates that there are probably fifty plant species on this one hill; we see the stems and dry leaves of showy goldenrod, hoary vervain, wild quinine, pale purple coneflower, and seep aster, and the tall stems of prairie dock, six and seven feet high, still stand watch over the prairie, perches for an occasional bird to land upon and sing. Kleiman reminds me that this entire pasture was a corn and bean field just a decade ago. "In ten years we've taken it from nothing, blank soil, to a prairie with a hundred to a hundred fifty species across this whole piece, down from the bottom where it's a little wetter, up to the top here where it's fairly dry." In the summer, it's filled with buzzing insects, the chattering and the songs of birds perched and swirling and foraging—and now, within this menagerie of sound, are the incessant chewing, the constant tearing of grass, and the movement of bison. This re-created prairie, constantly in flux, is full of diversity—it is the culmination of a vision for the conservation of big eastern prairie.

Although they are massive, and numerous, the bison are capable of unbelievable stealth—"Ninjas," one Nachusa staffer offered when I mentioned

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the trait. Compared to the farm machinery and utility vehicles the staff use to get around the property, the bison are as quiet as prairie mice. The bison appear to belong on the prairies of Nachusa Grasslands. And they require a change in human behavior befitting their ancient role; while we're in the prairie, we remain alert. A grazing herd can come upon you in no time. Cindy Crosby tells me about the time she was near a pond collecting dragonfly data, engrossed in her work. "Sometimes a fifteen-hundred-pound bison is there before you realize that it's there," she says. On this day, she stumbled upon a female bison and her calf; she couldn't see the calf because she was coming over a small rise—the mother responded with determination, just short of a charge, and she ended up in the pond to get away. "I probably moved faster than I have ever moved in my life." Another scientist had a similar experience; she was gathering data on prairie birds, when she noticed a bison in the near distance. She was careful around the animal but failed to notice the other female accompanied by a calf, which charged at her but then stopped short—a terrifying, humbling, false charge. "You feel like the top of the food chain when you're out walking in the prairie," the researcher said. "And then when there is bison, you get knocked down a peg."

In addition to keeping stewards on alert, the bison impacted the prairie in ways that were big and small. In the spring, as the bison shed their heavy coats, a number of birds were soon gathering this fur and weaving it into their nests; mice and voles likewise carried bison fur underground for their shelters (and those small mammals appeared to be utilizing the short-grass patches created by grazing). In the first few years, before enough data had been collected for scientific reports, such anecdotal observations were eagerly compiled. A snapshot of the prairie would reveal that grasses were grazed heavily, but a number of prairie flowers—blooming prairie phlox, wild quinine, and pale purple coneflower, for example—were passed over completely. Swallows hovered close to the bison to catch the insects that swarmed them; and butterflies were observed mobbing bison dung for nutrients, with Viceroys being especially conspicuous. One researcher, hoping to learn how the bison would affect bird presence on the prairie, placed cameras in the grasses to determine if the bison would disturb (artificial) birds' nests stocked with quail eggs—cattle and whitetail deer will eat eggs and fledgling birds, but would the bison?—and she recorded the animals grazing around the nests.

The bison did some unexpected things. Western bison managers told Kleiman he wouldn't need to fence his barns or buildings. "They won't go near a house or a barn," they told him. But he walked into a barn one day to find a

large herd of bison charging out though that same barn door. A fence around the barns soon went up.

In 2016, Nachusa's bison gained access to the main unit of Nachusa Grasslands, which was located south of a public road. To make this happen, they dug under Stone Barn Road to create an underpass large enough for bison. The tunnel was lined with a large tube; it was a culvert, essentially, that linked the original five hundred acres to the sprawling, thousand-acre main unit. The South Bison Unit, as the various knobs and reconstructed prairie plantings would now be known, was where the best, highest-quality remnants were located, on Delbert Schafer's former farmland. There were several high-quality remnant areas in the unit; in particular, Schafer's Knob, the site that had first attracted Doug and Dot Wade and Tim Keller, had the highest conservation value of the entire preserve. So the South Bison Unit was where the most was at stake.

Illinois's conservation community was eager to see these bison back in their Prairie State. Steve Packard, who'd dreamed this whole thing up thirty years earlier, came to visit in the summer of 2016. Packard found evidence of bison wallows. He observed that the rich wetlands were mostly undisturbed, and the remnant hilltops, too, showed "only traces of activity." He found lark sparrows seeking out the grazing lawns for food, blooming Hill's thistle, and a flush of regal fritillaries in a grazed portion of remnant prairie (and when the herd of bison came suddenly upon him, over a ridge, he found himself climbing over a fence to safety). In this North Unit, the bison seemed to prefer the top of a small hill for lounging. The hill was a degraded remnant that had been nursed back to health. They wallowed there, rolling atop the grasses and flowers until all that was left was bare earth. During the calving season, the bison frequented the hilltop, where there were a few bushes among the remnants, which may have provided a sense of security. The grasses naturally grew shorter on the sandy knobs, and that might have made it easier for the bison to move about. Observing those behaviors—and the changes in the prairie—was a revelation. "Some people insist that conservation is about the past, before Europeans, or before people," Packard wrote shortly after his visit. ". . . Nachusa suggests how profoundly conservation is also about the evolving present and, especially, the future."

Even before bison arrived, Nachusa Grasslands was never static. Annual flowers move around the landscape. Some years, a species blooms in profusion, and the next, it's diminished. Doug's Knob is one of Susan Kleiman's favorite places at Nachusa Grasslands and in the summer it is filled with the

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pinks of pale purple coneflower, the purple spikes of lead plant, the yellow of western sunflowers; every few weeks, the blooms change over, and there is something new producing nectar, attracting insects, or going to seed, a wave of color and life and reproduction. By fall, the little bluestem and poverty oats stand tall, as greens give way to tans and browns. Yet even within that variety, there was a degree of predictability to the prairie; some plant ecologists, especially in the wake of increased grazing pressure in eastern prairies, have begun to emphasize that old-growth prairies are stable systems composed of long-lived perennials. So the introduction of bison into the system brought with it an intensified amount of chaos and disorder.

During the first five years, the bison spent much of their time in the lower-diversity plantings—the older, "poorer" reconstructions planted back before Nachusa's stewards had found their footing, which were dominated by a few species of tallgrass. That preference by the bison has radically changed those units. "Five years ago, this would have just been an ocean of Indian grass and big bluestem," says Susan Kleiman. "It would have been like five feet tall . . . and it would have seemed like mostly grass. . . . If you'd walk through, you'd be hard put to find a flower." After just one summer of grazing, the bison had transformed this unit into a patchy grazing lawn where the tall grasses no longer dominated. The bison graze there repeatedly throughout the summer—especially in the year following a burn—when the grass is growing fast and most nutritious. The bison devour the big bluestem and Indian grass, and when new shoots emerge, they come back for more; all summer long, the ground is opened to sunlight, and niches are opened for a diversity of other species to gain a foothold. This is exactly the kind of thing Bill Kleiman and Nachusa Grasslands had hoped would happen—the bison seemed to be doing the work they were brought there to do.

Aesthetically as well as ecologically, it's a big change. The sea of tallgrass is gone from this unit of Nachusa. Not all of the changes have been as exciting or welcome; in some areas, nonnative clovers are proliferating, as is stiff goldenrod, a common native whose woody stems now dominate the viewshed. These early colonizers are important to cover bare, distributed ground. But if goldenrod becomes dominant—along with those nonnative clovers—it could be a signal that the effects of grazing were shifting this reconstructed prairie into a degraded field. So they watch and monitor and gather data. "This time of year, you're like 'Oh, doesn't look as pretty as it used to,'" Susan Kleiman says. "But we're studying it. And all these birds are loving it, and flowers, and beetles, and butterflies. So it's just a different mindset with the bison grazing."

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This change in mindset is something Steve Packard has come to call an "adjusted aesthetic" ("Real nature requires an adjusted aesthetic," he wrote). Just as Illinois residents and professional conservationists had needed to learn what good grassland management looked like—a few decades earlier, chopping down trees and setting fire to the grasslands had been controversial and difficult topics—Nachusa's stewards are learning, and challenging themselves to accept, the differences of grazed and ungrazed land. "Some prairie lovers have worried that the bison-grazed prairie would look like an old pasture—depleted and bare," Packard wrote. "What the future holds is still a mystery." Indeed, a relatively small, carefully managed prairie can be predictable: A steward or enthusiast can often go out, year after year, and find the same plants growing in the same places. That predictability was comforting. But now that Nachusa had grown to several thousand acres and a herd of bison was running around, turning rank fields of tallgrass into cropped grazing lawns and exposing bare patches of earth, that stability had been disrupted. But most, if not all, of Nachusa's stewardship community has come to accept this "adjusted aesthetic" as the new normal—and bison grazing as the right thing to do.

As the first years wore on, the impacts of bison became more and more obvious. Cindy Crosby, who coordinates Nachusa Grasslands' dragonfly and damselfly monitoring program, says the bison have altered the landscape in significant ways. They churn up stream banks and pond banks, they carve deeply worn paths that didn't exist before. Conventional wisdom was that bison wouldn't spend time in the water, and they don't quite loaf like cattle, but they do have impacts. Because dragonfly monitoring requires spending significant time near water, Crosby has ample opportunity to observe and consider these influences. "They change those areas so significantly with their hooves, and with their wallowing. And I mean, it's astounding, really, to see," she says. "Every site that I'm in . . . there are trails now that weren't there before. There are wallows now that weren't there before. Which bring insects and things—which dragonflies are carnivores, so they're feeding on those insects—they churn up the stream banks of the creeks and the ponds, and form little, ephemeral pools, where the water collects." In the drier areas, there are other subtle effects—wherever bison have intensely grazed, there is less dry thatch during the fire season, which produces a less intense fire, and a patchiness of burned and unburned areas. These patches become, in turn, refugia for insects, or other plants, all of it occurring in a far more stochastic, natural manner.

There is no more obvious impact of bison on the landscape than a wallow.

Nothing contrasts with the careful maintenance of prairies, to the reality of having bison on the land, quite like a bison rolling and writhing, kicking up dust, caking its skin in soil and sand and mud. Both the action and the microhabitats this behavior creates are termed wallow. Individual plants are killed as these spots become bare soil patches. While these sites are used as wallows, nothing can grow in those patches of dirt. But when they're abandoned, they fill with early-successional species. In a high-diversity prairie such as Nachusa Grasslands, those species often include native violets—host plants for the endangered regal fritillary—plants that thrive in bare, open soil. Like fire and grazing and trampling, like the mounds dug by plains pocket gophers and American badgers, wallowing is yet another important disturbance.

The experiment with bison was thirty years in the making. After just five years, Nachusa Grasslands was a lot less like a garden, and a lot more wild.

Now that the bison were back on the tallgrass prairie, a kind of bison mania ensued. Thousands of visitors descended on Nachusa Grasslands. In September 2015, the first Autumn on the Prairie since the bison had been introduced, the area was swamped with onlookers coming to get a view of the bison. People arrived several hours ahead of the event opening; others waited in line for hours. Bison viewing became the number one reason visitors came to the grasslands and visitation increased tenfold. In the year after the bison arrived, the number of donations made to the Illinois chapter of the Nature Conservancy more than doubled.

But for all of their pioneering, groundbreaking work, Nachusa Grasslands has never been alone in the journey of ecological restoration—its workers have shared techniques and lessons, they've shared seed and even personnel with like-minded conservationists and projects throughout the Midwest. As an eastern tallgrass prairie preserve—as a site of ecological restoration—it wasn't going to be the only one with bison for long.

In 2015, twenty-seven bison were introduced to Midewin National Tallgrass Prairie in Joliet, Illinois. The fields they were placed on were composed mostly of nonnative pasture grasses, and it was an experiment to determine whether it was possible to restore a pasture to native prairie while simultaneously grazing with bison from day one (while also being an attempt to draw in more visitors). The next year, after four years of planning and preparation, twenty-three bison were taken to the Kankakee Sands restoration in northern Indiana. None of these sites were identical, and they would all contribute unique insights into the effects of bison grazing in eastern prairies. Because of the high water table, a significant portion of the Kankakee prairie was dominated by an equisetum,

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or scouring rush (*Equisetum hyemale*), an ancient fern-relative also known as horse tail—nearly a thousand acres, or one-eighth of the entire prairie, was an equisetum monoculture that foiled TNC's every attempt; they couldn't burn it, and they couldn't control it with herbicides. The sandy sterile plain, and high-water table, created perfect conditions for it to thrive. Conventional wisdom says bison don't like wet feet, but at Kankakee Sands, the bison were spending hours in the wetland areas eating *Equisetum*. "It is their absolute favorite thing to eat," refuge manager Tony Capizzo told me. In short order, the bison had whittled down the monoculture to a smattering of equisetum interspersed with native grasses and flowers; in some patches, the plants had been entirely eliminated. The bison were doing so simply in the quest for food, achieving goals that land managers with drip torches, diesel fuel, side-by-sides, and herbicides had failed to accomplish. "Right now we have seventy-four animals out there," Capizzo says. "So that's seventy-four different brains making decisions constantly about what to eat, where to wallow, and all of those decisions are having impacts on the landscape." Bison were also observed eating reed canary grass, one of the most malignant wetland invasives; they rubbed and damaged willow and cottonwood saplings—and in the summer, ate a surprising amount of woody browse—which were good and necessary things in the management of the prairie. At both Nachusa Grasslands and Kankakee Sands, the bison had split into bachelor pods and cow family groups, with the different social groups doing different things—"So you're getting two sets of decisions there and two sets of grazing impacts," Capizzo says. The effects might be hard to tease apart scientifically, but "it's one of those intuitively as a manager, when you get seven mouths that are on two acres for four days in a row—that's having a different impact than thirty mouths for twenty minutes one day and then nothing for the next seven."

Nachusa Grasslands now has a diversity of structure that was lacking before bison. This is known to be good and necessary for a wide range of prairie birds (while some require tallgrass, others require short)—and grazing, in general, has resulted in an increase in numbers and diversity of birds. Anecdotally, after bison arrived at Midewin, cattle egrets showed up but persisted for only a year. Lately, great horned owls have arrived in large numbers. "Does that have to do with bison or not?" Midewin's bison manager asks. "I don't know. But they weren't there in the numbers that they are now. . . . We haven't done a tie between the landscape and what's attracting them. But there were cattle grazing out there for a long time, and nothing." Northern harriers might nest

more frequently, as they are more comfortable in the shorter grass structure that bison grazing creates. At Nachusa Grasslands, the upland sandpiper—the bird that got this whole thing rolling—has been seen only once in recent years, on the edge of a crop field far from the bison-grazed prairies, in 2017. Even with a robust team of scientists, there are mysteries yet.

New species do continue to spring up at Nachusa Grasslands all the time, and much of this is just because someone starts looking for something. How many dragonflies had there been prior to monitoring? No one knew. But now we know there are many dozen. In 2017, a researcher documented a population of the federally endangered rusty-patched bumble bees at Nachusa Grasslands, a species which has suffered a 95 percent decline in recent years. They went looking for them at Nachusa, and they found them.

Much of this diversity is a function of size—there is space enough for this variety of life because Nachusa Grasslands is large. In 2019, Nachusa partnered with a local nonprofit wildlife preserve to release more than seventy endangered Blanding's turtles, charismatic turtles whose beak curves upward, producing what looks like a broad yellow smile. As part of that "head start" program, researchers take eggs from nests, and the turtles hatched from the eggs are reared in captivity and released when they've grown beyond their most vulnerable phase. Other species, meanwhile, persist without direct interventions. Some years earlier, a tract of land had been added to the preserve, and it was discovered that the piece contained a remnant population of ornate box turtles—and because that tract is now protected by Nachusa and not further degraded or plowed or drained or developed, this remnant population of an endangered reptile will persist. When another three-hundred acre tract was purchased, it was discovered to have one of the largest ornate box turtle populations in the entire state—and because it was not drained or developed into half-acre home sites, those animals live. Few if any of the sites had been included in the Illinois Natural Areas Inventory—but there was enough richness and diversity persisting in these remnant acres that it has taken decades to uncover.

Jeff Meiners has lived at the corner of Lowden and Naylor roads for nearly forty years. As Nachusa was being established, he was there building his own home from the ground up, just to the east of Schafer's prairie. "To me, the prairie looks better every year. If anything, [the bison] thin the grasses down," he says. Initially, Meiners had been skeptical as to whether Nachusa could make the bison work. "But they pulled it off almost flawlessly." During the annual

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bison rut, in August and September, Meiners likes to leave his windows open so he can hear the bulls bellow. "They bellow all night long. It's just a sound that you would never think you would hear in northern Illinois."

Meiners is not the only one to be so enchanted: Bison seem to connect all manner of people to the prairie. Before those large mammals had been introduced, the mission of Nachusa Grasslands could be abstract and hard for some to appreciate. Jeff Meiners was quick to see its value; in fact, he started gathering seed and sowing prairie into his own property's remnant grasslands in the first years of Nachusa's own restoration. But others in the community have not been so quick to see the value of the preserve. "I think generally they think we work really hard," Bill Kleiman says. "They're not sure *why* we're working so hard." On more than one occasion, Jay Stacy has been confronted while working on a project—a vehicle has stopped in the road and the driver has rolled down the window to shout something to the effect of "What's all this good for?" Stacy says there's a number of ways to answer such questions, whether it be the inherent right for creation to exist ("Do you have the right to say that that beautiful little bird there doesn't have a right to exist anymore?") to carbon sequestration ("This is one of the few places around that's sequestering carbon—little Nachusa Grasslands is fighting global warming every day, every hour"). Initially, the arrival of a herd of bison caused even more consternation among the preserve's neighbors. At the local diners and bars, neighbors grumbled about this latest idea—would they be able to contain these animals? Would the bulls crash through their fences and bring diseases to their neighbors' cattle? But after those initial grumblings had died down—and after Nachusa's fences and husbandry proved to be up to snuff—the bison have helped bring context, and meaning, to the decades of hard work—the blood, sweat, and tears—involved in restoring Nachusa Grasslands.

Cindy Crosby believes that if bison can make people care about Illinois's prairies, then perhaps this is their most important function at Nachusa Grasslands. "For me, the bison are almost a necessary component of the spirit of the prairie," she says. "And some people"—meaning scientists and other ecologists—"won't like that. But it's true. If we're going to engage people with rebuilding and restoring some of these lost places, some of them are not going to be reached by technical information." Failing to appeal to people, failing to be noticed at all, was part of the struggle to preserve the tallgrass prairie in the first place. Prairie enthusiasts continue to lament that conservation programs for grassland birds have been much slower to emerge than those for the brightly colored forest birds; as a group of Illinois conservationists wrote,

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"Drab sparrows that avoid being seen and heard in order to stay alive don't muster as much emotional support." Crosby acknowledges that the scientific rationale for bison at Nachusa Grasslands, the ecological need for grazing, is valid and appropriate, but she firmly believes that it is just as important, and valid, to use the bison to reach the hearts and minds of the American people "by appealing to the spirit of the prairie. . . . That is a connecting point that I think is just as important for the future of restoration. Engaging people's hearts and their spirits with something like bison, who maybe are never going to see an eastern prairie fringed orchid, or really get too excited about some of the less sexy plants that are a sedge, maybe, but that is just as important, maybe, to a system, but doesn't have that charismatic appeal."

On a visit to Nachusa Grasslands in June 2024, I witnessed that charisma firsthand. I felt it in the early morning as I listened to the massive animals chewing as a group of bison grazed and moved through the tall grasses; their heads slung low, they never stopped moving, and I could not stop watching. Later in the day, I watched a lone bull wallow in the sand on the edge of a pond. In the evening, after a day of botanizing and exploration, I came upon several cars pulled off to the side of Lowden Road (the vegetation along the roadsides, it is worth mentioning, is composed of a wonderful assortment of prairie grasses and flowers). Among the small crowd was a family—they live not far from there—eager to get a glimpse of bison; two large animals were ambling remarkably close to the perimeter fence. "You don't know how lucky you are," one of the men said to me. He was with his kids, and he assured me that the animals were rarely that close to the fence. The joy and the wonder in his voice were palpable. He couldn't believe his luck; he couldn't believe mine.

A few years earlier, I had an opportunity to get even closer to one of Nachusa's bison.

It is late summer, and I am in a truck with Cody Considine, looking for a bull; it was spotted earlier in the week with what appeared to be an eye infection. "If we find it, we should probably get a dart in it," he says. Darting means tranquilizing, and tranquilizing an animal requires getting close to it. When Cody locates it, I'd like to be there.

As we follow a two-track lane through the grasslands, Cody constantly interrupts himself to point out unique plants and landscape features. "There's some bottle gentians there, that purple. A really cool plant." "This looks really cool, all this different structure, green structure." "A lot of diversity of forbs." "There's tall coreopsis, there's a sawtooth sunflower and then there's some gay-

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feather where grasshoppers are on those long cylindrical—" I get the impression that he would be making these observations, in his mind if not aloud, even if I were not in the truck. We pass the main complex of knobs, which was part of the original land purchase, and then Cody discusses the rare flowers growing in a reconstructed wetland. In 2017, that mosaic of patchy habitats beckoned to a pair of endangered whooping cranes. These birds, which had been down to a low of twenty-one individuals in 1941, had slowly climbed to around eight hundred birds over the past eighty years. Just once before, Susan Kleiman had seen them flying over the preserve, but this was the first time they'd ever been documented at Nachusa Grasslands (and it just happened to have occurred after three years of bison grazing). Susan texted her friend Rich Beilfuss, the director of the International Crane Foundation, who replied that it was likely the first time since the 1830s that whooping cranes and bison had been seen together on an Illinois prairie. "For all we know, whooping cranes had a relationship with bison," Beilfuss told me. When the last whooping cranes were discovered at their breeding grounds in Canada, it was in the boggy wetlands of Canada's Wood Buffalo National Park; hundreds of years ago, before the prairies were plowed up and the wetlands drained, when a more robust population of whooping cranes would have migrated south, they would have flown through the bison-grazed prairies of Saskatchewan, and south toward the tallgrass prairies and salt marshes of the Gulf Coast. "Most of their range, they would have been associated with bison, historically," Beilfuss said. Today, thanks to whooping crane recovery efforts, a second population now migrates from Wisconsin to Florida, and on this day, they'd made a stop at Nachusa Grasslands.

When TNC embarked on the Nachusa Grasslands experiment in 1986, it was to preserve an entire landscape—to restore the evolutionary processes of an Illinois prairie. At that time, no one cited sandhill cranes or the vanishing whooping cranes as targets of their conservation efforts. But by establishing a landscape for big prairie and for the unknown and the unexpected, they made space for the ancient association of crane and bison to be reestablished.

As we continue our hunt for the injured bison, Considine points to an area where the federally endangered prairie white-fringed orchid has been reintroduced. That orchid (*Habenaria leucophaea*) is among the nine high-quality, or "conservative," species that Bob Betz identified as being indicators that a prairie restoration had succeeded—these indicator species were the first to disappear when a site was drained or heavily grazed. Steve Packard called this list the "pinnacle of [the] royal species" and recalls that Bob Betz, who planted the

first large-scale prairie restoration at Fermilab in 1975, believed that the restoration of these most conservative species was "the ultimate and most challenging goal of prairie restoration." In recent years, more than four hundred of these orchids have been counted at Nachusa, making it the largest population in the entire world.

Considine admits that these kinds of successes had been a source of worry for the early restoration ecologists—they wondered if success might be a double-edged sword. If restoration could be successful, of course that was good—but might it also give a green light to the destruction of pristine natural areas elsewhere? The idea that it's fine to bulldoze a prairie or drain a wetland because "You can just mitigate," he says. But nothing could be farther from the truth. "Even the best prairie restoration is likely nowhere near the quality of what a remnant grassland was. There's so many components that we're missing and we're not even aware. And so at Nachusa, we're trying to do the best we can to restore those components, at least put them in place, and let them have the best advantage to reassembling and be a functional community." The work is hard and expensive to do. Nachusa Grasslands is one of the finest ecological restorations in the world, and it has taken forty years to restore approximately 4,000 acres—and we should remember that the original tallgrass prairie spanned nearly *150 million* acres. Wherever relic habitat exists in this world, we'd be wise to let it be.

The worries of those early restorationists are founded. As Considine toured me through the restoration, the Greater Rockford Airport Authority, located thirty miles north, was considering a plan to bulldoze a Class 1 remnant, Bell Bowl Prairie, for a new cargo hub. This was not the first time Bell Bowl Prairie was on the chopping block. In the 1960s, Bell Bowl was almost lost and then was protected thanks to the efforts of an amateur botanist, Egbert W. Fell, who explained the situation to the airport authority, which agreed to spare the rare grassland. The prairie was saved again in 1986 when his son George Fell, with an assist from the governor of Illinois, once again convinced the airport to protect the prairie. The property had been included in the Illinois Natural Areas Inventory, but the airport authority had never gone so far as to enroll it as an Illinois Nature Preserve. Recently, the airport had begun removing references to the prairie from their website. When conservationists noticed this erasure—and when the airport authority announced plans to build this new cargo hub—the authority argued that Bell Bowl Prairie could be picked up and moved. Just as the conservationists had feared, this development entity was justifying their actions by pointing to ecological restoration—that things

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could, in fact, be replaced. The federally listed rusty patch bumblebee is there, as are conservative prairie plants (leadplant, prairie tickseed, prairie cinquefoil, wild quinine, and violet wood-sorrel, among others). But Bell Bowl Prairie is private property, and the Endangered Species Act does not prevent the destruction of endangered plants on private property. And so the owners of the land, the Greater Rockford Airport Authority, are largely free to do what they want; the destruction of an ancient ecosystem that has survived so much activity all around it is not prohibited by law. The presence of an endangered species, the occurrence of one of the last scraps of ancient ecosystem—1/700th of 1 percent—pulls at the heartstrings of a growing number of Americans, but not all.

In 1985, when Steve Packard argued for protecting a large natural area large enough for prairie animals—even if it meant pouring attention into an area that was degraded and in need of restoration if not wholesale re-creation—he had his detractors. When ecologists with the Fish and Wildlife Service proposed restoring prairie at the Neal Smith National Wildlife Refuge, when the Nature Conservancy proposed creating Kankakee Sands, they heard the same thing. There are remnant prairies that are still unprotected, and a flashy restoration project will divert attention and funds away from the real thing. As Nachusa Grasslands has grown and attracted donors, a few other old-growth remnants may have fallen off the radar of the region's conservationists.

A short time later, after a short reprieve to listen to the concerns of the prairie preservationists, Bell Bowl Prairie was bulldozed by the airport authority. From twenty-five acres, it was reduced to less than five. As an at-risk site, Bell Bowl Prairie has never been alone; there are other remnant natural areas in Illinois, including INAI sites, that are likewise unprotected. Even where current land-uses seem compatible to conservation, things can change rather quickly. A sand prairie might never be plowed for corn, but perhaps an entrepreneur will come to realize that it'd be a great place for a solar farm, a distribution hub, a data center, or yet another housing development. Perhaps some minerals there will be identified as useful to a new technology.

Prairie reconstruction is a useful term, but it's important to remember nothing at Nachusa Grasslands is created from scratch. They gathered the seeds of living things where they still remained. They learned the needs of the communities and the individuals and tried to provide those things. But if there are no remnants, there is nothing to gather—if the sources have all been destroyed, there will be nothing to piece back together. Consider the prairie bush clover; it

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had occurred on the sand prairies of Franklin Grove, ostensibly, for thousands of years. But as the prairies all came under cultivation, prairie bush clover, along with hundreds of other species, began to vanish. If Nachusa Grasslands had been turned into a housing division, that rare population might have been lost altogether, along with the lingering ornate box turtles, regal fritillaries, and hog-nosed snakes. A Rock River conservationist would have been chasing ghosts. As the Illinois botanist Gerould Wilhelm has concluded, "We can't make a single living thing."

Nachusa is now large enough to contain a number of ecosystems and communities—but this gravelly soil can never be all of Illinois—it cannot replicate the cypress swamps of southern Illinois, nor the black soil grasslands of the old Grand Prairie. To preserve life, to preserve those things, plant and animal, that have evolved in the country for tens of thousands of years—and whose ancestors are far more ancient—we will need not only Nachusa Grasslands but all of the original postage-stamp prairies that remain. It's worth recalling Aldo Leopold's first rule of intelligent tinkering, which was "to keep all the parts."

Nachusa cannot be home to all creatures. It cannot contain all of the region's creations, nor be an ark for all of life. But what it can do for the rest of our nation, and what it does exceptionally well, is inspire. And perhaps the next bold restoration of tallgrass prairie will make even Nachusa look like the postage-stamp preserves of an earlier generation.

It's been a decade since bison were introduced to Nachusa Grasslands. In 2024, a team of scientists including Elizabeth M. Bach, Nachusa's resident research scientist, published a review of the first five years of grazing, and what they reported was firmly in the middle: Grazing had not significantly altered plant diversity. For five years, they identified and counted the plants growing in randomly placed quadrats (PVC pipe squares placed on the earth). Within the square, scientists such as Bach got on their hands and knees and inspected every blade of grass, every broad leaf, every flower and seed pod and unique shade and hue, to identify and record species after species, year after year (a few of these transects have been monitored at Nachusa for more than twenty years). And although the same species were present, it was their structure, or height, that had changed; for example, instead of Indian grass standing five feet tall, it was now more often just five inches tall.

None of the conservative species have vanished from Nachusa Grasslands, but make no mistake, bison can be rough on the remnant habitats. On some of

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the knobs, bison wallowing and trampling has led to erosion. The bare wallows become deep depressions, and if these wallows are enlarged, the prairie turf may eventually slide down the hill. In some areas, grazing seems to have encouraged an increase in nonnative weeds. Bill and his team are closely monitoring these changes, and should it ever become necessary, if it seems as though the bison are doing too much damage to Nachusa's highest-quality remnants, Kleiman would consider fencing them off from the rest of the prairie for a few weeks, a year, or some other time period that would strike a balance between the benefits of grazing and the undeniable impacts of massive, hungry, wallowing animals. If the monitoring data suggested that the bison were doing serious harm to the remnants, or even the planted prairies, he could reduce the number of bison at Nachusa or even remove the animals entirely. "But the question will never be 'Did it work, or did it not work?'" he says, "it's always going to be something in between that." As the Chicago-area natural historian Joel Greenberg concluded, "Recognizing that sound management could mean treating different parcels differently merely acknowledges that humans are not omniscient."

Despite the impacts of the bison, there's reason to conclude that these knobs will be resilient. Schafer's Knob, for one, had been mined for gravel a generation earlier; after the digging had stopped, the land had grown up as high-quality prairie (as Susan Kleiman says, "The prairie up above fell into it"). To the north, cattle and horses had grazed the remnant knobs down to the nubs for years, yet the land had still harbored conservative plant species. The remnant areas of Nachusa Grasslands had seen a significant amount of action over the years, and they'd proven to be resilient.

Some conservationists have said the same thing about the patch-burn grazed prairies of Missouri—that they have recovered nicely from the cattle and the patch-burn grazing, that perhaps the impact of those cattle wasn't as bad as some had feared. It's been nearly twenty years since those experiments unleased a flurry of controversy and quarreling among prairie conservationists. The conflict between the pro- and antigrazing camps seems to have died down, but not so much because they've reached a consensus. Indeed, if the controversy has died down, it's because the two camps, pro-grazing and antigrazing (reductive terms I hesitate to use), have stopped communicating with one another.

East of the Mississippi, the ideological lines have not been so pronounced (largely due to the fact that there were no Grade A remnant prairies large enough to even consider grazing). In fact, Illinois's conservation community

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has been overwhelmingly supportive of Nachusa's experiment. Doug Ladd, who was critical of the patch-burn grazing program that had occurred in his home state of Missouri, says that Nachusa is doing conservation grazing as well as anyone. "I think they're sort of a model of how you would approach grazing in the tallgrass," he says. "It's the philosophical approach of saying, there's an irreplaceable constellation of biodiversity, our goal is to abate critical threats and enhance the viability of the totality of the prairie biodiversity—and that's the lens through which we will measure and apply processes, be they grazing or fire or plant reintroductions or anything else." "They are building a biological legacy where the restorations [themselves] have fairly unique value compared with relatively new restorations," he concludes. "And their being intercalated with existing remnants creates an irreplaceable landscape of global significance from a biodiversity perspective."

Five and ten and twenty years of data are good, but Nachusa wants to stay healthy indefinitely (to that end, Friends of Nachusa Grasslands has already raised $4.5 million for an operational endowment; if the Nature Conservancy ever decides to sell the property, the Friends group is capable of funding stewardship, and the property is now a dedicated state nature preserve). But "What happens in five hundred years?" Bill Kleiman asks. "We don't know."

In the 1980s, when Steve Packard argued for the need to conserve an Illinois prairie large enough to capture ecological processes, it was a vision of life into the future—for a world that did not yet exist. "We're so used to thinking in terms of next quarter, or next tax period," he says. "But even in terms of a human lifetime is too short a period to think of. We need to think beyond." To think beyond, in an ecological context, also means looking *back*, to the ancient past, so that we can understand how we came to inherit such a rich and diverse world—and what we can do to keep it. "To a considerable degree, I think of Nachusa as a Pleistocene experiment," he says. He agrees with the skepticism that the level of grazing at Nachusa Grasslands today is probably not a reflection of the level of grazing that occurred on that patch of earth in the year 1600. "But what was the level of grazing for five million years?" he asks. "And how adapted are plants and animals to an ecosystem that existed that long ago?" We know that grassland birds flocked to the emerging postglacial prairies 10,000 to 12,000 years ago, but mitochondrial DNA suggests that most of those grassland birds, as species, were 200,000 to 300,000 years old. "Which means they lived here with mastodon and the long-horned bison and saber-toothed cat." Grazers, of some kind or another, have been integral to the

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prairie ecosystem for hundreds of thousands of years, and bison happen to be the last of the megafauna from that grazing lineage. "The plants, the insects, they all evolved with bison," Packard says. "We don't have to have them everywhere, but there should be an eastern tallgrass ecosystem that survives with bison on good quality soils, in part, so the bacteria and algae and all this stuff is working together in a way that we can draw genes from, for making crop plants healthier, or that solve disease outbreaks when they come along. . . . So it's just, in some ways, safety for the planet to maintain high-quality ecosystems. And prairie with bison is one of those."

Although North America's grasslands evolved with grazers, it's unlikely that any of those massive animals, bison included, stayed on any one 1,500-acre piece day after day, year after year (and over the past 10,000 years, any herd of bison would have been hunted down by human hunters long before they'd had an opportunity to overgraze any of those knobs). But the bison of Nachusa aren't going anywhere. "Grasslands evolved with fire; grasslands evolved with grazing," Kleiman concluded. "And of course, the struggle is: How do you do it in modern America? How do you fence in an animal that eats prairie and not have it eat the whole prairie? And we're trying to figure that out."

For all the benefits to ecosystems and to the public's engagement with conservation, there's another big question that these conservationists must begin to wrestle with, and that is: What's in it for the bison?

One summer, Bill and Susan Kleiman took me to see Rock River, a few minutes down the road from Nachusa Grasslands, to get a look at a pod of white pelicans. That large group of birds had gone there in 2005, after Hurricane Katrina had blown them out of the gulf. This kind of thing happens from time to time with hurricanes (the year before, pink flamingos had turned up in Ohio and Pennsylvania), but the curious thing about the pelicans is that they have stuck around, perhaps because the climate is warmer or perhaps owing to some other unknown influence. We know that other large birds are changing their range—anhinga, black-necked stilts, and Mississippi kites are now occurring farther north, which appears to be a response to the warming climate. With no shortage of examples of climate movements, including American alligators settling as far north as Memphis, Tennessee, the writing's on the wall.

In response to climate change, the American bison in North America has changed significantly over millennia. During the ice ages, our modern bison's ancestors were much larger; their horns were longer, their humps were more pronounced—in all regards they were much more massive. But as the

climate warmed, the species shrank, adapting and evolving to the changing climate and habitats (and perhaps to human hunting pressure as well). But this time around—as our own climate rapidly warms—the American bison will have fewer opportunities to find a new niche because there's nowhere they can go; with the exception of herds at Yellowstone and Grand Teton, and two relatively small populations in Utah, every bison in America is behind a fence. But even where they are unfenced, if those "free-roaming" bison cross a designated boundary, they will face a wall of ammunition; they are not free to roam. If they are capable of evolving adaptations to the warming climate, it will be as a semidomesticated species, not a member of the wild biota. Furthermore, there is some worry, and growing awareness, that Americans might be unintentionally domesticating bison. "Indeed, it is my experience that bison behave increasingly like cattle as they are more intensively managed like cattle," Al Steuter, the grassland ecologist who pioneered conservation grazing with bison, wrote. To these concerns, we should add that we've placed the American bison in a situation where it has no climate resiliency.

Indeed, the restoration of bison in the twenty-first century was a compromise for the species and a half-truth for us. In the process of saving the animals, the bison were changed. The American buffalo had become a symbol of wilderness but not the expression of it. In the nineteenth century, the species had been reduced numerically from tens of millions to tens of thousands; in the twentieth century, they were also reduced in spirit. Even if bison represented wilderness, the vast majority of the animals were not permitted to live *wild lives*. They lived behind fences, for the sake, and presumably the safety, of the viewing public, and when their numbers swelled, they were rounded up in corrals and processed through abattoirs just like domestic cattle. By the 1990s, there were more than a quarter-million bison in the nation, but only 20,000 of them lived on public lands and only a couple thousand of the publicly owned bison were truly free roaming. The vast majority of America's bison, more than 250,000 animals, lived on private ranches; they were raised for meat and hides, and they occurred in an agricultural setting, not as members of an ecological community. The buffalo was a romantic presence on the landscape, but the truth was that they were becoming livestock, an icon of wild America slipping into domestication. The public had quietly accepted it—a caveat for just the one species—as the outcome of a settled America. It wasn't necessarily a conscious, deliberate choice debated by scientists and politicians; it was just what happened.

The American conservation movement—which had introduced whitetail

deer, elk, black bear, which had recovered ducks and geese by the millions—had stopped short of recovering the wild bison. Every other large animal in North America—even ones as ferocious and powerful as grizzly bears and American alligators—were free to come and go and move about the land. We had done a great job of increasing the physical presence of bison as individuals—the animals were out there on ranches and pastures for all of us to see—but as wildlife, as members of the biological community capable of exercising their own evolutionary potential, they were still functionally extinct. Bison were contained for our pleasure and for our benefit—and almost everywhere, they were divorced from their ecological contexts.

In 2002, Texas A&M geneticist James Derr published a genetic study of the American bison: In short, the species was in trouble. Generally speaking, killing more than 40 million bison over the course of several decades and thus reducing the population of wild bison to a few hundred animals put the species into a dangerous position in terms of inbreeding and genetic drift. What's more, Derr's studies revealed that most of the nation's bison now contained domestic cattle genes. According to his estimates, only 15,000 bison in a few parks and refuges had been spared cattle introgression.

Aware of the need to conserve not just the ecological function of bison but their genetic diversity and integrity, Nachusa Grasslands entered into an arrangement with Wind Cave National Park. Nachusa and several other TNC preserves would be a living genetic bank; they would maintain the genetic integrity of this herd, and should Wind Cave or another preserve need an infusion of new animals, Nachusa Grasslands could be a source.

Still, despite the fact that their genes were being conserved and carefully monitored and curated, the expression of their evolutionary potential remains truncated—not just in Illinois but in South Dakota, where the source herd is fenced and contained.

The movement to restore bison to the eastern tallgrass has largely focused on ecosystem services, which carries the risk of viewing the bison as mere cogs in a machine—or worse, as machines themselves—without their own inherent rights, and evolutionary potential, beyond the fenced enclosures. Bison are not even classified by the state of Illinois as a native, wild species; all bison in this state are formally classified as livestock. It's not hard to understand why a legislature would want to draw arbitrary lines around 2,000-pound beasts, but it's an ahistorical classification. And it's undignified that a wild species that evolved on this continent, that coevolved with this grassland biome, is

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prohibited by law from stepping off its owners' fenced properties and is not classified like every other mammal native to the state.

In 2005, a diverse group of stakeholders including the World Wildlife Fund, the Wildlife Conservation Society, the National Park Service, the Lower Brule Sioux Tribe, the Council of Athabascan Tribal Governments, a number of private bison ranchers, and the Nature Conservancy, among others, met at Vermejo Park Ranch in northern New Mexico. Together, those groups—tribal organizations, public and private conservation organizations, and private bison producers—released their "Vermejo Statement": "Over the next century, the ecological recovery of the North American bison will occur when multiple large herds move freely across extensive landscapes within all major habitats of their historic range, interacting in ecologically significant ways with the fullest possible set of other native species, and inspiring, sustaining and connecting human cultures." Because we're talking about bison, this may seem to be a high bar for success, but those conditions were in fact no different from those set for any other species in the United States.

That same year, the Wildlife Conservation Society reformed the American Bison Society. Among the new group was Glenn Plumb, the former chief wildlife biologist of the National Park Service. For more than forty years, Plumb has played a significant role in the evolution of our relationship with bison in North America. He was responsible for purchasing the first Nature Conservancy–owned bison herd and for managing them on the Ordway Preserve in South Dakota while comparing their grazing ecology for a doctoral thesis. After all these years of working to restore these animals, he says, we are only just now beginning to consider the effects on the species: "If we're simply creating a relict assemblage of animals on a relict, degraded piece of the earth, it's false to suggest that we're conserving this species. Because if you don't conserve its ecology, and you don't conserve its evolutionary potential, then the species is at a dead end."

"We need to take a hard look," he continues. "What it is that makes a bison a bison is critically depleted across the entire continent. . . . It is time, if not today, in the near future, it is time to start taking down the fences. . . . Those bison on TNC preserves are not wild bison."

Wild bison, in many ways, represent the crux of our challenges in the East. We want to save the bison, preserve them in situ and in their ecological context, but our human environments dominate the land so thoroughly that it's hard to imagine how this can ever be possible. In the East, what's most obviously missing from various projects is the bison's ability to *move*, to go some-

where other than the confines of the grassland preserves. Historical accounts of bison from Illinois and Indiana to Ohio and Kentucky were unequivocal about the herds' ability to move fast and far. (The restoration of elk to central Appalachia, by contrast, was riddled with ecological devastation, but the elk of central Appalachia are truly wild and free, which is something that cannot be said about nearly every living bison, whether it lives and dies on a national wildlife refuge or at Nachusa Grasslands.) Conservationists should keep these shortcomings front of mind even as they celebrate the successes of grassland restoration—because the work to conserve the American bison, even as herds increase on preserve after preserve, is far from complete.

Jason Baldes is the tribal buffalo program manager for the National Wildlife Federation, and in this capacity he has supported the restoration of over a hundred "conservation bison" to tribal and public lands throughout the West. Baldes, who is a member of the Eastern Shoshone Tribe, has written that "we need a paradigm shift in how we collectively 'see' buffalo. Today, the animals are generally confined by fences or prescribed boundaries. The people who travel to see them are probably unaware that most are privately managed and not considered 'wild.' We have forgotten how to see buffalo in their habitat, the way we see pronghorn, moose, elk and other wildlife species."

At Nachusa Grasslands, that is only partially true. The bison are fenced; they are not free to come and go as are the whitetail deer, the coyote, the badger, and the mink, but they are on native habitat. Nachusa's bison occur in ecological context on one of the finest expanses of grasslands in all of Illinois. For all the good the herd does to bring a grazing complexity to Nachusa, their occurrence there also helps us to finally "see" bison in the East, both its shortcomings and its potentialities. What's more, perhaps the bison at Nachusa will help us "see" the entire land community in all of its diversity and complexity and do right by it. Perhaps it will do this, however, while also deepening our commitment to keeping bison behind fences.

In our lifetimes, it's unlikely that the former Prairie Peninsula from Illinois to Ohio—or the meadows and oak savannas from Tennessee and Kentucky to the Carolinas—will be able to offer bison a landscape large enough to allow these animals to engage with their full evolutionary potential—and by that I mean it's unlikely that we'll see free-roaming bison in the eastern United States anytime soon. The bison's fate as a wild, free-roaming animal will likely be determined in the Great Plains, where there is the most land and where we have come to expect to see bison. But even way out west, as the conservationists Dustin Ranglack, Glenn Plumb, and Luke Rogers recently wrote,

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bison "only function as wildlife under natural selection on < 1.2% of the original range. . . . Thus, while the American bison may seem to be an iconic and ubiquitous species, worthy of their designation as the United States national mammal, recovery as a wildlife species is not yet assured."

As for the wild ecologies of the East, who knows what changes the continent will experience. Fifty years ago, we couldn't have imagined prairie restorations on this scale happening in Illinois and Indiana, and now there are thousands of acres of replanted prairie with bison on them. Perhaps we could re-create a landscape that would support free-roaming bison—animals as free on the land as a moose in Maine's North Woods or an elk in east Kentucky.

In June 2024, I walk the remnant knobs of Nachusa Grasslands with Susan Kleiman. She's indefatigable, collecting seeds as we walk and testing their ripeness against her teeth; as we look for rare plants, she stops to pull weeds (king devil, *Hieracium piloselloides*, was under control in the unit several years ago but has returned). Susan uses her phone to mark the spot on Nachusa's GPS software, and the task is added to their never-ending list of chores.

When I stand on the top of a remnant knob, I look out to the various landscape features—to the sandstone outcropping on Coyote Point, to the wetlands, to the bottoms where the drain tiles were dug out with a backhoe; to the west are woodlands and savanna, and to the northeast, beyond the headquarters barn, is Clear Creek Knolls. There are units and ecosystems that are beyond my viewshed. The place is big. More is conserved there than Dot and Doug and Tim could have imagined. As I begin to express some astonishment, Susan Kleiman, who has spent a lifetime there with the bush clover and the king devils, the ground squirrels and the bison, puts it back into perspective. "Four thousand acres, you would think, it seems big—we can barely keep up with the management. But if you pull back in the satellite view, it disappears. It just disappears. It's a *dot*." She's right, of course. Nachusa is a drop in the bucket when compared to the original tallgrass of Illinois. This preserve is enveloped by a modern world and human culture that demands more space, more roads—more distribution centers, more data centers, and more population centers—more of every natural resource, day after day, year after year. I know that when I stand at the high point of the hill on the North Bison Unit, I will see the cloud of steam rising from the massive cooling towers of a nuclear power plant—as vivid as any reminder of the ever-sprawling, ever-consuming human population. But even as Susan tells me this—and as I hear her words and her meaning and grapple with this

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perspective and what can quickly become a crushing futility—I also hear the songs of dickcissels, Henslow's sparrows, and red-winged black birds. Susan herself soon interrupts herself, midsentence, to identify a kingfisher flying and calling over our heads. As the sun continues to rise during our hike, the periodic cicadas in the adjoining woods have awakened, and there's a wall of sound enveloping the prairie. As we continue walking, I try to refrain from stepping on conservative plants, but it's useless; rare plants are everywhere there. Soon we stumble into what appears to be a badger's den, atop of which an American painted lady butterfly sucks nutrients from the fresh scat of a coyote. To our east, a pair of sandhill cranes and their colt scour the soil for insects. Susan Kleiman is right, Nachusa Grasslands is a dot, but even this dot contains multitudes.

For the past thirty years, Bill Kleiman has done his part to bridge the gap between the restoration that occurs at Nachusa, and the vanishing of nature elsewhere—he has partnered with neighboring landowners, preserve districts; he's formed a land trust to preserve other undeveloped lands in the Middle Rock River region; and he has trained dozens of young land stewards ("passing the drip torch," he says). Shortly after Nachusa was established, the Byron Forest Preserve District hired Chris Bronny to lead its ecological restoration program; in the years since, the district has planted thousands of acres of prairie with a professional staff and crew. The Franklin Creek State Natural Area, just down the road, is now acquiring cornfields and planting them to prairie, work that Kleiman and his crew also assist with. In the fall, when Nachusa's staff harvests seed with a combine, most of it is shared with these conservation partners. "For harvesting seed, you really can't beat scissors and buckets," Kleiman says. "There's no machine that does it when it's all out there mixed together. . . . Humans across the globe, forever, have had their hands on the plants. [It's] an ancient human behavior, to hand harvest, and I think it's pretty cool when we're doing this. It's an old story." Because portions of Nachusa Grasslands are now dedicated as a State Nature Preserve and other acreage is enrolled in the Illinois Land and Water Reserve Fund, neighbors can enroll and protect their adjacent land if they wish—and one neighbor has recently done that, exponentially increasing the conservation value of the entire area. And growth is still on the horizon for Nachusa. Today, it's at just over 4,000 acres, but the final plan envisions as many as 10,000 acres. Which means that this world-class restoration may yet double in size. For the hundred bison, growth would mean that they would have access to more acreage—and perhaps the area would more closely resemble a historic occupancy in Illinois—or

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perhaps it could mean more bison. As Cody Considine tells me, "This is just the beginning."

Cody and I have been in the truck, looking for the injured bison, for over an hour. As we round a bend of tall grass, we stop in the two-track—a bison is lounging in the middle of the path. We wait for it to move, to determine if it's the animal he's looking for. But, no, it's not the one. On that morning in September, he and I never do find the injured bison. Later in the day, I go off with a seed-collecting crew. Over the radio I hear that Cody has just found his bison. I wish I could have been there, but the animals are not livestock; they're not there for me to touch and feel. If the bison had lived at Yellowstone, the infection might have festered and become a liability; it might have healed, or it might have succumbed. If it had been born in the Book Cliffs or the Henry Mountains of Utah, it might have been harvested and eaten. All of those possibilities would have been noble endings to a wild life. At Nachusa Grasslands, the animal's health will likely improve. It will continue to graze among orchids and fritillaries; the presence of this bison will kill some living things, and enrich others; it will bring light to the kittentails and the prairie bush clover, and sunlight and enough space are essential if we are to have those things. In the fall, these same bison might be rounded up and taken to join a tribal herd in Wisconsin, New York, or even out west, to South Dakota—or they may stay at Nachusa for many years to come. The bison's life and death will transpire in this setting that is both domestic and a bit wild—emblematic of its species and wild lands in the East.

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PART III

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CHAPTER 15

The Singer Tract

In northeast Louisiana in the 1930s, there remained an old-growth forest remote enough that whitetail deer and wild turkey could still flee from hunters; a tract of primordial bottomland swamp whose canebrakes were so thick that black bears could vanish without a trace and where the cypress and gum trees were so massive that the bruins could make their dens in their hollow cores. Within that tract the rare ivory-billed woodpecker still hammered into the decaying wood of towering snags; and in the dark of night barred owls screeched and panthers pounced on prey. An ancient forest where the saw palmetto twisted toward the sky, and the Spanish moss dripped from creeping branches. The forested wetlands were filled with mink and otter, massive alligators, snapping turtles, and cottonmouth snakes; in the winter, its oxbow lakes swelled with wood ducks, mallards, and all manner of migrating waterfowl. Even at that late hour of westward expansion, the howl of wolves still filled the night air. It was a world that Henry David Thoreau would have taken infinite pains to get to know, where no demigod had come before and plucked the best stars from the sky, an entire Heaven and an entire Earth.

Not far from the Mississippi River, that 80,000-acre property was a timber holding of the Singer Sewing Machine Company; it was the heart of the Tensas River swamp, and it contained the prized old-growth trees that might someday be cut and crafted into the company's signature cabinetry. The expanse was a remnant of the wet, dark forest that had once covered 25 million acres of the lower Mississippi Valley. It flooded so frequently, and with such devastation, that it was foreboding to even the hardiest of settlers—the deltas had been saturated over and over again for thousands of years, and the recent floods of 1912 and 1927 had broken state records. The floods set back ecological succession, and for a while, the waters and the dense canebrakes had kept the farmers and timbermen at arm's length. But the Singer tract, again, was a mere remnant of the former expanse. Like the tallgrass prairies of Illinois and

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Indiana, like the Big Barrens of Kentucky and Tennessee, the vast bottomland forests of the Mississippi Valley had been almost entirely transformed by agriculture. These acres of the Singer Tract were among the best of their kind, and the last. In 1926, in an acknowledgment of the value of the place, the forestland had been set aside and protected as "a sanctuary and propagating grounds" for Louisiana wildlife—the Singer Wild Life Refuge—to be jointly managed by the state and the Singer company. But it was just a ten-year contract, and time was almost up.

A landscape like that, an eastern forest that contained large carnivores, was a special thing. These animals that must kill to make a living—meat eaters, like the game hunters that followed them into the forest—imbue the land with a sense of danger, excitement, and opportunity; especially the big things with sharp teeth and massive paws, capable of downing an elk, a moose, or a full-grown whitetail deer—those predators were essential to the sense, and the function, of a wild America. But in the early twentieth century, these kinds of places were vanishing in tandem with the big game and the ancient forests. Wolves and cougars had been extirpated from most of the East—the last mountain lion to be taken in the Northeast would be shot by a hunter in Maine in 1938; and no one had heard the howl of a wolf in the East in decades. Black bears, too, were increasingly rare. The swamps of Louisiana and east Texas were among the westernmost extension of the Eastern Deciduous Forest ecoregion—along with the oak and hickory forests of the Missouri and Arkansas Ozarks, that was where the wet, rich forests of the East and the arid prairies of the West collided and comingled. Although the Mississippi River is a convenient, and real, dividing line between East and West, wild nature is less tidy, and often as fluid as the mighty river itself. Natural communities, species even, intergraded and mixed, and the bottomland swamps of the Mississippi Valley were no exception. These last forests, natural areas holding the line against the inevitable ax and plow, continued to harbor the pitiful remainders. The Singer Tract was one of those rare places; even into the 1930s, the big trees, the sprawling wetlands, and all of the South's big carnivores were still there.

Some of the animals we classified as vermin, and hunters seemed not to extract a noble sportsman's pleasure from killing them; they were trapped or shot or clubbed to death because they had to be destroyed, not because the average hunter enjoyed the pursuit (the average farmer, meanwhile, was just concerned with protecting his herds and flocks). Other carnivores, however, became game—because the hunters enjoyed either the pursuit or the taste of

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their flesh—and the pursuit of American black bear had become a hunt to prove one's sporting mettle. In October 1907, President Theodore Roosevelt went to the Tensas country on one of several bear hunts. His guides regaled him with stories of panthers chasing bobcats. But it was the wolves that caused these men the most consternation—wolves often killed their hunting dogs or killed their sheep back home. A few years earlier, in his book *The Wilderness Hunter*, he had made clear what he thought of those predators: "The wolf is the archetype of ravin, the beast of waste and desolation." Indeed, although predators of all kinds had been subject to bounty laws, it was the wolves that caused the most hysteria, and it was the wolves that would be targeted for complete eradication. Big-game hunters, and conservationists of all kinds, believed that if game was to persevere on the land—even in a place as wild as the Tensas River swamps—all wolves should be killed. Only a few conservationists of the era had anything good to say about wolves; when the Pennsylvania writer Henry Shoemaker stated in 1914 that "All living things have a *purpose*" and that wolves have an "inherent right to live, to be protected by mankind," he was a lone advocate (and it mattered little, anyway—all of the Pennsylvania wolves were already dead and gone).

In the 1930s, Tappan Gregory, a Chicago lawyer and amateur naturalist, would revive the minority opinion that wolves were not evil incarnate. "Always we had thought of the Timber Wolf as possessed of the most courage, the most cunning, the most stamina and, to those of his kind, perhaps the greatest loyalty of any of the wild beasts inhabiting North America," Gregory wrote. Tappan Gregory was ahead of the times in many respects. For the past several years, he'd been perfecting a novel method of photographing wild animals—perhaps the world's first camera trap—and the timber wolf was his ultimate prize. Stanley Young, the assistant head of the Biological Survey's Division of Predatory Animal and Rodent Control (PARC), was Gregory's partner in that effort. It was a strategic if ideologically contrasting pairing. Working now in Washington, DC, Young had joined the federal war against wolves in 1917 as a government trapper in the West. Over the years, he had come to grudgingly admire wolves, but he was resolute in his belief that their time on the continent was over. "Man has won. The wilderness killers have lost," he had written a few years earlier. "They have written their own death warrants in killing, torture, blood lust, almost fiendish cruelty." Although he perpetuated antiwolf propaganda as fervently as anyone else did, he was not without admiration for the targets of his crusade, soon going so far as to suggest that they possessed near human intelligence. He was curious enough to partner with Gregory, not to

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kill the animals, as was his duty, but to see if they could capture an image of these animals, living in the wild. As he corresponded with state and federal agents, it became clear that northeast Louisiana offered Tappan Gregory his best chance of finding a Mississippi Valley wolf (the campaign to eradicate the wolf was going extremely well). When the September rains finally came, a local trapper named Andy Ray went into the Singer Tract and reported signs of a sizable pack. Over the past three years, game wardens had trapped eighty-three wolves, and seventy-one wildcats off the perimeter of the refuge. If Gregory was to get a photograph of a living wolf, he'd better hurry.

Wolves had survived there for the same reason wild things had survived elsewhere in the United States: because it was not easy country to access and exploit. Bayous on either side of the Tensas swelled in the rainy season, and during the dry turned to a "sluggish residue" in stagnant pools; locals described the soil as "buckshot gumbo." Gregory, Young, and several others trekked in through these swamplands, and when they found an area with sufficient wolf sign, they quickly set their elaborate camera trap, which involved a plate that when stepped upon by a wild animal would complete a circuit, and simultaneously trigger the camera and a flash. As a professional trapper, Young knew how wary a wolf could be; to conceal their human scents, they dipped their overshoes in manure. "[The ground] was then dusted and fanned and made to look as natural as possible so that no passing wolf might know that the ground had been disturbed," Tappan reported. They did so as quickly as possible so that the sun might burn off their scents.

They were soon rewarded for their efforts, as the camera traps would succeed after just six hours. When they developed the film in their portable darkroom, they discovered their exact quarry—a black wolf, alive and well, trotting through the Louisiana understory. It was slightly blurry—the animal had been moving quickly—but it was remarkable in all respects. "We felt we had made new wolf history," Gregory wrote. "So far as we knew, no Timber Wolf had ever been persuaded to take its own picture in its natural habitat."

It was good wolf country, and Gregory got several more photos of wolves on that trip, all of them black. (Tappan noted the frequency of black-phase mammals in that dark, wet country—along with black wolves there were all-black skunks and black squirrels, too.) In two of the photographs, the wolves are seen with their nose to the ground—they were on the move and picking up scents. In the evening, Gregory and his crew heard wolves barking and in the morning awoke to their yapping. They even saw a wolf pup stalking four wild turkeys on a road. They saw an abundance of deer sign at various licks, and the

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fresh tracks of a large wildcat (or bobcat). Their camera traps captured more critters—a "spike-horn Louisiana white-tailed deer," a raccoon, pigs, steers, and people. They even watched an ivory-billed woodpecker—one of the rarest birds in the world—working the bark of a cypress tree for half an hour. When they finally drove out of the swamp, "the sound of wolves, heard in the east early that morning, [was] still ringing in our ears."

Gregory went back to Chicago and continued his career in law and his various naturalist pursuits. Stanley Young would soon be named senior biologist in the Biological Survey's Branch of Wildlife Research. (If his time in the Tensas with Gregory was a kind of ceasefire, that truce soon ended, and his campaign to exterminate the wolves of American resumed.) As for the Tensas and the Singer Tract, it would be another thirty years before any naturalists came looking for wolves again for any other purpose than trapping and killing.

But things were about to get very busy in the Singer Tract. It was becoming clear that the ivory-billed woodpecker, the largest woodpecker in the land, existed nowhere else but there. In 1907, Teddy Roosevelt had seen the birds while pursuing his black bear. "The most notable birds and those which most interested me were the great ivory-billed woodpeckers," he wrote. "Of these I saw three, all of them in groves of giant cypress; their brilliant white bills contrasted finely with the black of their general plumage. They were noisy but wary, and they seemed to me to set off the wildness of the swamp as much as any of the beasts of the chase." In the intervening years, the birds had grown exceptionally rare. In 1932, Louisiana state representative Mason Spencer found one among the bayous of the Tensas River, which ran through the heart of the Singer Tract; he shot the bird and carried it out to prove its existence. Soon ornithologists went there to study and celebrate that special bird. It was likely the last place on Earth where an ivory-billed woodpecker could be found.

Ever since settlers first laid eyes on the massive birds—shortly after proclaiming, "Lord God"—they started shooting them. The ivory-billed woodpecker had been killed and eaten, and its beauty—its striking white beak and its bright red plumage—had been used for ornamentation and ceremony by Native Americans for hundreds if not thousands of years. "The bills of these birds are much valued by the 'Canadian Indians' who make coronets of 'em for their princes and great warriors," Mark Catesby wrote in 1731. "The 'Northern Indians' . . . purchase them from the 'Southern' people at the price of two, and sometimes three buckskins a bill." (In 1939, an ivory-billed woodpecker beak would be reported from an Indian grave as far west as Colorado.) In the

early 1800s, John James Audubon observed, "Travellers of all nations are also fond of possessing the upper part of the head and the bill of the male" birds. "I have seen entire belts of Indian chiefs closely ornamented with the tufts and bills of this species, and have observed that a great value is frequently put upon them," he wrote in *The Birds of America*. At least one ceremonial peace pipe would be recovered—from the Iowa Tribe of Oklahoma—adorned with six bills and crests of ivory-billed woodpeckers. But the settlers' guns, as they had time and time again, proved to be too much for the species. The striking red feathers from the crest of the male's head were fashionable adornments for women's hats. The birds were killed for the millinery trade, they were killed so that their heads could be sold as curiosities, they were killed so that their bills could be used as "watch charms or fobs." Ivory-billed woodpeckers were killed because they were beautiful and people wanted to get a closer look at them.

But shooting the bird wasn't the only action driving it toward extinction: Ivory-billed woodpeckers were increasingly without any place to live. Some bird populations were able to rebound quickly after the Migratory Bird Treaty Act outlawed taking eggs and killing birds at certain times of the year. But not the ivory-billed woodpeckers, which were habitat specialists who fed primarily upon the insects that lived between the bark and the sapwood of dead and decaying trees. The birds needed big dead trees; they needed a landscape that allowed rotting things to linger, to decompose slowly, a landscape dripping with both life and decay—and those kinds of places were now few and far between.

As with other rare creatures, many people allowed themselves to believe the vanishing species had simply gone elsewhere. "It is generally believed that the Ivory-billed Woodpeckers have not materially decreased in numbers," wrote one naturalist in 1906, "but that, as they are a wild and suspicious bird, they have retired before the advancing civilization to the naturally quiet and hardly accessible southern swamps where they can hardly be molested." John Decker, the Pennsylvania contemporary of Jim Jacobs, had said the same thing about Pennsylvania's wolves and passenger pigeons. But as we now know—and as the ivory-billed woodpecker's admirers were coming to accept—the retreating animals were in fact dead. When the swamps were drained, when the old-growth was cut and the old snags removed, they had nowhere else to go.

It was a good thing that the Singer Tract was preserved; at least the birds had that place. In 1935, James Tanner, who was becoming the foremost authority

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on ivory-billed woodpeckers, succeeded in documenting the birds there. Soon he would write a dissertation on those last birds—twenty-four were thought to live there—and would become the only person ever to band an ivory-billed woodpecker. When his team of investigators finally saw the bird in the Louisiana forest, his colleague George Miksch Sutton recalled feeling that the experience was like a dream. "As I beheld his scarlet crest and white shoulder straps I felt that I had never seen a more strikingly handsome bird. His crest was gorgeous. But somehow what struck me most was the rich whiteness of his beak and the staring whiteness of his eye."

Tanner's quest for the Lord God Bird brought him into close contact with the southern wilderness. In addition to the ivory-billed woodpeckers, he stumbled into the tracks of Louisiana panthers, he saw massive alligators swimming in the lakes, and he witnessed a black wolf as it strode through the palmetto thickets. Tanner thought it would have made "an excellent national park or monument of North American wilderness." Despite the relentless development of America, that wild and ancient place, where the waters of the Mississippi welled up, was still intact. If they could preserve that place for the ivory-billed woodpecker's habitat, they'd preserve it for all these other creatures too—the myriad birds, the intact vegetation, the old-growth cypress, the wild turkey and whitetail deer, and the black wolves and black bears, too. "I believe that I have seen almost every bit of virgin timber in the South and unreservedly, the Singer Tract has the finest stand of virgin swamp forest," Tanner said. "The Singer Tract should be preserved, as an example of that forest with all its birds and mammals—a true bit of the north American wilderness."

Lumber barons, however, have often failed to be so enchanted by the songs of wolves or the bills of birds. And it was lumber barons to whom the Singer Sewing Machine Company had just sold its logging rights. The Chicago Mill and Lumber Company started cutting right away, as early as 1937—the felled trees would be processed into boxes of various sizes—and James Tanner was rightfully worried about what it meant for the future of the ivory-billed woodpecker. But he also believed the lumber companies could harvest some timber *and* protect the woodpecker, too (or he was willing to make those concessions). He outlined a management plan that called for some areas to be preserved, some to be selectively cut, and in certain sections, he even allowed for clear-cutting. But the company was uninterested in anything Tanner had to say, and as the cutting accelerated, the ivory-billed woodpecker population

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plummeted to just six known birds. Whether we call it a wilderness or an old-growth forest—a virgin stand of timber or a primeval swamp—without that particular kind of forest, the ivory-billed woodpecker had no future.

By 1942, as the logging continued, the governors of Louisiana, Mississippi, Tennessee, and Arkansas pleaded to save some forest and with it the ivory-billed woodpecker. Appeals were made to President Franklin D. Roosevelt to intervene; his administration made the case to Chicago Mill and the Singer Company to save some of that forest (the administration "agreed to state in writing that the United States didn't need the lumber at the Singer Tract to win the war"). Sam H. Jones, the governor of Louisiana, offered to pay $200,000 for the Singer Tract in a deal that would have paved the way for a new national park. But Chicago Mill was not interested in any kind of compromise. "We are just money grubbers," James Griswold, the chairman of the board, is reported to have said. "We are not concerned, as are you folks, with ethical considerations." Chicago Mill declined to preserve even a small portion of the Singer Tract. There was no Endangered Species Act then, no critical habitat designation to invoke; no one had the authority to decide what Chicago Mill, a rich and powerful corporation, could do with that land and those trees but the company itself, even knowing that a beloved and remarkable species might forever vanish if they insisted on cutting every last acre.

Meanwhile, the National Audubon Society sent the conservationist Richard Pough to the Singer Tract. Born in Brooklyn, New York, Pough was a trailblazer in the world of land conservation (in a few years, he would become one of the founders of the Nature Conservancy together with the Illinois conservationist George Fell). A few years earlier, he had convinced a philanthropist to purchase a 1,400-acre mountain tract in eastern Pennsylvania to put an end to the local practice of shooting hawks; the new preserve became the nation's first dedicated to birds of prey. But in Madison Parish, Louisiana, he would run up against a wall. He found the lumber company unwilling to compromise or even slow down for a moment—and he found very few ivory-billed woodpeckers. He would track the lone female he did find, watching its movements every day for a month; "she would come out and call and call and call," he recalled. "No male ever responded." (Like the last elk bugling in Pennsylvania's Sinnemahoning Valley, the animal was following its futile instinct to find a mate.) In January 1944, an ivory-billed woodpecker would be spotted for the last time in the Singer Tract, as the Chicago Mill and Lumber Company sent in German POWs to harvest the last big trees. Don Eckelberry, a wildlife artist and part-time Audubon Society warden, raced down to the John's Bayou

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section of the Singer Tract, where he spent two weeks following and painting the bird (Eckelberry noted the lone bird's "hysterical pale eyes" and was impressed "by the majestic and wild personality of this bird, its vigor, its almost frantic aliveness"). It was an obituary created *en plein air*—the last sighting of an ivory-billed woodpecker anywhere.

Clear-cutting the Singer Tract was devastating to all living things dependent on that old-growth system. It's unknown exactly what happened to the black wolves of the Tensas, but around that time they, too, "disappeared." Perhaps wolves didn't require the insects behind the bark of mature trees, as the ivory bill did, but surely they needed something more than buckshot gumbo. It's curious that a large terrestrial mammal such as the wolf, hated in every corner, could linger longer than a bird celebrated for its beauty, but such was the case. Wolves had the ability to live in a wider diversity of habitats, and that adaptability gave them a slight advantage. But only to a point. Their time, too, was almost up.

Wolves had been subjected to eradication campaigns for more than three hundred years. The first wolf bounty was enacted by Massachusetts in 1630, and every colony and state either followed suit formally or in action. In 1697, the province of New Jersey paid "Negroes and Indians" ten shillings for every wolf they killed; "Christians" twice as much. Those campaigns were not meant to "manage" or "control" individual nuisances; the law in New York, for example, was explicit: "The breed of Wolves within this colony, may be wholly rooted out and Extinguished." The wolves nearest the Atlantic were wiped out the soonest; the last wolves of Maine were killed in the 1890s, in Pennsylvania in 1891. By the early 1900s, all of the wolves were gone from the Adirondacks. In West Virginia, the last wolf kill was recorded in the remote mountains of Randolph County, in 1900. Wolves lingered in the swamps and in the most rugged mountains, but settlers were coming for them, just as surely as they came for the last big trees. There were organized ring hunts, circular hunts, and drives; there were professional bounty hunters and fur traders; and every person with a gun in the woods was expected to shoot wolves on sight.

Wolves had been killed by trappers long before guns had arrived on the continent, and the most widespread method of capturing the animals was the classic wolf pit. Settlers likely learned the technique from Native hunters—wolf pits were used everywhere from the Carolinas to the Blackfeet Country. "A would-be trapper needed only a shovel and a strong back," wrote the historian Bruce Hampton. "Baited and well-camouflaged, a pit could be used

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repeatedly to capture unsuspecting animals. Some pit builders refined this technique by constructing an elaborate revolving platform attached to a center timber acting as fulcrum. When the wolf jumped on the baited platform, it promptly dumped the animal into the pit below." In 1630, a Massachusetts woman accidentally fell into one such pit; a short time later, a wolf fell in, too. After a "terrifying night huddled in opposite corners of the pit," the woman was pulled out, and the wolf was "bludgeoned to death." Moravian missionaries in Bethabara, North Carolina, captured wolves in their pits in the 1750s, and a century later, when there were just a few remaining wolves in the state of Mississippi, the animals were likewise targeted with pits: "They are taken in pens or traps made of poles, and baited with fresh meat, which is previously dragged over the ground for miles through the woods near their haunts, to lure them on the trail," wrote the newly appointed state geologist, Benjamin Wailes. "Pits are also constructed with a slight covering of twigs and leaves, into which they fall in attempting to reach the bait suspended over them."

Wolf pits were a staple of vermin eradication. There are towns named Wolf Pit (or Wolfpit), from Connecticut to North Carolina, and westward to Kentucky; near Northampton, Massachusetts, a Wolf Pit Swamp. In western Indiana, John James Audubon witnessed three black wolves in a farmer's pit and watched the man torture the wolves to death.

> The woodman stretched out their hind legs, in succession, and with a stroke of the knife cut the principal tendon above the joint. . . . We now hauled the terrified animal up [out of the pit]; and motionless with fright, half choked, and disabled in its hind legs, the farmer slipped the rope from its neck, and left it to the mercy of the dogs, who set upon it with great fury and worried it to death. . . . [The third wolf] showed some spirit the moment the dogs were set upon it, and scuffled along on its forelegs, at a surprising rate, snapping all the while furiously at the dogs, several of which it bit severely; and so well did the desperate animal defend itself, that the farmer, apprehensive of its killing some of his pack, ran up and knocked it on the head with his axe.

The modern leghold trap, however, would soon render pits obsolete. The seminal device was the Newhouse No. 4½, invented in Oneida, New York, in 1895. As the Newhouse company soon boasted, ["The Newhouse trap] going before the axe and the plow, forms the prow with which iron-clad civilization is pushing back barbaric solitude, causing the bear and beaver to give

way to the wheatfield, the library and the piano." Those clams were not mere salesmanship; previously, steel traps had weighed as much as eighty pounds, but the Newhouse trap, and the even lighter models that would soon follow, allowed trappers to set traps in even the remotest locations. Like the Kentucky rifle and the John Deere plow, that simple steel contraption would transform entire landscapes.

Perhaps it is gratuitous to recount the destruction of yet another North American mammal. We have already seen how elk and deer and buffalo were hunted down to the last individuals. We've seen the wastes of meat, the rotting carcasses, the mounds of skulls and piles of skin. But the destruction of canids in the 1800s and into the twentieth century was unique—the widespread use of poisons, bounty systems, and the employment of government-contracted killers was a peculiar treatment reserved for the American wolf and its smaller cousin, the coyote. These campaigns would profoundly affect how we think about these animals, and whether or not we would ever extend to the wolf the right to even exist. It was a gruesome crusade we've struggled to move on from yet.

The greatest slaughter of wolves came early: Between 1780 and 1789, more than 330,000 wolves were harvested by commercial fur traders (although these traders failed to differentiate between wolves and coyotes); the historian Bruce Hampton considers that as the period when the "greatest number of wolves [were] ever killed within such a short period in the continent's history." A century later, the federal government would embark upon a campaign to find all of the straggling wolves, and finish the job. In the late nineteenth century, as conservationists were pleading with Americans to save the buffalo from extinction, the same men were simultaneously, and intentionally, driving another species to the brink of extinction. Even William Temple Hornaday, the great buffalo savior and president of the American Bison Society, "could scarcely find words loathsome enough for wolves," wrote Hampton. "Of all the wild animals of North America, none are more despicable than wolves," Hornaday wrote in a series of publications; "deadly dangerous to man . . . a black-hearted murderer and criminal. . . . There is no depth of meanness, treachery, or cruelty to which they do not cheerfully descend. They are the only animals on earth which make a regular practice of killing and devouring their wounded companions, and eating their own dead."

That kind of propaganda, expressed by one of the nation's leading zoologists, was incredibly effective. In 1907, the federal campaign to exterminate wolves began in earnest; and by the end of the year, combined efforts would

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result in the destruction of 1,800 wolves, and 23,000 coyotes. (President Roosevelt, who had described wolves as "the beast[s] of waste and destruction," would soon welcome his Oklahoma hunting companion Jack Abernathy to the White House; Abernathy was "renowned for his ability to chase wolves on horseback, corner the exhausted animals, grasp their jaws with his bare hands, and wire them shut before running his dogs loose to dismember the animals.") In all, 1,723 wolves would be killed that year by forest rangers in western states. In 1913, the Biological Survey's Predator Animal and Rodent Control (PARC) was established, and, in addition to the monies states were paying for bounties, the federal government would soon be spending millions of dollars to exterminate the myriad undesirable native mammals of North America.

In the 1920s, the Biological Survey began mass-producing poison strychnine baits. A pair of wildlife biologists who were employed for many years in federal predator control summarized the extent of the poison: "Destruction by this strychnine poisoning campaign that covered an empire hardly has been exceeded in North America, unless by the slaughter of the passenger pigeon, the buffalo, and the antelope. There was a sort of unwritten law of the range that no cowman would pass by a carcass of any kind without inserting in it a goodly dose of strychnine sulphate, in the hope of eventually killing one more wolf." Like the compulsion to drain every swamp, to cut down every bit of timber, Americans were insatiable in their desire to kill every wolf. When a few wolves were discovered in Iowa, in 1892, a sheepman was disgusted with his fellow countrymen for allowing it to happen, calling it "a stain, a foul stigma, on the civilization and enterprise of the people of Iowa that these wolves remain." Although we had killed everything in America, the emotion attached to wolves—and the compulsion to destroy every single one—was unique.

In the 1920s, a few wildlife biologists began to see some folly in the campaign, even from the singular perspective of game. Between 1906 and 1931, the Biological Survey would record the destruction of 4,849 coyotes, 554 bobcats, 781 mountain lions, and 30 wolves on the Kaibab Plateau in Coconino County, Arizona. As early as 1920, biologists noted that there were suddenly far too many deer for that arid habitat. In 1924, Aldo Leopold would visit the Kaibab Plateau, but he found few people within the Biological Survey (with the exception of few scientists, including Olaus Murie) who were willing to admit that perhaps it had been a mistake to kill off every single predator. Ten years after the Kaibab Plateau campaign began, more than 70,000 deer would starve to death. A small group of biologists made the suggestion of reintro-

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ducing some of the vanquished predators—but the idea was dead on arrival. According to the historian Thomas R. Dunlap, "Direct human management was the only acceptable—indeed the only 'thinkable'—course."

In the early twentieth century, American sportsmen had developed a modern ethic toward wildlife; but as they had rebuilt game populations, as they had established wildlife refuges and enacted strong game laws, they had bypassed wolves. "When Americans set about saving nature, wildlife, and wild lands in the late nineteenth century," Dunlap wrote, "they made exceptions for the 'bad' animals—the predators—and chief among them were the wolf and the coyote."

Wolves now occurred only in the areas least desirable for human settlement, and at that point in time, that left only the wettest. Eastern swamps had a long history of sheltering the region's last large mammals. Recall that the last elk of Pennsylvania was found in Flag Swamp of the Allegheny Mountains and that when whitetail deer and the American black bear were hunted to near extinction in the East, their few strongholds were likewise the swamps of the Gulf and Atlantic Coasts. Just west of the Mississippi, it was in the Big Swamp of northeast Arkansas and southeast Missouri that the last elk and bison could be found, "the only situation in which these animals are to be found east of the most advanced settlements of the whites." Wolves found shelter there, too. They hid out in the Grand Kankakee Marsh as late as 1907 and in the east Texas swamps of the Big Thicket. Into the 1920s, south Georgia's famous Okefenokee Swamp was cited as "one of [the wolves'] last strongholds and may even yet shelter a few survivors." The Mississippi Delta region around Natchez was believed to hold at least a dozen wolves (the historic flood of 1927 was believed to have pushed the animals across the river). And it would be in the Everglades of Florida, the famous wetlands at the edge of the continent, that the only panthers east of the Mississippi would survive.

But by the middle of the twentieth century, Americans had devised technology to get nearly anywhere. In Minnesota's northern wilderness, where the nation's last gray wolves lived, bounty hunters had begun shooting wolves from airplanes. After the passage of the Wilderness Act, in 1964, there was now only one place those aerial hunters could not go: the Boundary Waters Canoe Area Wilderness, a newly created federal wilderness area where flights under 1,200 meters were no longer permitted—and it would become the species' primary refuge. Without that refuge—without those early federal protections—wolves would likely have been gone from Minnesota, too.

Elsewhere, extirpation continued to mount. Gray wolves were considered

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extirpated from Wisconsin by the early 1960s, with the last animal being struck and killed by a vehicle in the Bayfield Peninsula in 1958, and they were declared gone from Michigan's Upper Peninsula by the end of the decade. A survey of Yellowstone National Park failed to turn up any wolves in the 1960s, and it was believed that the species was now extirpated from the West.

Yet despite those intense control efforts, reports of wolves continued to trickle in from the mid-South. There happened to have been some pockets of wild, undeveloped land left, and those places evidently harbored wolves. In Louisiana, there even seemed to be an increase of wolf depredations on livestock. The Biological Survey, having nearly run out of wolves to kill in the West, was ready to devote its attention to the region, and it was prepared to get those animals under control, too. In 1950, the Fish and Wildlife Service reported killing 356 red wolves in Texas alone, a 50 percent increase from the previous year, along with 2,829 bobcats, 27,176 coyotes, and 18 mountain lions. Between 1915 and 1965, federal agents reported killing a total of 55,000 wolves in Texas and Oklahoma. By and large, the wolves in question weren't the larger gray wolves, *Canis lupus*, common to the North, but rather an intermediate-sized southern animal now commonly known as the red wolf.

As much as Americans were sure about the need to destroy all wolves, they weren't entirely sure what these wolves were, especially in the Southeast—and they weren't eager to find out. When Tappan Gregory ventured into the swamps of Madison Parish, Louisiana, to get a picture of the black wolf of the Tensas, he joined a rare club of folks who were interested in the lives and ecology of these wild animals. Other Americans wanted the wolves dead and gone, and fast.

But those who did pay attention, even if their goal was destruction, noted that the wolves of the South and East were a little different from the gray wolves of the North and West. Wolves had been documented, and described in the latter regions for centuries. Around 1609, Captain John Smith provided one of the first descriptions of the animals when he noted that "their wolues [are] not much bigger then our English Foxes." A century later, John Lawson published an account of his exploration of the Carolinas, during which he had encountered rich and diverse Native cultures, and a staggering variety of natural landscapes, and in the "percoarson" or pocosin swamps, packs of howling wolves. "The wolf of Carolina," he wrote, "is the dog of the woods. . . . When they hunt in the night that there is a great many together, they make the most hideous and frightful noise that ever was heard." In 1743, Mark Catesby added,

"The wolves in America are like those of Europe in shape and colour, but are somewhat smaller." Around 1776, the acclaimed Quaker naturalist William Bartram encountered wolves in the prairies of Florida, feeding on the carcass of a horse: "The wolves of Florida are larger than a dog, and are perfectly black, except the females, which have a white spot on the breast; but they are not so large as the wolves of Canada and Pennsylvania, which are of a yellowish brown colour."

Nearly sixty years later, the famed naturalist John James Audubon, together with John Bachman, his collaborator on *The Quadrupeds of North America*, wrote about black wolves in Florida in the 1800s. They encountered wolves elsewhere in the South, as well as the red Texan wolf: "In shape the Red Texan Wolf resembles the common gray variety. It is more slender and lighter than the white Wolf of the North West, and has a more cunning fox-like appearance. The hairs on the body are not woolly like those of the latter but lie smooth and flat. Its body and legs are long, nose pointed, and ears erect. . . . This variety is by no means the only one found in Texas, where Wolves, black, white and gray, are to be met with from time to time." Audubon and Bachman were the first to define the ranges of various North American wolves, and they noted varieties in colors corresponding to geography: In the North, "a tendency towards white. . . . Along the Atlantic coast, in the Middle and Northern States, the majority are gray. To the south, in Florida, the prevailing color is black, and in Texas and the southwest the colour is generally reddish." But those giants of natural history didn't have any satisfactory explanations for the amount of variety in wolves: "It is difficult to account, on any principles of science, for this remarkable peculiarity, which forms a subject of curious speculation." A number of these questions would remain unresolved into the present—and in the years to come, they would be of paramount importance to how we should determine which wolves to save and where.

If we lacked explanations for the wolves' diversity of appearance, we more than made up for it in the usage of common names. To go along with those diverse colors and sizes were myriad regional names, too; in New York there was the "deer wolf," in west Texas a "buffalo wolf," and in east Texas, the "timber wolf" of the Big Thicket. There were a dusky wolf, a lobo wolf, a loafer wolf, a brindle wolf, and a varying wolf; and up in Canada, there were a wood wolf and a forest wolf. Depending on the terrain, there were mountain wolves, and there were also plains wolves—which were distinguished from the smaller *prairie* wolves (which we'd later come to know as coyotes), which were sometimes called "brush wolves" (both in Minnesota and in the Ozarks).

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Few North American mammals were given such distinctions. There was a wide variety and diversity of wolves on the landscape. It's not just interesting that there were different names for those animals; that would later be incredibly significant. Years later, when we'd try to put things back together, those descriptions, together with a few skins and skulls, would be all we'd have left to piece together what had once been there.

But scientists kept at it. In the 1930s and '40s, two men had begun to try to make sense of it all. Stanley Young, who had led the Biological Survey's crusade against wolves, and the mammalogist Edward Goldman compiled a two-volume, 635-page overview of the species titled *The Wolves of North America*. In that tome, Goldman determined that there were no fewer than twelve subspecies of gray wolf, and he grouped together all of the wolves of the Southeast—the black, the gray, the reddish, the timbers, the Texans, the Mississippians, and the Floridians—as one species, *Canis niger* (later renamed *Canis rufus*). The southern wolf was intermediate in size between the larger gray wolf of the North and the coyote of the West. As Goldman wrote in 1937, the red wolf "exhibits a departure from the true wolves, and in cranial and dental characters approaches the coyotes." Young described the red wolf as "greyhoundish in appearance, with long, somewhat spindly legs, a build which seems better fitted for long-distance running than is that of its relative of the western plains, the coyote." There were still questions about its origins and where and why it might hybridize with other species, but Goldman believed it to be a unique species of wolf, separate from the others.

For the common name of the southern and eastern wolf, Goldman chose "red" wolf, which was a departure from local custom. Although Texans recognized the red wolf, few others had ever used that common name; along the Atlantic seaboard, wolves had simply been wolves, and from the Mississippi Valley to the Florida Everglades, they had just as often been "black." At times, the Texas animals did have a reddish cinnamon tint to their coats, but they were rarely known to appear as the "red barn-roof paint" that the name might imply. If you run your hands through a wolf's pelt or the sun shines on the animal just right, you might see a reddish tone. But the adjective *red* failed to capture the full diversity of the wolf, an animal that had just as often been black and gray, just as the adjective *gray* fails to capture the diversity of a species that's often entirely white or entirely black. In the Mississippi Valley and down through Florida, animals such as Tappan Gregory's black wolves of the Tensas were most common. The mammalogist Ronald M. Nowak would later write that "most available specimens of 'red wolves' actually exhibit a typical

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wild canid color pattern, consisting of an agouti gray or brown, interspersed with black hairs, especially on the back, and with the muzzle, ears, and other surfaces of the limbs tending toward a tawny color." Decades later, the journalist and nature writer T. DeLene Beeland would come to describe the wolves' appearance as well as anyone: "They are not red like a red fox; rather, it's the red of a forest animal camouflaged by dried pine needles, bark, and the dank humus of decaying hardwoods." Any single adjective, then, was likely to fall short. But so it was: From that point forward, the southern wolf would be known as the *red* wolf.

As the taxonomy of North American wolves progressed, each year there were fewer and fewer living wolves. They were long gone from the Carolinas and Florida; and the last wolf in the Atlantic states was shot in Georgia's Okefenokee Swamp in 1908. By 1950, they were gone from Mississippi and Alabama.

But somehow wolf reports were still common in the central South, from the Missouri Ozarks down through the coastal prairies of Texas (in Texas, one federal trapper reported killing 350 red wolves between 1938 and 1941). In Louisiana, where there was an uptick in livestock depredations and wolves on traplines, some people began to wonder if there weren't several packs surviving in some backwoods wilderness. Depending on one's worldview, it would have been either a cause for concern or, for the rare wolf admirer, a small miracle.

Either way, the mystery of its relative abundance would soon be made clear.

In 1959, the mammalogist Howard McCarley completed a survey of the mammals of east Texas. It had been fifty-four years since the first and only comprehensive survey of Texas's mammals had been done, and he felt it was due for an update. A lot had changed in the past half century; human activity had modified much of the state, many animals were declining or extirpated, and nonnative species had been added to mix. But when he began his analysis of the wolves of east Texas, something didn't add up. Reports indicated that they were still present, but when he examined the skulls of recently killed red wolves, he determined that they were not in fact wolves; they were misidentified coyotes. Every one of them. The red wolf, it seemed, was now entirely absent from east Texas. "It is probable that the red wolf of East Texas is either extirpated or extremely rare," he concluded.

After his survey was complete, McCarley dived deeper into the canid conundrum. To determine what was happening with the wolves of east Texas,

he broadened his search to include eastern Oklahoma, Arkansas, and Louisiana and then went looking for skulls. In Texas and eastern Oklahoma, he would have no difficulty locating recent specimens, as wolf hunters had taken to proudly displaying their kills on fence posts. (On the outskirts of Houston, Texas, one trapper's collection was so large, the area came to be known as Wolf Corner.) For that study, he would examine 221 skulls and carcasses, many of which he found on such roadside posts. He compared those and other specimens to the historic collections Edward Goldman had examined a few decades earlier. What he discovered confirmed his suspicions. "On the basis of the evidence," he wrote, "all of the wild *Canis* currently occurring in Arkansas [except two skulls], Oklahoma, and Texas" were coyotes. "Admittedly, the available evidence which discounts current reports of red wolves from these areas is of a negative nature, but it seems likely that if animals large enough to be considered red wolves currently existed in these areas, at least some recent specimens would have been available." Those findings implied that everyone compiling statistics on wolf kills over the past several decades—the bounty hunters, the ranchers, and the government trappers who reported the numbers—had been wildly mistaken.

Some amount of confusion was understandable. Many decades earlier, before the word "coyote" had become commonplace, "prairie wolf" and "brush wolf" had both been used to refer to *Canis latrans*, and many settlers, like the fur traders before them, hadn't bothered to differentiate between the bigger gray, the intermediate red, and the smaller brush wolf. But wherever the red wolf and the coyote overlapped, many folks, especially the ranchers, knew how to tell the two species apart, and they had good reason to do so; as the mammalogist Vernon Bailey wrote in 1905, "While paying a bounty of $1 or $2 for coyotes, the ranchmen usually pay $10 or $20 for red wolves." That was no trivial difference. But farther east—in the forest/prairie borders of east Texas, eastern Oklahoma, and Arkansas—it appeared that as the red wolf had quietly vanished, folks had simply started referring to anything wolflike as a wolf. So when a man said he was taking a wolf hunt in eastern Oklahoma or Arkansas, he was actually going out to shoot coyotes.

That was a bombshell; it meant that a native species was going extinct and that until McCarley had started looking around, nobody had noticed.

If that was really happening, McCarley wanted an explanation. First and foremost, coyotes weren't supposed to be there; *Canis latrans*, the western coyote, hadn't occurred in the easternmost states in over 10,000 years (they

were absent from the fossil record). In 1905, Vernon Bailey hadn't included coyotes in the fauna of the timbered districts of east Texas, but red wolves, he noted, were fairly common. More recently, in 1943, George H. Lowery, Jr., hadn't included coyotes in his survey of Louisiana. For thousands of years, the densely wooded western edges of the eastern deciduous forests—the Ozarks, the Arkansas and Louisiana deltas, the Big Thicket of east Texas—had been *wolf* country.* To be sure, coyotes did venture east of the Mississippi River, but they kept largely to the Prairie Peninsula of Illinois and Indiana.

But by the early twentieth century, things were changing. Wolves were vanishing from just about everywhere, and the original, native landscape was being transformed. For the coyote—the smaller, adaptable, western canids—it meant that there was a new ecological niche that they could fill. "It could be suggested that red wolves were not able to adapt to the man-wrought environmental changes associated with intensive farming and lumbering operations, and gradually disappeared," McCarley concluded. "Coyotes, on the other hand, have apparently been able to utilize the changing habitat and have ecologically replaced red wolves as primary predators."

In hindsight, it was clear that the changeover had been happening for decades. As the larger red wolves continued to be trapped and shot off the landscape and as the ancient forests continued to fall, the smaller coyote could slink by unnoticed. When all of the great herds of whitetail deer had been killed, the red wolf struggled to survive; the diminutive coyote, meanwhile, could simply subsist on smaller prey. Coyotes could hide in shorter grasses and den in smaller depressions; being small in a domesticated landscape provided a tremendous advantage. And so, with the bigger, badder wolves out of the way, coyotes went east. By the 1930s, they began appearing in the remnant prairies of Arkansas. Soon they were traveling up and above the old Prairie Peninsula, far into Ontario and into the Northeast. Coyotes, in fact, were present in the St. Lawrence Valley by the 1920s; they had migrated as far as Maine by 1936; and they were considered common in the Adirondacks of New York State by the 1950s. Not only were the coyotes moving east, they had made themselves at home.

But McCarley wondered if there wasn't a second thing happening as well:

* "Timber wolf" was the name that earlier generations had bestowed upon *Canis rufus*, now called the red wolf. "Timber wolf" is also the name commonly used to describe the wolves that occupy the Great Lakes region, centering on Minnesota, although those animals actually belong to the species *Canis lupus*.

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In addition to being usurped by the coyote, perhaps the red wolf was being subsumed by it.

In 1944, Richard Pough listened to the last ivory-billed woodpecker call for a mate. In 1867, hunters in Pennsylvania's Sinnemahoning Valley had been alerted to the presence of the state's last wild elk because they had heard it bugling. Both of those animals—the ivory-billed woodpecker and the bull elk—were the last of their kind, calling out for something that was not there. But when a lone wolf howled in the Ozarks or in the forests of east Texas, it got a response. The pitch wasn't as low or mournful as a typical red wolf howl; it was higher and filled with yips. It was the sound of a coyote. During the mating season, when there weren't any other wolves around, those remnant red wolves—intermediate in size between gray wolves and coyotes—heard the response of the coyote and decided it would do.

Or at least that was how it might have happened. Howard McCarley had begun to suspect that the remaining red wolves—lingering on the margins of the settled landscapes—had begun to hybridize with the newly arrived coyotes. McCarley didn't speculate on the interaction—whether a female red wolf, say, looked at a newly arrived male coyote, not quite her size but large enough—and saw something familiar, something wolfish. Nor was McCarley the first mammalogist to suspect the ability of red wolves to hybridize. "West of the Mississippi River, the range of the red wolf is overlapped by that of the coyote," Stanley Young and Edward Goldman wrote in *The Wolves of North America* in 1944. "These two species are normally quite distinct, but small red wolves, especially in parts of central Texas, resemble coyotes very closely, and some specimens appear to be hybrids." The central part of Texas that they were referring to was the Edwards Plateau, where the western prairie and desert communities blended and merged with the eastern deciduous forest—an ecotone in which it was natural for eastern and western species to comingle and coinhabit. The earliest *Canis* specimens from that area, dating to pre–European settlement, indicate that wolves and coyotes had existed together there but had rarely hybridized. But after the wolf population had been reduced to stragglers, whatever preexisting isolation mechanisms that had existed between the two species had apparently broken down—and McCarley theorized that as hybridization had increased, the increasing coyote population was "gradually swamping out" the declining red wolf.

Louisiana, however, presented a slightly different picture. In addition to sightings, actual specimens of red wolves were collected as recently as 1956

and 1957 in Terrebonne Parish in southernmost Louisiana and near the Mississippi River, in Madison Parish (the home of the old Singer Tract). There was no mistaking the animals; they were wolves, and they were big. (A possible explanation for the persistence of wolves in Louisiana was that the state's modern game agency, the Louisiana Department of Wild Life and Fisheries, wasn't formed until 1944, and intensive predator control had only begun as recently as 1947.) In the years to come, wolves weighing in at forty, seventy-five, and as much as eighty pounds would be killed in Louisiana; and coyotes weren't yet known to occur in the state.

If a core population of red wolves still existed, perhaps it was there in Louisiana.

Howard McCarley's research sounded an alarm—a large and storied American mammal was facing extinction—but in an era of predator control, few people heeded the call. ("Is the wolf at your door?" asked an Associated Press report in 1950. "The United States Fish and Wildlife service wishes you would shoot him.") Indeed, a frenzied push to save the last southern wolves did not ensue. Unlike with the ivory-billed woodpecker, there was no meeting of governors, no appeals were made directly to the president. The only people likely to read McCarley's paper were other mammalogists, and they didn't command the ears of legislators, much less the attention of the American people. As far as the common person was concerned, wolves killed calves and fawns, they behaved like renegades, and they needed to be "controlled." The loss of the red wolf, like that of any other wolf, was a success. If the wolf was in fact going extinct, then good riddance.

The story of the red wolf might very well have ended with Howard McCarley's paper in 1962—another chapter in the chronicles of American extinction—had it not been for the curiosity of Louisiana native Ronald Nowak. At the time, Nowak was a history and political science student at Tulane University in his hometown of New Orleans. He'd been interested in rare birds; he read about the destruction of the ivory-billed woodpecker in James Tanner's book and the timbering of the Singer Tract that had occurred twenty years earlier. Tanner's narrative was filled with descriptions of wolves, bears, and panthers—massive wild animals that had startled Nowak to learn about. "I had no idea we even had such animals in Louisiana," he recalls. "And then this spurred my interest, and of course I quickly found out, yes, we have them—or we did have them—but they're almost gone. . . . And this really upset me." As his interest in mammals grew, his mother gifted him a copy of the National Geographic

Society's *Wild Animals of North America*; to the book, published in 1960, Stanley Young had contributed an essay to the chapter on canids, including a section on red wolves. In the chapter, he provided a brief history of the red wolf, noting John James Audubon's encounter with them in the woods of Kentucky and the "black phase" described by William Bartram in Florida. "Intermediate in size between the gray or timber wolf and the coyote or prairie wolf, the red wolf once ranged from Florida to Texas, and up the Mississippi Valley to Illinois and Indiana," he wrote. "Subject to the same persecution as its two closest relatives, it is now fast disappearing, and is found only in a small area west of the Mississippi." Those two words—"fast disappearing"—stuck with Nowak. "I felt I just had to do something about it," he says.

Nowak's first instinct was to find out if the claim—that the red wolf was "fast disappearing"—was true, and to do that, he started collecting data. He requested reports from the various state wildlife agencies and learned that for more than a decade officials in Louisiana and Arkansas had been noting that their large wolves were gone and a smaller wolf had moved in from the west. But when he wrote to the Fish and Wildlife Service for information, officials there told him that he was mistaken: "There are thousands of them and we're killing a bunch every year in Texas, and Oklahoma." (It's unclear if those officials were trying to placate Nowak or if they truly believed that the red wolf was doing fine.) But Nowak continued to compile information, including McCarley's bombshell 1962 report, and built his case. Finally, in 1963, he sent all of the information, along with a personal letter, to the Fish and Wildlife Service, and somehow it wound up on the desk of the right person: John Paradiso, a biologist with the Bird and Mammal Laboratories at the Smithsonian Institution, who had a special interest in endangered species. Nowak emphasized that he was concerned about the future of the species, in part because the predator control division of the Fish and Wildlife Service was continuing to kill the animals. Paradiso read the letter from Nowak, looked at the report by McCarley, and quickly made arrangements to travel to Texas and search for the animals himself.

In his quest to find evidence of living red wolves, he would have to settle for the recently departed—the surest way to find evidence of the region's animals was to work with local trappers—and so, as was typical, he would be working with skins and bones. He spent time in diverse Texas habitats from the coastal prairies to the wooded areas of the east, and he examined six skulls collected from the Anahuac National Wildlife Refuge on the east end of Galveston Bay; as well as the skin and skeleton of an animal from Kenedy County in far south-

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ern Texas. Those specimens were "unquestionably red wolves," he wrote in his report, adding that they "do not differ in any significant way from early specimens of red wolves" from east Texas, Louisiana, Arkansas, and Missouri; two of the animals he had examined weighed seventy pounds or more. "Inasmuch as the red wolf appears to be on the verge of extinction elsewhere and has been listed as an endangered species . . . the species still survives, perhaps in sizeable numbers, in at least some of the Gulf-Coast counties of Texas."

On the evidence of recent specimens, Howard McCarley had suspected that there might be wolves in Louisiana. Now John Paradiso of the Smithsonian Institution was saying something similar about the coast of Texas. Perhaps all was not yet lost.

Nowak wasn't the only person concerned by reading McCarley's paper. Douglas Pimlott, a wildlife biologist and professor at the University of Toronto, had also read about the plight of the red wolf. A native of the village of Quyon, Quebec, Pimlott was among the first generation of biologists to study the ecology of wolves in North America, with a study of the wolves of Algonquin Provincial Park that he'd begun in 1958. At a time when most traditional conservationists still wanted wolves eradicated from national parks in order to protect the majestic game species that people had come to see—the elk and the deer and the bison—his interest in wolves was considered peculiar. There were between five hundred and a thousand Algonquin wolves (*Canis lycaon*) in the vicinity of the park, and most of the park's neighbors thought that was far too many.* But Pimlott had developed different ideas about wild nature. As a graduate student at the University of Wisconsin, Pimlott's mentor had been "the father of wildlife ecology," Aldo Leopold. Like nearly every other game manager in the United States, Leopold had once been a predator hunter; in Arizona and New Mexico, he'd tracked and killed wolves for the US Forest Service to protect the livestock grazing on public land. "In those days we had never heard of passing up a chance to kill a wolf," he wrote in his soon-to-be-famous essay "Thinking like a Mountain." In the story, he and several other foresters are having lunch in the mountains when they spot a wolf pack fording a river below. "In a second we were pumping lead into the pack. . . . We reached the old wolf in time to watch a fierce green fire dying in her eyes. I realized then, and have known ever since, that there was something new to

* Many years would pass before researchers would understand the special relationship between Algonquin wolves and southern red wolves.

me in those eyes—something known only to her and to the mountain." That was the experience that changed him forever. "I was young then, and full of trigger-itch; I thought that because fewer wolves meant more deer, that no wolves would mean hunters' paradise. But after seeing the green fire die, I sensed that neither the wolf nor the mountain agreed with such a view."

In the early 1960s, Pimlott's studies of wolves in Algonquin Provincial Park—together with Adolph Murie's pioneering work on wolves in Denali, begun in 1939, and the wolf-moose studies started by Durward Allen and continued by L. David Mech on Michigan's Isle Royale in 1958—were among the first scientific investigations into the complex relationships between wolves, their prey, and the environment. Those long-term studies began the process of uncovering what had before that time been shared only by the wolves and their proverbial mountains. Pimlott's personal philosophy had been that "Man was but a part of the environment and had to bring his numbers into balance with it, and individuals had the power to make things happen." He also believed that scientists had a "special duty" to engage in public issues, and he took on the role of an environmental activist. In addition to overseeing wolf research for the Ontario Department of Lands and Forests, he would chair the World Wolf Conservation Group of the International Union for Conservation of Nature (IUCN), and he would be among the earliest conservationists to argue that gray wolves should be reintroduced to Yellowstone National Park, decades before that project would become a reality. It was in 1964, with support from the World Wildlife Fund, that he and a graduate student named Paul Joslin traveled to the American South to see if they could uncover not just the skulls of recent kills but perhaps the last living, breathing red wolves.

Recently, Pimlott had pioneered a new method of locating living wolves that didn't rely on shooting and trapping: He went out into the woods and did his best imitation of a wolf, and if any were present, they howled back. Using that call-and-response method, Pimlott worked out the beginning of a way to estimate pack sizes and territories (down in Texas, Howard McCarley would use the same howling method, as well as tape recordings, to collect comparative quantitative data to differentiate wolves from coyotes). Soon Pimlott switched to recorded wolf howls, which required hauling a big metal loudspeaker into remote wilderness areas. In their quest to locate red wolves, he and Joslin first went to Arkansas, but for all of their efforts they got only two responses that could be attributed to wolves (wolf howls were often at a lower frequency, they lasted longer, and they were often described as a low and mournful sound; coyote howls, on the other hand, featured a rapid rise, breaking upward, and

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were broken with many yips, gargles, laughs, and screams). When they returned to the Ozarks a year later, there were plenty of coyote yips, but there was not a single howling wolf.

Pimlott and Joslin next went down to Louisiana and documented three small packs in the three northeastern counties, including the area of the former Singer Tract (which was no longer an old-growth forest but rather a dense early-successional bottomland forest); and on Davis Island, which was over the Mississippi state line, but was separated from the adjacent Louisiana forests only by an old oxbow bend of the river. The island was fifty square miles of wet woodlands, and with deer and other wildlife so plentiful, it had the feeling of a wilderness. People who hunted on the island believed that wolves were present; and members of the local hunt club would even claim to have killed a few. (In Morehouse Parish, Paul Joslin's local guide, a Louisiana biologist, sat with him in the brush "nervously fingering his pistol," while Joslin called to the wolves and they called back.) In St. Landry Parish, north of Lafayette, they examined an animal recently hit and killed by a car and identified it as a wolf. (There was strong evidence that wolves remained in southwestern Louisiana, in Cameron Parish—ranchers continued to kill large wolves on organized hunts—but Joslin and Pimlott couldn't find them there, either.) Pimlott would reach a similar conclusion as Howard McCarley: that most of the canids in the region were probably coyotes. When Nowak returned to the Delta several years later, there was no sign of wolves on Davis Island or anywhere else in northeast Louisiana. At the old Singer Tract, a portion of which had been "maintained as a state game management area for a time," he reported, "the lease expired and much of the area is now being cleared for soybean production."

In 1966, with the passage of the first-ever Endangered Species Preservation Act (ESPA), the Fish and Wildlife Service was authorized to compile a list of America's vanishing species—and the red wolf had the dubious distinction of being among the first fourteen mammals listed. The purpose of the act was to conserve, protect, restore, and propagate endangered fish and wildlife. Advocates such as Ronald Nowak and Douglas Pimlott were ahead of their time, perhaps, with regard to wolves, but as the legislation showed, they weren't the only folks worried about the state of wildlife. It was a time of changing attitudes toward not just predators but all living things—from the rarest orchids and prairie flowers to the most charismatic songbirds and large mammals. As upstart land protection groups such as the Nature Conservancy were raising funds to purchase intact remnants of natural land, wildlife advocates were on

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a parallel quest to protect—and to treat humanely—individual species of vanishing wildlife. Among the most influential of these groups was the Defenders of Wildlife. Founded in 1947, originally as Defenders of Furbearers, the group had initially focused on the use of steel-jaw foothold traps and decried the widespread use of poison, which the American Society of Mammalogists had for decades been arguing was indiscriminately killing hundreds of thousands of animals across the West. Under the leadership of its executive director, Mary Hazell Harris, Defenders of Wildlife raised awareness about the Endangered Species Preservation Act among its members and the general public. A year after its passage, FWS was authorized to spend up to $15 million annually to purchase habitat that might stave off the extinction of an endangered species. Although not a single acre would be purchased to save the red wolf in its native habitat, the act got the bureaucratic ball rolling to do something before it was too late: The first step in solving a problem is to admit that there is a problem. The Fish and Wildlife Service listed seventy-eight endangered species—fourteen mammals, thirty-six birds, three reptiles, three amphibians, and twenty-two fish—for all to see.

The idea of conserving wolves was a wildly different proposal from that of conserving a species such as deer, elk, or wild turkey. Those beloved game species, which had once been nearly extirpated throughout their native ranges, had a devoted constituency committed to bringing their populations back, who also put their money where their mouth was; the sportsmen who sought to restore those species financed the work with their hunting licenses and excise taxes. Of course, those efforts weren't just acts of benign altruism; at the end of the day, there was something in it for hunters. If they were asked to refrain from shooting something for a year or two, and if they paid just a little bit into the system, they could be assured that there would be something for them in the end: a successful hunt, a freezer full of meat, and ultimately, if the resource was managed properly, sustained yield. (And then there was another glaring difference: Deer, elk, and wild turkey rarely killed and ate sheep and pigs and other game species.)

With wolves, of course, the situation was very different. Conservationists would have to convince hunters and ranchers not to shoot wolves not because the animals would yield any personal benefits, but simply because those native animals had an inherent right to exist. In the preservation of nongame species, the reward was the thing itself—the mere existence of the wolf, the orchid, the warbler—and that was it. If conservationists were going to save the red wolf, they were going to have to appeal to a person's values—to emphasize the value

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of living things. Among the ranchers and deer hunters of southeast Texas and southwest Louisiana in the 1960s, it was an extremely hard sell—by and large, conservation values simply did not extend to predators.

Indeed, as the awareness grew that Louisiana and east Texas might contain the last of a dwindling population of the endangered red wolf, landowners continued to hammer the wolves with every intention of wiping them off the face of the earth. Although deer hunters were expected to shoot wolves on sight, it was the ranchers who waged an all-out war against them. In 1960, state trappers had caught "four big timber wolves," reported to be "killing calves, sheep and hogs in the area for months." "The one male animal caught stood about 30 inches tall and weighed around 80 pounds"—more than twice the size of an average western coyote. Trappers had been catching wolves throughout Louisiana (or so they thought), but the animals from the southwest parishes were different from all the others—these big animals were genuine "Louisiana timber wolves." Douglas Pimlott and Paul Joslin met a trapper who had recently killed fifty-two wolves in southeast Texas "by means of cyanide guns." Between 1963 and 1966, another trapper reported having killed 151 wolves on a single large ranch in Jefferson County, which happened to be one of just three Texas counties where a core population of red wolves was believed to persist. Even after the passage of the Endangered Species Preservation Act, red wolves continued to be slaughtered at a shocking rate; from January 1968 to October 1969, 265 wild canids were killed in a six-county area of southeast Texas. In the coastal prairies of southwest Louisiana, wherever a wolf was suspected of harassing a rancher's herds, hunting parties were assembled on horseback to flush out the wolves, which were lassoed and then shot, strangled, slit at the throat, or clubbed to death. (Many of the skulls that mammalogists such as Paradiso and McCarley worked with were fragmentary because of the custom of bashing the animals' heads in.) "At least three wolves have been killed in an all-out wolf hunt started this past weekend on Grand Chenier and from airplanes, jeeps, trucks and horseback," the *Cameron Pilot* reported in 1963. There was no easy place for wolves to hide at Grand Chenier, which was just a narrow strip of land rising between the Gulf of Mexico and a sprawling wetland, and so the cattlemen were determined to succeed in their "all out effort to wipe out the entire pack." Among the dead over a five-year span was a rare Louisiana black wolf shot on Pumpkin Ridge—perhaps the last Louisiana black wolf in existence—and a massive seventy-five-pound red wolf killed at Grand Chenier.

The Endangered Species Preservation Act of 1966 was good for raising

awareness, but it did not provide legal protection for any species. As late as 1970, the red wolf was still listed as an "outlaw quadruped" by the Louisiana State Legislature, to be "legally killed at any time." (The state Wildlife and Fisheries Commission did have an "unofficial protection policy," and on at least one occasion a captured wolf was transported to a wildlife refuge across the state; but just as often, livestock owners killed the captured wolves before state agents could arrive.) "Despite the general awareness of the red wolf's plight, no refuges have been provided for it, no laws protect it, and little money has been spent to help it," Ronald Nowak reported in 1970. "The time has now come for a top priority effort to save this unique American species."

Looking back, it's clear that the effort was woefully insufficient. But the Fish and Wildlife Service did have some men on the ground. In 1968, the service sent a young wildlife biologist, John Steele, to gather information on the predicament of the red wolf; in 1969, that effort was continued by Glynn Riley and Roy McBride, two experienced trappers who were tasked with coming up with some basic information they were lacking: What was the true extent of the red wolf's range, how many were there, and what did they eat? To what extent were red wolves actually predating on livestock? And finally, would it be possible to convince local people to aid in the effort to preserve the species? The efforts were focused on southeast Texas and southwest Louisiana, between the Brazos River and Vermilion Bay, the last stand of the red wolf.

After two years of trapping (Steele and a team even built some temporary pens from which to observe the animals) and developing relationships with local ranchers, Riley and McBride estimated that perhaps as many as three hundred wolves might yet remain. By analyzing scat, and through direct observation, they confirmed that red wolves were eating nutria, rabbits, rice rats, cotton rats, and muskrats; in terms of livestock, they found significant disagreement between ranchers about the role of red wolves in depredation, which indicated to Riley and McBride "that red wolves are not as serious a predator on cattle as were gray wolves." To be sure, there were significant problems—the core population was dwindling, their range was shrinking, and the threat that coyotes might swamp out the wolf genome was quite serious—but there was also a great deal of wild land down there: The Sabine National Wildlife Refuge, at more than 120,000 acres, was the largest Gulf Coast marsh in the nation; the Anahuac National Wildlife Refuge, established a few years earlier, had added 34,000 acres of marsh and prairie; and when combined with a series of nearby refuges, the natural lands added up to more than a quarter million acres. Biologists were coming to conclude that these marsh

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complexes weren't ideal red wolf habitats—but they were better than nothing, and, in fact, this land might have been the reason that the remnant population persisted at all. (In the middle of those refuges there was a ranch covering nearly 20,000 acres where the wildlife-loving owners wouldn't let any wolves be harmed—in fact, they wouldn't even let Fish and Wildlife Service biologists enter their property because they didn't want to disturb the wolves. They had never known the wolves to harm their cattle, so they'd never entered the wolf wars.)

The most significant aspect of this work, however, was Riley's developing relationships with private landowners; he offered to assist with depredating canids—a service they were glad to accept—and this allowed him an opportunity to capture living red wolves. In 1971, the service was slowly developing a Red Wolf Recovery Program, which included the possibility of a captive breeding program. At the very least, if no other alternatives emerged, Riley could release wolves far from a rancher's herds: Again, that slice of the Gulf Coast had been bypassed by significant development, and there remained wide-open expanses where a wolf could theoretically make a living without getting into trouble. Because coyotes had been slow to colonize those portions of southwest Louisiana, some observers were hopeful that a core population of red wolves might be able keep the western coyotes at bay.

But more development was sure to come. The 1970s would see a steady rise in industrial agriculture, a doubling down on wetlands drainage, and a boom in oil and chemical development. Sprawling suburban development between Houston and Galveston had already fragmented the coastal wolf population—those highways and concrete environments and the construction of Interstate 10 had split the red wolf populations in two, not unlike the way the Union Pacific's dagger through the northern and southern herds of bison with the transcontinental railroad in 1867 had effectively cut the gene pool of each in half.

The writing was on the wall.

While the initial investigations were under way, Ron Nowak continued piecing together the ancient and recent history of these southern wolves, and over the next several decades, that information would be critical in the effort to restore the species. After graduating from Tulane in 1963, he had enlisted in the US Army, and no matter where he was, his interest in the red wolf, and other endangered species, would never wane. While stationed at Barksdale Air Force Base in northwest Louisiana—where there was a 20,000-acre forest concealing hydrogen bomb components—he convinced the base commander

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to issue a regulation saying that no one was to hurt a wolf or panther on the base (there was no evidence that either animal occurred there, but Nowak was passionate about it, so the base commander had obliged him). Nowak continued to meet with trappers, following them into the field, learning how they hunted with dogs and how they utilized traps and poisons; they told him about using dynamite to destroy entire dens. Nowak pored over the narratives of early American settlers and naturalists. In 1967, his article in *Defenders of Wildlife News* provided the first definitive history of the red wolf in Louisiana; and over the next several years, he would publish a string of articles, outlining the plight of the red wolf, in both popular and scientific publications. In 1969, he joined John Paradiso at the Bird and Mammal Laboratories for a summer internship before beginning a PhD program at the University of Kansas. His major professor would be E. Raymond Hall; in the 1930s, Hall had been one of the most vocal critics of the Biological Survey's (now Fish and Wildlife Service) use of poison to kill predatory animals. Nowak's PhD work would focus on the taxonomic history of red wolves and related *Canis*—and for the next fifty years, Nowak would continue to refine and update our understanding of wolves in the Southeast. Nowak made trips to the Gulf Coast to help field staff identify wolves. In 1973, he received a small grant from the World Wildlife Fund to find out if any panthers remained in Florida; his plan was to bring in a western cougar hunter—Roy McBride, who'd recently worked with the Fish and Wildlife Service's Glynn Riley on the red wolf project—to use his dogs to try to locate any remaining panthers. McBride was successful, and that discovery kick-started an effort to radio-collar, protect, and restore that other endangered species.

In the meantime, the situation in the field was growing worse: In 1972, Dennis Russell with the Texas Parks & Wildlife Department and James Shaw of the Yale School of Forestry concluded that the red wolf was in critical danger; based on the responses to their howling surveys, they estimated that there was a maximum of ninety-two animals in all of Texas. The range of the species was also declining; rather than occurring more than a hundred miles inland, biologists now suspected red wolf territory to exist no more than fifty miles from the coast. "The animal is totally unprotected and its endangered status is not generally known to the public, even in those areas in which it still occurs," Russell and Shaw concluded. "Unless the serious plight of the red wolf is much better publicized, and unless some protective measures and management plans are instigated very soon, we believe that this species, once indigenous

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to the entire southeastern United States, will completely disappear within this decade."

America had experienced an environmental awakening in the 1960s, but it had not been a whole and complete revolution. As the 1960s had come to an end, there had still been no legal mechanisms to protect these wolves on private property.

The academy, however, pushed forward. In 1973, the International Union for Conservation of Nature formed a Wolf Specialists Group, chaired by Douglas Pimlott, which would produce a declaration of principles for wolf conservation. "Wolves, like all other wildlife, have a right to exist in a wild state," its members declared at their first international conference in Stockholm. "This right is in no way related to their known value to mankind. Instead, it derives from the right of all living creatures to coexist with man as part of natural ecosystems." It was a radical statement given the times—the war on wolves had yet to come to an end—and those scientists weren't confident that it was a sentiment shared by all. "The wolf poses one of the most important conservation questions of our time," Douglas Pimlott had written some years earlier. "Will the species still exist when the twentieth century passes into history? Or will man have exterminated the wolf as a final demonstration of his 'conquest' of the wilderness and of wild things that dare to compete or conflict with him?" The questions were not merely provocative; Pimlott was truly uncertain. Unless something changed, and quickly, the red wolf might not be around in the next decade.

CHAPTER 16

Rescue Mission

On December 28, 1973, President Richard M. Nixon signed the Endangered Species Act (ESA) into law—and for imperiled species such as the red wolf, that landmark legislation changed everything. The legislation was wildly popular and passed nearly unanimously through Congress (92–0 in the Senate and 355–4 in the House). Building on the acts of 1966 and 1969, the goal of the new act was again to protect species and the ecosystems they depend upon, and to restore populations—but this time, the legislation would have some teeth: Endangered and threatened species would be protected by mechanisms making it illegal to "take"—defined as to harass, harm, or kill—a federally listed animal. The ESA would also spark the establishment of international treaties to protect species around the world. Species such as the American bald eagle and the Florida manatee would become poster children for the ESA, but the act would also protect rare fish, mollusks, and little-known butterflies. Even large carnivores, such as the Florida panther, the grizzly bear, and the much maligned gray wolf, would receive not just protection but a dedicated recovery team.

Almost overnight, the Fish and Wildlife Service was required to transform itself from an agency that trapped and poisoned and killed thousands of predators to one responsible for not just safeguarding, but also restoring, the nation's most endangered biological heritage, including both gray and red wolves. The changeover was swift and severe: Government trappers, for example, who'd been tasked with killing wolves one day went to work the next day to learn that they were now to figure out why the wolf population was declining (they had a pretty good idea) and what they could do to turn it around. (Trapping and killing coyotes, on the other hand, would hardly skip a beat.) Keith Schreiner, who would be the first to lead the endangered species program in Washington, DC, began a search for biologists with an ecosystem level approach to conservation. "He had to go out to the Universities to

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recruit people who were specialists," recalled one FWS biologist. "Nobody hardly in the Fish and Wildlife Service was knowledgeable about endangered species."

A few months later, a young biologist named Curtis Carley was placed in charge of the Red Wolf Recovery Program; Carley's job, mandated by Congress, was to save the red wolf. For the past six years, Carley had been studying coyotes and predator ecology. Years earlier, as an undergraduate, he had spent his summers in wetlands and wilderness areas of northern Minnesota guiding canoe trips in the Boundary Waters Canoe Area Wilderness, the only other area in the United States where native wolves, the Minnesota gray wolf, had survived eradication. In 1960, he had had his first encounter with a wild wolf there on the Beartrap River: "We had just finished supper and a dense fog was settling over the river," he later recalled. "Suddenly I could feel the hair standing up on the back of my neck. It was a strange sensation—it was as though you felt the sound before you heard it. Across the river came a long low wolf howl that slowly increased in volume. It was answered by a similar howl from down river. That built a crescendo of howls from 4–5 wolves. I had never experienced anything like it. It was exhilarating beyond belief."

Carley belonged to a generation of young Americans who wanted to spend time in wilderness areas, and when they encountered a wolf, they didn't instinctively reach for their guns. In fact, they rather enjoyed being among these animals. Looking back, he would cite the impact of writings by Aldo Leopold and Rachel Carson, whose *A Sand County Almanac* and *Silent Spring*, respectively, stimulated "an awareness that Man was irreparably damaging the environment." (He also acknowledged the growing influence of television and programs such as *Mutual of Omaha's Wild Kingdom*: "If credit were to be assigned to just one source as the primary catalyst of the environmental movement among the general public I would nominate *Wild Kingdom* for that honor.") The Fish and Wildlife Service needed someone like Carley, a trained scientist with an advanced degree, but also someone who was comfortable getting dirty. In fact, he came to believe that he had been chosen for the job because his background included manual labor and because of his experience in harsh, wild, waterlogged landscapes; the red wolf job was going to require long, hard hours and the monitoring of traplines from dawn to dusk in an unforgiving marsh. His experience as a farmhand would also be useful: he would be expected to handle, and often kill, a whole lot of animals.

Carley and his wife soon made their way to Beaumont, Texas, just across

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the Neches River and the Louisiana state line, and made a new home for themselves in the heart of red wolf country. Carley's goals were to restore red wolves in their present range; maintain an adequate gene pool; reestablish red wolves in additional locations within their historic range; and determine the location and abundance of each surviving red wolf subspecies. None of those tasks would be easy, and some would be impossible; for example, it would soon become clear that there were no other surviving subspecies. The work was unprecedented: never before had Americans tried to deliberately restore or expand a population of wolves.

The habitat wasn't exclusive to red wolves; coyotes were already there in the salt marshes. Not only could they be heard howling in the night, but they turned up on traplines in abundance. Hybridization was already the law of the land; there appeared to be a veritable canid soup, a Louisiana gumbo, of wolves and coyotes and dogs and hybrids of all kinds, and discouragingly few canids that might be considered pure red wolves. Still, on occasion, Carley's team would stumble across the big ones—as they had in February 1974, when they trapped four animals they identified as red wolves. "These animals were very impressive and came from an area of deep southeast Texas in which we've not trapped before," he noted in one monthly report. But he knew that four animals was no cause for celebration; as he said at the Southeastern Endangered Species workshop later that year: "We do not know if the red wolf can be preserved as a viable species in its present range, but we would be negligent in our responsibilities if we did not try."

Curtis Carley worked with a team of trappers, "old-timers," as he called them, who knew the animals intimately: the coyotes, the wolves, the things in between, and all of the other critters running around on the landscape with them. ("These men were the best trappers in the state program, and as a group, were the most ethical and moral men I ever encountered," he later wrote.) Some of them were employed by the state agencies, while others worked independently. Glynn Riley, who was among the younger trappers working in Texas, had been trapping red wolves for the nascent recovery effort since 1969—and he'd been trapping animals more generally since he was a kid. Back in 1948, when deer had been reintroduced to Freestone County, a bounty had been placed on coyotes—which the local people called wolves—and it was trapping coyotes that had given Riley his start as a government trapper. As was typical in predator control efforts, he had laced a lot of bait with Compound 1080 (sodium fluoroacetate) and set countless "coyote getters," which used a

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.38-caliber cartridge to deliver sodium cyanide to anything that stepped on the bait (coyote getters killed indiscriminately, of course). He had been interested in red wolves his entire life; he'd read everything about them he could get his hands on. He was the prototypical bounty hunter turned endangered species biologist.

One of Glynn Riley's jobs was to gather wolves for a captive breeding project; if the FWS planned to reestablish red wolves elsewhere in their historic range, it was going to need more animals. As a federal trapper, Riley's demeanor and his background enabled him to establish relationships with landowners that might have unwanted wolves on their property—he wore cowboy hats and button-down Wrangler shirts; he dressed and talked more like a Texas cattleman than an endangered species biologist from Washington, DC. If a landowner might have otherwise killed a trapped wolf, Riley could grab that wolf for the captive breeding experiment.

Of course, not all wolves were put in pens. Others were turned loose with radio collars, which helped the biologists find dens and otherwise learn about the ecology of red wolves. In fact, these were some of the first living red wolves that most biologists had ever handled. (When Edward Goldman analyzed red wolves in *The Wolves of North America*, and when Howard McCarley and John Paradiso considered the canids of Texas and Louisiana, they were dealing exclusively with severed skulls and detached skins. The ecology and description of *living* red wolves were novel.) Although it was difficult for a layperson to tell a coyote from a red wolf, trappers saw clear distinctions once they had animals in hand. "We feel the difficulties described in the literature in distinguishing this animal from coyotes or hybrids are exaggerated from the true situation in the field," Riley and McBride reported in 1972. (Riley had also trapped and handled wolves in Minnesota, which informed his understanding of these southern canids.) Although mammalogists relied upon skulls to make definitive decisions, Riley and McBride were able to determine that "disproportionately long legs and large ears" were two features that helped to easily separate red wolves not just from coyotes but from gray wolves as well; red wolves also held their ears at an angle that "creates an accentuated triangular facial appearance markedly different from that of the gray wolf or coyote, whose ears are more erect." When compared with the local coyotes, red wolves had much larger paws, they had large, bulbous heads, and they were simply more massive. "They were definitely a different animal than a coyote," another Fish and Wildlife biologist would later say. "They tended to have bigger snouts

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and longer legs. They were just massive overall, especially the head. They sure *looked* like wolves."

The excitement around red wolf ecology was tempered by the fact that there were so few of them—it was not an emerging field of inquiry, it was a dead end. In the first couple years, trapping work was aimed at removing coyotes and hybrids in order to "buy more time" for the red wolf; in other words, the recovery team hoped that they could slow the hybrid swarm, and they hoped that if they could grow the number of wolves on the ground they might then have a chance at restoring historic isolation mechanisms to prevent hybridization. At one point, someone even floated the idea of building a "dingo proof" fence, to keep coyotes out and red wolves in (the idea was dropped because of cost and impracticality). But it soon became evident that all of these efforts were a little too late—over the course of the last trapping season, only one wolf was caught in the area north of Interstate 10. To the south, red wolves, coyotes, and their hybrids were all using the same areas. At the end of the 1976 trapping season, the Red Wolf Recovery Program and its advisers concluded that "it was no longer feasible to try to preserve the red wolf in southeastern Texas."

The individual wolves that did remain were also far from thriving; the Gulf Coast was a haven for debilitating parasites, and the landscape itself often harassed the animals as doggedly as the ranchers did. "Most pups acquire hookworms and are so weakened by them that they cannot keep up with their parents," Paradiso and Nowak reported. "They die indirectly from hookworms, and adults have a shortened life span due to hookworms and heartworms." As the author T. DeLene Beeland would later write, "The coastal sawgrass razed the fur off of their tails and the sides until many looked like Pleistocene-sized rats. Forced into swampy habitat that they may not normally have occupied, the wolves became an all-out feast for parasites. The animals were riddled with sarcoptic mange, hookworms, tapeworms, and ticks. Heartworm was found in almost every wolf older than three. One study documented 500 heartworms in a single wolf. . . . Their heart and pulmonary vessels were so choked with parasitic roundworms that their brains and muscles were temporarily starved of oxygen. Some of the wolves' hearts became physically deformed by the masses of heartworms." Those last few wolves had survived pits, traps, poisons, guns, and a hybrid swarm only to find themselves in a den of parasites.

Curits Carley came to accept the fact that his current efforts were either insufficient or impractical; so long as coyotes lived and mated with that fading population of red wolves, he could not prevent extinction in the wild. "One

evening I finally accepted the facts," he later reflected. "Once I had accepted the deplorable situation, the focus became the fact that I was the one responsible for fixing it. The only way I could see to fix it was to remove all animals determined to be likely wolves and place them in captivity. This would mean we would be intentionally causing the extinction of the red wolf in the wild."

What Carley was proposing—rounding up every last red wolf and breeding the species in captivity—was, of course, no simple matter. The goal of the Red Wolf Recovery Program and the Endangered Species Act of 1973 was to preserve species and habitats *in the wild*. The Fish and Wildlife Service had engaged with other captive breeding programs—notably of the endangered whooping crane (*Grus americana*)—but those programs had not been runaway successes. Although the idea of wolf reintroductions had been discussed and advocated for, no one had yet succeeded. (In fact, the most recent attempt at wolf reintroduction had ended in disaster. In 1974, four gray wolves had been translocated from northern Minnesota to Michigan's Upper Peninsula. One of the wolves had been shot to death and its "carcass dumped on the doorstep of a state conservation officer." When the remaining three were also found dead, the project was abandoned.) But as Carley saw it, the program was out of options and running out of time. As early as 1967, Ron Nowak had suggested that it might be necessary to begin breeding the animals in captivity: "The practice of taking rare animals from the wild to be bred in captivity has been criticized, but must be considered for *Canis rufus* if no other solution presents itself." Thus far, none had. Soon the recovery team would agree that that was the best way forward—that the biologists in the field should round up every red wolf they could find, declare the species extinct in the wild, and start over again somewhere else.

If Glynn Riley and Roy McBride had believed that the difficulty in distinguishing red wolves from coyotes had been overblown, that skill was about to matter now more than ever; every animal that was trapped for the next several years would either become a founder of a future red wolf population or be discarded (although a few coyotes would be released back into the wild, the vast majority were destroyed). If they were wrong about an animal, they risked removing important genetic information from the species forever or, conversely, introducing undesirable coyote or hybrid DNA into the new founding population. Riley and McBride were right; the problem wasn't separating wolves from coyotes, it was separating wolves from the wolflike hybrid soup. Carley and his team developed a system of metrics to classify and distinguish the animals. The captured canids were either drugged or tied, and their

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bodies, paws, and other measurements were analyzed. Eventually, they would use X-rays to measure and compare the skulls of living animals. "Even with the development of these standards," Howard McCarley wrote, "there was no single character, morphological or behavioral, by which all red wolves could be distinguished from all hybrids." A large wolf and a small coyote were easy enough to tell apart, but the hybrids presented a serious problem. There was a lot of nuance and gray area, and Carley was tasked with making important decisions on the fly ("Triage Biology," he called it). "The one thing I've never been able to express," Carley would later say about the recovery effort, "is the sense of absolute frustration at every turn in the road. . . . We literally did not know how to proceed, or what we would find if we took a certain path." Now that they had committed to removing the wolves from the wild, they could not afford to make any errors; the future of the species depended on it.

Between 1973 and 1980, more than four hundred canids were captured by the red wolf recovery team. Many of the animals were captured because ranchers had asked trappers such as Glynn Riley to come and get them off their property—had the Fish and Wildlife Service not been working in the area, they would have been killed. The team employed some novel—and risky—methods: If they located an animal from the air, they'd lean out of their helicopter, lower a catchpole over the animal's head, and tighten the loop around its neck; they also fired net guns from helicopters. When the animals turned up on traplines, Riley could tell most coyotes from wolves by their "threat posture": "Wolves bare their canine teeth and raise the fur along their neck and back," he wrote. "Coyotes, on the other hand, assume a wide-mouthed posture with teeth showing, back arched, and tail held between the legs." When he got close to the animals, to tie them or to administer drugs, Riley knew when he had a wolf on his hands: "An alpha animal, a big old male or somethin', they'd bite you if they got the chance." Some of the animals looked like coyotes, some like feral dogs, but others matched the description of a red wolf to a T: large ears, often held at a forty-five-degree angle; blocky, massive heads; heavy bodies and big chests; tawny coats; long legs; and tall.

These big wolves were taken from federal refuge lands, from private ranches, and from the sprawling landholdings of oil companies; they were living in the coastal marshes, on open prairie, and on the gentle rises of sand ridges. Once the animals were in hand, anything deemed to be a hybrid was typically euthanized: "We all worried that we would make mistakes and kill some wolves," Carley said. "And we knew that by taking this approach, we might be creating a new species of red wolf that was different than the species had been originally.

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But under the circumstances, we felt we really had no choice." Out of those four hundred animals, forty-three were thought to be wolves and were sent to the captive breeding facility. Later, once the captive animals began to breed, if a litter of pups displayed hybrid characteristics, all of the animals would be destroyed. Glynn Riley was reported to have been disturbed by the implication that "unusual" wolves would be excluded from the gene pool—he insisted that red and gray wolves varied greatly in size—but Carley saw no other option. Later, at captive facilities, if a caretaker refused to do so, he euthanized the animal himself.

Going forward, the recovery of the species would depend upon the health and cooperation of human relationships. The Fish and Wildlife Service, which was now wholly responsible and in possession of every remaining red wolf, would need the support of state fish and wildlife agencies—and most important of all, they were going to need the support of the American people. Over the past seven years, Carley maintained a good relationship with the state fish and game agencies; the heads of the Louisiana and Texas wildlife departments had helped Carley obtain the necessary permits and approvals. Joe L. Herring, the chief of the Game Division of the Louisiana Department of Wildlife and Fisheries, even provided state trappers and student employees to help with the red wolf effort when Carley's men were overextended. But there were some peculiarities about working in the region. In Texas, it was actually illegal to transport or release a wolf anywhere in the state, which put the whole endeavor into a gray area. Strangest of all, the captive breeding program would be headquartered nowhere near the Gulf Coast but rather 2,300 miles northwest, at the Point Defiance Zoo in Tacoma, Washington, which had emerged as the only place in the nation with both the facilities and the interest.

To be fair, the breeding of captive, federally listed endangered species—and *wolves*, no less—was uncharted territory. But the conservation institutions of east Texas and southwest Louisiana weren't exactly raring to go. When the essayist Edward Hoagland first wrote about the plight of the wolf for *Sports Illustrated* in 1974, he observed that "the leading naturalists of Houston seem to have been remarkably indifferent, if not actually hostile [to the recovery of the red wolf]. The city zoo has not even bothered to exhibit a red wolf, for example," while the "Texas Parks and Wildlife Department over the years has taken what might politely be called a minimum of interest." The Point Defiance Zoo, meanwhile, had been involved since day one. In 1969, before the Fish and Wildlife Service had made the decision to remove all of the remaining red

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wolves from the wild, the Tacoma facility had been holding animals for the developing recovery effort. The zoo's director, Norman Winnick, felt a responsibility to the wolves, to the recovery of an endangered species: "The red wolf needed help badly, and no one really seemed interested in it," he said. "We all knew that someone had to do something."

Once the wolves were in captivity, biologists had to cure them of mange; they cleaned and monitored the animals, and they vaccinated them. At first, the biologists weren't sure if the animals would breed in captivity, and when they did, in 1977, the program's staff breathed a collective sigh of relief. But of the forty-some animals brought to the zoo, only fourteen produced surviving offspring, which meant that the future of the entire species and the genetic heritage of a species that had evolved in North America over the course of millennia had been whittled down to a little more than a dozen animals. (In the short term, the wolves gave birth to healthy, normal wolves, but down the line, the paucity of genetic diversity would surely lead to trouble.) Yet caring for the animals in captivity and getting them to breed would turn out to be the easy part of recovery. The struggle that awaited—to restore the wolf to the wild—would span decades.

There wasn't an abundance of space at Point Defiance. In the early years of the program, the zoo had been forced to refuse animals, even when trappers in Texas and Louisiana had wolves in hand, because there was no place to keep them. But then in 1976, a local mink farmer named Dale Pedersen offered the program the use of a piece of his property. As Pedersen told Curtis Carley, he felt an obligation to give something back to the world of wildlife and the animals that had granted him a good living. (Although fur farming was disdained by animal rights activists, he didn't think it was any different from raising other kinds of livestock.) Over the years, he had taken in orphaned black bears, mountain lions, lynxes, and river otters; and he would later become the first person to successfully breed wolverines. Although those two sites would remain central to the Red Wolf Recovery Program's captive breeding program, Curtis Carley and his colleagues knew they needed to expand beyond the pair of facilities in Washington State—if an epidemic swept through these captive populations, the species could be wiped out in no time.

As luck would have it, a new wolf facility was in development back east, in Missouri. In 1971, Marlin Perkins, the host of the television program *Mutual of Omaha's Wild Kingdom*, and his wife, Carol, proposed the establishment of a wolf sanctuary in western St. Louis County that would come to be known as

the Endangered Wolf Center. Before long, red wolves would be sent there, too; mated pairs would give birth to pups and live on an acre of land.*

In 1980, with all of the wolves rounded up, the Beaumont field office was shuttered, *Canis rufus* was declared extinct in the wild, and the centuries-long campaign to exterminate the wild wolves of the South was complete.

In the 1930s, Edward Goldman had offered a bit of assurance to mammalogists who were then protesting the loss of our iconic American predators. Although wolves "no longer have a place in our advancing civilization," he said, rest assured that populations of the animals would remain in Canada and Mexico. Wilderness was elsewhere, and Goldman offered this idea as a comfort and a matter of fact. Of course, we can appreciate today that there were numerous pitfalls to that kind of thinking, and for the red wolf, there was a fatal error: The wolf had not evolved in the Arctic North, nor even in the Wild West; there was no faraway wilderness for it to retreat to. The western edge of its range had become inhospitable, and there were too few individuals to survive the combined effects of intolerant ranchers, protective deer hunters, and interbreeding with coyotes. The red wolf was of the East, it had coevolved with ecological communities in the East, and if it had a future on this planet, it would be in the East.

As the Fish and Wildlife Service struggled to find a home for the animals, Curtis Carley looked all the way to the Atlantic Ocean. He knew it was imperative to return the wolves to the wild as soon as possible, and he started laying the groundwork for an experimental reintroduction even while they were still trapping animals—and still attempting to conserve the species in the wild—in Texas and Louisiana. Carley had zeroed in on a place called Bulls Island, which was three miles from the mainland and part of the Cape Romain National Wildlife Refuge in South Carolina. The 5,000-acre Bulls Island had several things going for it: It was within the red wolf's former range; it was owned by the federal government (the Fish and Wildlife Service managed the property as a refuge, so it didn't have to seek permission); and it was an island, which meant that the wolves couldn't easily wander astray. The island's forests and marshes were filled with rabbits and other prey species, including

* The wolf sanctuary was run in cooperation with Washington University and would also become a captive breeding facility for the endangered Mexican wolf, a subspecies of the gray wolf.

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whitetail deer. If the experiment could succeed there, it would give the Fish and Wildlife Service the confidence to attempt a permanent reintroduction elsewhere.

Moving the wolves to Bulls Island *should* work—its habitats weren't too different from the coastal areas of Texas and Louisiana—but the truth was that the biologists knew comparatively little about red wolf ecology. For the past twenty years, the field of red wolf inquiry had been too consumed with finding living animals and proving that they existed for them to spend much time investigating their life histories and daily lives. In fact, the experiment on Bulls Island was a fact-finding mission as much as anything else, and it would mark the first time that modern wildlife biologists had observed *any* wolves—black, white, gray, or red—on the Atlantic seaboard.

More important than anything else, however, was what they would learn about the logistics of reintroducing red wolves to the wild. The first wolves let loose on Bulls Island were a mated pair rounded up near Sabine Pass, Texas, that had since been living in captivity at Point Defiance. The animals were outfitted with tracking collars: They visited a hunter's gut pile, and the female wolf killed and ate an American coot (biologists heard the bird scream and then found its feathers in the wolf's scat); at night, the pair settled into the sand dunes.

Unfortunately for a wildlife agency hoping to keep these wild wolves separate from modern society, the wolves proved to be more than capable swimmers. The male swam to a private island, but since the landowner didn't mind, FWS let it be. But the female went farther afield, toward the mainland, and was eventually found in a marsh a half mile from shore. The biologists grew increasingly worried—what if they ran off toward Charleston or the interstate highway?—so they were both eventually rounded up and returned to their pens.

Shortly thereafter, a second pair was rounded up from the Gray Estate Ranch in Louisiana, and brought to Bulls Island. To try to keep the second pair from running off, they were kept in acclimation pens longer. After their pens were opened, the pair swam between Bulls and Capers Islands, and the female even gave birth (though the pups died, possibly from hookworm or parasites). At the end of the experiment, when the female was recaptured, she was found to have gained three pounds; the male had put on a dozen.

The experiment on Bulls Island showed that red wolves could be reestablished in the wild—they found prey, they mated, and for a brief period of time, they lived like wild wolves. Although it was just temporary, the Fish

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and Wildlife Service considered it the first successful translocation of a wolf to the wild.

But the experiment was also a warning: As the first pair of wolves demonstrated, these animals weren't necessarily going to stick around a socially acceptable landscape or observe lines on a map—and in a place as heavily settled as the eastern United States, that spelled trouble. Had they not been on an island, who knew where they would have gone?

Furthermore, keeping a few red wolves on a small barrier island was not a solution. At just under eight square miles, Bulls Island did not provide a future for the species; none of the South's barrier islands approached anywhere near the size that might be necessary to maintain a sustainable population. If more than one pair of wolves was placed on Bulls Island, they were likely to feel that the others were competitors and would try to kill one another. Bulls Island was helpful, but it was not a solution.

In 1982, Warren Parker was the field supervisor of the FWS's Endangered Species Field Office in Asheville, North Carolina; for some time, he had been working with Curtis Carley to find the wolves a new home back east. Briefly, he looked into the feasibility of an introduction in the Florida Everglades as well as Ossabaw Island, Georgia. But then the Tennessee Valley Authority, the administrator of Land Between the Lakes National Recreation Area, a sprawling 170,000-acre peninsula in western Kentucky and Tennessee, caught wind of FWS's need for land. According to T. DeLene Beeland, "The TVA ached for good press related to endangered species. They courted aggressively to put wolves on their land. The space was large enough and, to Parker, it looked like a godsend just when he needed one." Just recently, a large, fenced facility had been constructed to propagate the giant subspecies of Canada geese—but with geese populations skyrocketing and increasingly a nuisance, that program had been scrapped, and the facility sat empty. (Canada geese, like whitetail deer, were among the species whose runaway success had led to a novel dilemma: an overabundance of wildlife in contemporary landscapes.) From a biological and technical perspective, everything about the place made sense—it had the infrastructure for captive rearing and acclimation pens—and there were 170,000 acres for a pack of wolves to roam in and hunt an abundance of prey.

Warren Parker had been with the Fish and Wildlife Service since the 1950s. One of his first jobs was in the area of the Red River in Texas and Oklahoma, where he worked with trappers who were surely killing wolves. "That was in the old days," he later recalled. "Cougars and wolves and eagles—anything that

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preyed on game animals was looked on with great disfavor. . . . Our biology was really skewed." But when Parker worked out of Vicksburg, Mississippi—and he had been there when Douglas Pimlott had gone looking for red wolves in the Mississippi Delta—he was involved in the beginnings of an ecosystem-level approach to managing the river basins. "The whole concept of 'game management,' which [we] were taught in school, changed to 'wildlife management'—all wildlife," he said. As the approach gradually evolved, the Endangered Species Act of 1973 kicked everything else into gear. But the key to conserving predators—which Parker came to believe as strongly as anything in wildlife management—the thing that would hold everything together was the buy-in of the local people.

Parker campaigned in the Land Between the Lakes area for three years, hoping that the local people's attitudes toward predators had transformed as rapidly as it had the trajectory of the Fish and Wildlife Service. But he got nowhere. Cattle ranchers said they feared depredation, and deer hunters worried that hunting land would be restricted to protect the wolves; they worried that deer hunting on Land Between the Lakes would be shut down. "There was just an enormous amount of fear among people in the area," he said. "They talked about being afraid to go out at night, they were afraid for their schoolchildren waiting for the bus . . . and we had not addressed those fears." Some believed that the red wolves would dig up graves. Furthermore, coyotes were already present in significant numbers, and animal rights activists threatened lawsuits if the agency were to cull them.

In addition to those concerns, it was the kind of emotion driving the opposition that was so significant—local people weren't just fearful of wolves, they were still angry with the Tennessee Valley Authority for taking their homes and their land. In 1964, just shy of twenty years earlier, the TVA had begun the process of condemning 170,000 acres of land in Kentucky and Tennessee and relocating 2,500 residents in the process of establishing the Land Between the Lakes National Recreation Area. Local people had neither forgotten nor forgiven the authority for doing so, and Warren Parker, and the red wolf, stumbled into the hornets' nest. "There was a great deal of animosity towards TVA over there," Warren Parker recalled years later. "It gave them a podium to blast the project as well as the whole idea of the Federal government being involved in that area."

Furthermore, the evolution of ecosystem thinking—and the idea that all wildlife, including predators, had value and a right to exist—hadn't gained traction in all of society. In the Rocky Mountain West, ranchers fervently

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opposed the reintroduction of gray wolves, calling the notion "a ridiculous idea—like trying to get the dinosaurs reinstated"—and vowed "to fight this to the bitter end." The idea hadn't even been accepted by all wildlife professionals; in Alaska, for example, in 1980, aerial gunning of wolves once again became the management tool of choice. It was one thing to try to save the majestic whooping cranes or the secretive Kirtland's warblers—it was another to suggest that we ought to live with wolves again. "With this program, we're getting into a little human psychology," Curtis Carley said in 1982, ". . . man has been literally raised from the cradle to be afraid of wolves—the Little Red Riding Hood thing."

After a show of bitter opposition at public hearings, both state agencies withdrew their support for the program and the project was scrapped. Without a suitable landscape, the federal government was powerless to restore the red wolf to the wild. "It was devastating," Parker said.

It was now 1984, and there were sixty-five red wolves across six facilities. After more than a decade in captivity, the red wolves were still homeless. With the loss of Land Between the Lakes, the recovery program was running out of large swaths of natural land where it could introduce a pack of wild wolves. Coyotes, thriving in the novel landscape, were pushing ever eastward.

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CHAPTER 17

A Last Wilderness

On the North Carolina coast, not far from the Atlantic Ocean, there is a peculiar ecosystem known as a pocosin: high-elevation wetlands, often described as evergreen shrub bogs. Pocosin soils are composed of peat, and are filled with American hollies, loblolly bay, sweet bay, and red bay; a dense shrub layer composed of colorfully named species such as fetterbush, wax myrtle, swamp titi, and dusty zenobia; and a canopy of pond pines and Atlantic white cedar. The word *pocosin* is of Algonquin origin and is thought to have meant "swamp on a hill." The word was used by many English settlers, but those colonists also knew those landscapes as "dismals"; the Great Dismal Swamp, for example, in southeastern Virginia and northeast North Carolina, is the nation's most famous pocosin swamp. The name tells you what the colonists thought of those places. A surveyor, in 1728, marking the Virginia–North Carolina border, was even more explicit: "The exhalations that continually rise from this vast body of mire and nastiness infect the air for many miles round, and render it very unwholesome for the bordering inhabitants," William Byrd wrote. ". . . It would require a great sum of money to drain it, but the public treasure could not be better bestowed."

Historically, pocosins occurred from Virginia to northern Florida, but North Carolina was and is their epicenter. At one time, 70 percent of all pocosins occurred in that state, and the Albemarle Peninsula, a sprawling mosaic of wild lands in northeastern North Carolina, was the heart of the system. The peat soils of this region began forming as long as 10,000 years ago. "The low pocosin systems generate a water table that is perched above the regional water table"—the swamp on a hill—"with little relationship existing between the two aquifers," Curtis J. Richardson wrote in 1983 in one of the earliest scientific investigations of pocosin ecosystems. Rain that falls on the pocosin stays on the pocosin and only gradually drains into adjacent systems; those coastal wetlands are worlds unto themselves.

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In 1709, John Lawson was perhaps the first person to use the word in an English text, as he chronicled his journey through the eastern Carolinas. "The Land in this Percoarson, or Valley, being extraordinary rich, and the Runs of Water well stor'd with Fowl," he noted. And well stored it was; Lawson's Indian guide had gone ahead thirty minutes and secured three fat turkeys for their dinner (the night before, they had dined on a possum-teal-venison "ragoo"). Lawson described the soils ("Viewing the Land here, we found an extraordinary rich, black Mould, and some of a Copper-color") and the night chorus of wolves and other wild beasts in the swamps: "When we were all asleep . . . we were awaken'd with the dismall'st and most hideous Noise that ever pierc'd my Ears . . . our *Indian* Pilot . . . acquainted us, that it was customary to hear such Musick along that Swamp-side, there being endless Numbers of Panthers, Tygers, Wolves, and other Beasts of Prey, which take this Swamp for their Abode in the Day, coming in whole Droves to hunt the Deer in the Night."

As foreboding and reviled—and indeed dismal—as they were, the colonists were not so fearful of the swamps that they did not enter them and try to exploit their resources. In 1763, a group of investors that included the future president George Washington kick-started an effort to drain roughly 40,000 acres of timberland in the Great Dismal Swamp. Enslaved Africans dug the earliest canals and ditches that drained the land, which was then put into cultivation. "These and other profound environmental changes depended on wholesale slavery," wrote the biologist Roy T. Sawyer. "With only one or two notable exceptions, African slaves dug virtually all the great navigation and drainage canals in the Albemarle region prior to the Civil War. The conditions under which these [enslaved people] manually dug through miles of inhospitable swampland are unimaginable."

After the Civil War, absentee corporations timbered the Albemarle region. They cut down the ancient cypress trees; the Atlantic white cedar, which grew to great proportions there, was particularly valuable, so the lumbermen went after it hard. Today, after four hundred years of commercial harvest, less than 4 percent of North Carolina's Atlantic white cedar forests remain. After the ancient trees were cut, the land grew up in pines and scrub, which attracted pulp and paper companies, eager for one last cut. Once those last profitable trees were finally gone, so were the companies and their wealth.

Meanwhile, wetlands drainage continued, and by the late 1920s, 130 miles of canals had been dug, and more than 500,000 acres of North Carolina's coastal wetlands had been destroyed. A notorious group even drained Lake Mattamuskeet, North Carolina's largest lake, and in the 1920s, residents of the

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town of New Holland farmed its rich lake-bed soils. The maintenance of the drained lake depended on what was at the time the world's largest pumping station. But even that station was not up to the task, so the lake continued to fill. By 1934, New Holland was abandoned, and the lake soon returned. Later that year, Lake Mattamuskeet was sold to the federal government for a migratory bird refuge, which became home to whistling swans, Canada geese, and hundreds of other species. The lake and its waterlogged ecosystem dealt a rare blow to commercial enterprise.

Despite the heavy exploitation, much of the eastern edge of the peninsula remained as it had been for millennia: a natural refuge for wildlife. In the early 20th century, the Albemarle Peninsula harbored some of the last black bears on the Atlantic coast, a sizable herd of whitetail deer, and all manner of small game. In the 1940s, Rachel Carson went to Lake Mattamuskeet as an employee of the Fish and Wildlife Service; her assignment was to write a descriptive essay for the American people. "The thing I will always remember," she wrote to a friend, was "the constant, haunting music of the geese—thousands and thousands of them." In the published pamphlet, she noted that "Much of the forest as the Indians knew it is gone . . . but even today some of the wildest country of the Atlantic coast is to be found in this easternmost part of the Carolina mainland. . . . Here, in this coastal region, are dense woods of pine, cypress, and gum; here are wild, silent spaces where the wind blows over seas of marsh grass and the only living things are the birds and the small, unseen inhabitants of the marshes." She spoke not just of the officially designated wildlife refuges but also of the privately held lands that hadn't been stripped of their wilderness character. (It was the kind of landscape that a large-mammal biologist in the East in later years—a Curtis Carley or a Warren Parker—could only dream of.) But preservation of that wild land was far from ensured—and the biggest schemes to exploit the place were yet to come.

The easternmost extension of the Albemarle Peninsula is a peninsula within the peninsula—bounded by the Albemarle, Croatan, and Pamlico Sounds; that spit of land, at over 200,000 acres, contains some of the wildest, most inaccessible swamps in the region, and only a few human settlements. The western edge of the peninsula is bounded by the Alligator River, a body of water that trickles out of the mainland swamps before opening into an impressive, mostly freshwater estuary that is many miles wide. In the early twentieth century, the land retained its wilderness character largely because the folks who owned it

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lived nowhere near the Alligator River. In 1885, 168,000 acres of the peninsula were purchased by a group of lumbermen from Buffalo, New York. They soon established Buffalo City in the middle of the swamp, a company town complete with general store, schoolhouse, hotel, and houses. But by the end of the 1950s, the town had fewer than a hundred residents, and before long it would be a ghost town. Absentee landlordism returned.

The same was true for many of the big timber holdings throughout the greater Albemarle-Pamlico Peninsula. At midcentury, after the most lucrative acres had been harvested, the companies pulled up stakes and left. Farmer-developers eagerly rushed in to buy what they left behind and build new roads, emboldened by a new postwar army of draglines and bulldozers that they hoped would be capable of taming and subduing the tangle of second-growth swamps and pocosins. Despite the water, despite the difficulty of drainage, the black muck, which was as deep and as good as any black soil in the Midwest, kept calling, and the speculators kept coming. One of the biggest projects, financed by two major developers, spanned parts of Hyde, Washington, and Tyrrell Counties; another, backed by Arnold Chase of Chase Manhattan Bank, sprawled across 30,000 acres. Midwestern farmers were moving in from Iowa and Kansas, one of whom estimated spending more than $2 million on roads, canals, and drainage ditches. Despite the challenges of that wild land, the big and the small farmers continued chipping away at the wetlands, and they were starting to make progress. "The sludge of wet peat and bog is gone," a reporter observed in 1959, "and men, houses and machines are moving in."

By the 1970s, the Albemarle Peninsula was under ever-increasing development pressures, as both domestic and international corporations were gobbling up hundreds of thousands of acres. Over the next decade, while just 1 percent of North Carolina's farms would come to be owned by foreign corporations, that ownership would be concentrated in four northeastern North Carolina counties: Hyde, Tyrell, Craven, and Carteret. An Italian-owned company operated a farm called Open Ground; and after the Georgia Timberlands sold 7,500 acres to a Japanese-owned firm, the latter got busy cutting and ditching the former woodlands for agricultural development.

These massive, corporate owners had far more access to capital to do more to drain and alter the ecosystems than the small farmers could have ever dreamed of. Few farmers at the time, even in the midwestern cornfields, had holdings of more than a few thousand acres—but a 10,000-acre spread in the Albemarle Peninsula was no longer uncommon. In 1973, when Secretary of

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Agriculture Earl Butz told American farmers to "get big or get out," the corporate landowners on the Albemarle were among the most capable, and had the deepest pockets, of any farmers in history.

But the biggest, baddest, and most ambitious of those "farmers" would be the homegrown multimillionaire shipping magnate Malcolm McLean. Starting with a single used truck in the Depression, his first enterprise would soon become the nation's fourth largest trucking fleet. He sold the company for $6 million in 1955 and would go on to invent the modern shipping container, which revolutionized global trade. Now he was ready to reinvent American farming: In 1973, he saw an ad in *The Wall Street Journal*. Westvaco Corporation (previously the West Virginia Pulp and Paper Company) was selling all of its land, 289,000 nearly contiguous acres, on the Albemarle Peninsula. He bought all of it, plus another 40,000-acre farm owned and operated by a midwestern grain company, for a total of 375,000 acres. He was now the owner of nearly a third of the Albemarle Peninsula, and his holdings straddled the wilderness of the Alligator River: "His fiefdom stretched over four counties and embraced the greater part of two of them."

McLean aimed to build the largest, most industrialized farming operation in the world. He'd grow corn, soybeans, and winter wheat and develop more than 150,000 acres of pasture. His early plans included thousands of cattle, and more than a million 210-pound hogs each year. Hog waste, "equal to the sewage of a sizable city," would be sprayed on crop fields. He wasn't done buying land; soon, his holdings swelled to 400,000 acres. The place was so large that employees would often get lost. When the farm manager wanted to look over the fields, he boarded a Cessna 185, and even traveling at a hundred miles an hour, it took him two hours to see it all.

McLean named the operation First Colony Farms after the infamous Roanoke settlement, which had floundered and eventually disappeared from the island due east of the Albemarle Peninsula in 1587. (It's unclear if that was a nod to local history or a challenge to himself to defiantly triumph where the English had failed.) To farm the land, he would need to do more than just cut timber; vast acreage of wetlands would need to be drained, and the same equipment that was enabling ever-larger surface coal mines, the latest D9 bulldozers that could move mountaintops and swamp forests alike, were soon carving up the peninsula. Bulldozers scraped the earth's surface, indiscriminately piling the land's rich biological heritage into mounds of waste, thousands of years of evolution and community wiped out in a day's work; draglines dug canals through the swamps, altering the water table and in-

terrupting ecological processes that had occurred there for millennia. On a smaller scale, intrusions such as that had been happening on the peninsula for nearly four hundred years, but the stakes were now higher—it was the last of the big wild lands in the East, and it was happening on a scale and at a pace that was unprecedented in the Atlantic wetlands. "A process of irreversible change has been set in motion," Luther J. Carter reported in *Science* in 1975. "In many places where before there was pine or scrub, there is now only cleared land, the fields divided neatly into rectangles by the windrows and grids of canals, field ditches, and farm roads . . . if First Colony's plans are realized, the peninsula will indeed become an agricultural domain rivaling some famous reclaimed areas, such as Florida's Everglades agricultural area and California's Imperial Valley."

That industrial activity, though praised by development boosters, gave plenty of others pause. In 1976, the Nature Conservancy had hired Charles Roe to establish the state's first-ever Natural Heritage Program, which would bring botanists and ecologists into places like the wetlands of the Alligator River to inventory and describe the biological significance of the Albemarle Peninsula (that same year, the Coastal Energy Impact Program was approved by Congress, funding biological inventories of coastal areas poised for energy development); the data the botanists compiled would provide a level of sophistication and certainty to the value of these swamps and forests, a quantifying of worthiness, that the lovers of these wild lands had already felt in their gut. Indeed, long before the information could be compiled and disseminated, it was the local people—and the Fish and Wildlife Service, which managed several large refuges in the area—who already had a firm understanding of the significance of the wetlands for migrating waterfowl and large mammals. In the early twentieth century, the swamps of the Alligator River country were one of the few places where American black bears had survived extirpation in the Southeast, and whitetail deer had always found refugia in those inaccessible lands. Biologists with the North Carolina Wildlife Resources Commission took one look at McLean's plans and the clearing that was already under way and understood what it would mean for local wildlife: Frank B. Barick, a bird hunter and wildlife director for the Wildlife Resources Commission, described standing at the edge of a First Colony Farm field, and seeing nothing but cleared land stretching out "forever." "That's the kind of situation that really eliminates almost completely the potential for game production."

There was also the problem of pollution from the one million hogs McLean planned to bring in. "There will be plenty of opportunities for accidental

spills and other problems," Carter noted in *Science*. But on a political level, the work was largely viewed as righteous progress. At a drainage permit hearing in Tyrrell County, a county commissioner said, "First Colony deserved every support in its effort to put land regarded heretofore as 'almost worthless' into productive use." Like the predators who'd been shot off the land, that remnant wilderness no longer had a place in our advancing civilization.

But it wasn't easy going for First Colony Farms. By 1977, Malcolm McLean had spent $100 million developing the farm but had no more than 30,000 acres in cultivation. First Colony Farms had started strong, clearing 25,000 acres a year, but slowed as the work bogged down, both literally and figuratively, in the muck of the peninsula. It was having trouble managing its three hundred employees, and maintaining equipment in these harsh, wet environments—to drain and dredge and pump, and bulldoze and clear the land, and then to plant and harvest, was no easy task. Most important of all, despite their best efforts, First Colony Farms was struggling to reclaim the wetlands cheaply enough to make the whole business worthwhile. Soon it started selling off parcels of land. Its hog operation went to Tyson, and it leased the remaining agricultural acreage to local farmers.

But McLean wasn't done with the land. Where he had once seen agricultural potential, he now saw a center of energy production.

The energy crises of the 1970s, following the OPEC oil embargo, sparked a frenzied interest in alternative fuels. The peat of the Albemarle Peninsula, a carbon-rich wetland soil formed by the accumulation of partially decomposed plant matter, contained tantalizing potential. For centuries, peatlands had been a reliable source of energy in Europe; increasingly, these soils were now being dug out, dried, and converted into fuel. At some point, Malcolm McLean began to realize that if he couldn't afford to convert the land to agriculture, perhaps he could mine it.

But the mining of pocosin soils, of course, spelled doom for the ecosystem. On either side of the Alligator River estuary, McLean owned an estimated 146,000 acres of wetlands, which combined for an estimated 407 million tons of peat. To go after that amount of peat quickly and efficiently, he would need to circumvent both environmental regulations, and eventually, basic logic. The first of those instances was in 1978, when First Colony Farms began to experiment with imported Soviet equipment, arguing that because it was clearing the land first and foremost for agriculture—eventually they were going to farm the land—they should be exempt from environmental review. Before

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long, McLean found allies in the federal government who were ready to agree with that logic.

In 1980, the US government created the Synthetic Fuels Corporation to promote energy security and the development of alternative fuels—and it was now offering $15 billion in federal subsidies for the work. Soon an investment group calling itself Peat Methanol Associates (PMA) requested $465 million in federal loans to fund a project at First Colony Farms on the Albemarle Peninsula. By the end of 1982, the funding would be approved. McLean was now set to make $14 million from the peat mining, in addition to having the conversion plant on his land, and he would finally get his land cleared; the wetlands would be drained, the shrubs would be cleared, the canals would be dug, and all of it would be paid for by American taxpayers, with federal tax dollars subsidizing the removal of peat and the creation of farmland for Malcolm McLean.

The Army Corps of Engineers in Wilmington wanted to make it happen fast and worked to streamline the process of gaining permission to drain the wetlands. "We hope to develop a system of conditions and parameters under which a project can proceed quickly but without damage to surrounding marine and animal life," a corps official in Wilmington said in 1982. But scientists already knew that further drainage couldn't be done without significant damage—and doing it quickly would just mean less oversight, and less time for communities to be informed. "We're simply saying go slow," said Jane Sharp, the president of the Conservation Council of North Carolina, in 1982. "It will certainly lower water tables. We don't know what it will do to estuaries." The ecologist John Clark with the Washington, DC–based Conservation Foundation had called First Colony Farms' plans to drain wetlands, harvest 90,000 acres of peat, and reclaim the area for grazing and crops "a potential environmental holocaust."

If any group was equipped to get away with such devastation, it should have been Peat Methanol Associates, whose founders were among the most powerful people in the nation and included several officials from the Nixon, Ford, and Reagan administrations (among its investors were the active director of the CIA, William Casey; and Robert Fri, who had served as acting administrator of the EPA during the Ford administration). Meanwhile, Congress had gone so far as to exempt the federal Synthetic Fuels Corporation from the 1970 National Environmental Policy Act, the 1972 Coastal Zone Management Act, and the 1966 Freedom of Information Act—a level of secrecy, coupled with personal financial gain, that smacked of corruption.

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There were significant environmental concerns too. Although wetlands research was still an emerging science, especially in the context of North Carolina's pocosin swamps, it was becoming clear that drainage would likely hasten saltwater intrusion into freshwater areas and possibly lead to subsidence. It also seemed as though Peat Methanol Associates wouldn't have much incentive to be a good neighbor; its bond for reclamation was a measly $50,000. In 1982, as the Army Corps of Engineers was working to expedite drainage projects, a study conducted by PMA consultants found that canals running through First Colony Farms contained levels of mercury that were twenty-six times higher than the state's maximum limit for aquatic systems. In response, PMA asked the state to change its threshold (peat naturally contains heavy metals, but when those metals are released through mining, processing, and drainage, mercury-laced water is discharged into local waterways). Furthermore, wildlife advocates noted that the burning of peat at First Colony Farms would no doubt contribute air pollution to the nearby wildlife refuges. Meanwhile, the National Wildlife Federation and others pleaded for more controls, citing the Coastal Area Management Act, which was supposed to regulate sensitive wetland areas.

But PMA said that its operation would be different: It would utilize a higher-moisture content peat to reduce dust; waste products, such as sulfur, could be sold or disposed of; air emissions would be diverted and used as fuel—and antipollution scrubbers would not be necessary. PMA said onerous regulations wouldn't be necessary, and asked the local people to trust them. But their word was already proving to be of little value; there were laws that prevented mining in wetlands, but the Army Corps of Engineers had ruled on behalf of the consortium that the pocosins on First Colony Farms' properties, despite their submergence in water for thousands of years and despite the fact that it was the submergence in water that had created the peat, were not wetlands.

A growing coalition of environmentalists and commercial fishermen didn't buy a word of it. By the early 1980s, scientists were warning that peatland conversion (i.e., drainage and farming) was contributing significant levels of carbon dioxide to the atmosphere at excessive rates, and nearby shellfish populations were declining due to a loss in ocean salinity. The PMA proposal would exacerbate all of those issues tenfold; once the land was drained and cleared and once the mining was done, First Colony Farms wasn't planning to restore a semblance of the natural landscape. It wanted to implement intensive agricultural production, which meant that a massive increase of fertilizers and animal wastes would be next to flow into the rivers and estuaries. "The total

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effect of pocosin conversion on the estuarine water quality is unknown," Curtis Richardson wrote in his 1982 essay on the precarious fate of pocosin ecosystems, "but we are definitely on a course to trade a significant proportion of an annual $500 million-dollar fishing industry for agriculture and short-term peat mining unless better land management guidelines are adopted."

The commercial fishermen of the Albemarle-Pamlico Peninsula knew all of that firsthand, and they had been protesting these and other drainage schemes for more than a decade. In 1976, local watermen had collected three thousand signatures and driven to the state capital in Raleigh, to demonstrate their opposition to the land clearance and large-scale drainage of corporate farms like First Colony Farms. But in the years since, the drainage and pollution had only increased, furthering the decline of local water quality. Significant portions of the Pamlico Sound, the largest of its kind on the East Coast, were closing to shellfish harvest because the waters were too polluted. In 1982, a local environmentalist and Carteret County native, Todd Miller, formed the North Carolina Coastal Federation and organized the fishermen who made a living in the waters, and the environmentalists and the members of the scientific community who valued the biological heritage of the lands, into a grassroots collective opposing the PMA plan. Meanwhile, four other wildlife and fisheries groups—the National Wildlife Federation, the Environmental Policy Institute, the North Carolina Fisheries Association, and the Pungo River Association—threatened to sue if the drainage permits were approved. "This project will cause irreversible damage to valuable wetlands in an estuary that supports a billion-dollar commercial and sport fishing industry," said the National Wildlife Federation's president, Jay Hair. "In the past 20 years, more than two-thirds of North Carolina's pocosin wetlands have been damaged or destroyed, resulting in degradation of one of the Atlantic Coast's most productive estuarine systems."

The opposition to PMA's plans was fierce—but its opponents were going up against some of the most powerful men in the world.

There was also a fundamental—and age-old—battle brewing. Those were among the last wildlands on the East Coast. Were they valuable as such, in their native and original condition, or were they simply wastelands, ready to be reclaimed by a productive civilization? Only within the last decade had North Carolinians begun to consider the outsized value of those wetlands. The lack of research into pocosins made them all the more precious to scientists. In that regard, the Albemarle Peninsula was not unique. The pocosins and the riverine swamps of the Alligator River were like the vanishing tallgrass

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prairie remnants of Illinois and Indiana or the mixed mesophytic forests of central Appalachia: biological hotspots, relics of a vast wilderness, underlain by exploitable resources and the promise of immense economic wealth. So the questions were now of values: Would the people of North Carolina value that biological heritage? Would they value clean water and clean air and their own future in these lands and waters? Or would they value the promise of profits and the good word of Peat Methanol Associates higher? For an impoverished region in a decade of decline, it was not an easy decision to make.

In 1983, while the Peat Methanol Associates proposal developed just west of the Alligator River on Malcolm McLean's Tyrell and Washington County land holdings, McLean continued to work other angles; east of the Alligator River, on the peninsula within the peninsula, he brought in the Prudential Insurance Company to help drain and develop farmland. Their joint effort would be known as Prulean Farms, and McLean would continue to lean on the support of local decision makers. The Army Corps of Engineers concluded that dredging drainage canals through 22,000 acres would have "minimal or nonexistent" impacts on wildlife habitat, wetlands, and groundwater—and they continued to deny that the pocosin bogs were wetlands—again despite the fact that they'd been wet for thousands of years and despite the fact that the peat soils had been formed exclusively in wetlands. Furthermore, the corps allowed dredging to commence before permitting was complete—Prulean Farms was filling in a 4,000-acre wetland—with 100,000 acres of wetlands drainage pending.

In September 1983, as many as eight environmental, fishery, and other citizen groups filed suit with the federal government for failing to properly regulate the activities of both Peat Methanol Associates and the Prulean Farms joint venture. Soon the PMA project began to unravel on multiple fronts. Both Republican and Democratic leaders in Congress called into question Synthetic Fuels' guarantee of $465 million, "worried that the corporation's allocation of funds was being influenced by the self-interest of its own officials." In the fall of 1983, the federal General Accounting Office launched an investigation into the legality of Synfuels' backing of the project, specific criticisms raised by North Carolina environmentalists, and the price guarantees PMA had received. By February 1984, prominent supporters of Peat Methanol Associates began to bail, with the departure of the Koppers company of Pittsburgh, Pennsylvania, offering the decisive blow: "As far as we're concerned," a Koppers spokesperson said, "the project is dead."

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Prudential pulled out next, and a few months later, the First Colony Farms megafarm was finished.

In November 1986, Malcolm McLean filed for bankruptcy—across his ventures, he'd made a number of other miscalculations. He would soon off-load all of his land on the Albemarle Peninsula, a "fiefdom" that just recently had sprawled over 400,000 acres.

With the collapse of those two projects—the peat-burning factory and the Prulean Farms megafarm—there was now an unprecedented opening for conservation. For the past decade, ecologists with North Carolina's Natural Heritage Program had been documenting the natural communities and the myriad species that were native to the Albemarle Peninsula. As early as 1980, the North Carolina chapter of the Nature Conservancy had been negotiating a sale of Prudential's nonagricultural holdings on the peninsula; just east of the Alligator River, ecologists had documented high-quality wetlands with significant conservation value. Indeed, despite the ditching and dredging and logging, the Alligator River country was still wild, and it contained significant, unbroken expanses of swamp forests, pocosin wetlands, and both brackish and freshwater marshes. Much of the peninsula was a remnant, intact ecosystem. In particular, Milltail Creek, a tributary of the Alligator River, was known to ecologists as a high-quality, quintessential, blackwater creek. And the interior pocosins were among the last and best in the country.

In 1982, a few years before he would become an acclaimed writer, William duBuys was the director of the Nature Conservancy in North Carolina. Over the years, he had developed a collegial relationship with the business managers of First Colony Farms and Prulean Farms. Now that McLean Industries and the Prudential Insurance Company were getting out of the farming business, he was working on a deal to accept the land as a tax-deductible donation. With the support of North Carolina Congressman Walter B. Jones, the chairman of the House Committee on Merchant Marine and Fisheries, and Edmund Welch, the committee's chief counsel, Prudential was able to secure a written tax opinion from the IRS *before* the donation occurred, an exceedingly rare occurrence. In 1984, in exchange for an $86 million tax deduction, Prudential donated all 118,000 acres to the federal government. (The Nature Conservancy negotiated the deal, but in order for the company to receive the tax benefit, the property had to go directly to the federal government.) Interior Secretary William P. Clark, Jr., called it "one of the largest and most significant [private land donations] in the history of American conservation."

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In an eastern landscape characterized by numerous small, private landowners, the Albemarle had gained a significant, unbroken swath of public land. On the other side of the sound were the beaches and the massive tourist infrastructure of the Outer Banks. "Visitors coming into the county from the west drive through the refuge; most other visitors are unlikely to realize such an area even exists," Warren Parker would soon write.

The land was remote, it was difficult to access, and it was surrounded by water. Because of the dredging of the intercoastal canal, the peninsula was, technically, an island. With its large population of black bears and American alligators, the land was already host to large carnivores—not a few people even believed that panthers still lurked in the swamps. There were only two paved highways and little more than a thousand residents, the majority of whom lived on the edge of the peninsula. The interior of the landscape was dark and empty, and it was to be managed by the Fish and Wildlife Service.

On March 14, 1984, the Alligator River National Wildlife Refuge was officially established. Combined with the adjacent federal bombing range, the public landholding now totaled more than 160,000 acres.

Surely that would be large enough for several packs of wolves.

CHAPTER 18

The Alligator River

The Alligator River begins as a small, tannic stream. As it flows north, the waters swell and spread into a massive body of water until it empties into the Albemarle Sound, and the two become one. When you are immersed in these brackish waters, there is no beginning or end, there is just an immensity of water and horizon. That estuary, and the blended mouth of the Alligator River, is as expansive and grand as any place in North America.

In 1984, the lands drained by the Alligator River were home to endangered species—bald eagles soared over the landscape, red-cockaded woodpeckers bore into the snags of decaying pond pines, and the northernmost breeding population of American alligators made a living in the black waters of their eponymous river. The Albemarle Peninsula was a meeting place of southern and northern species, home to rare stands of Atlantic white cedar, lowbush cranberries, northern white bog sedge, and insectivorous spoonleaf sundew; in the summer, tropical migrants, including black-throated green warblers, worm-eating warblers, cerulean warblers, and prairie warblers, flocked to the peninsula.

Much of the place, especially the pocosin swamps, was an impenetrable wilderness—the peat soils do not bear weight, and to walk through a pocosin you must step only upon the root mass of the shrubs; miss the roots, and you will sink to your knees. Yet the pocosins are laced with game trails blazed by both small mammals and the largest, heftiest black bears anywhere on the continent; the indigenous wildlife knows its way around, knows where it can be supported, and where it cannot. The Alligator River area was wild land, and we had almost lost it forever: Had the peat-mining saga played out any differently, that irreplaceable landscape might not be there today.

The Alligator River National Wildlife Refuge was also, as Warren Parker immediately knew, the last best hope for the American red wolf. The peninsula was not yet filled with coyotes, and it was full of potential prey. The refuge had

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not been established because red wolves needed a home—by all accounts, no one involved in the creation of the refuge had wolves in mind—but now that it was owned by the Fish and Wildlife Service, Parker would argue that that had become the refuge's most important job. Within months of its receiving the property, a plan was under way for bringing red wolves out of captivity and into North Carolina.

There had been no local movement calling for that—it was not the grassroots, sportsmen-driven game-species restoration of the midcentury conservation movement, it was a project of biological conservation initiated by FWS biologists and advocates such as Defenders of Wildlife and backed by federal legislation. The American public was supportive of endangered species work, but the truth was that most Americans had no idea that those specific animals, southern *red* wolves, existed. The Fish and Wildlife Service informed conservation groups, the North Carolina congressional delegation, the state game agency, the North Carolina Department of Agriculture, and local county commissioners about the proposal; its representatives met with representatives of the US Air Force and Navy, which operated training missions on a 40,000-acre tract adjacent to the refuge, and they communicated with local trappers and hunters. And they waited to hear back from them.

There were reasons to be hopeful. Attitudes toward predators were changing nationally, and the Endangered Species Act, which required the Fish and Wildlife Service to restore populations of both red and gray wolves, was still quite popular. In 1985, 74 percent of respondents to a poll at Yellowstone National Park said they believed that a restoration of wolves there would "improve the Yellowstone experience." Locally, the North Carolina Wildlife Federation, which had been founded by hunters and anglers in 1945, was on board with the proposal. "Game populations will not be harmed, since most of the diet of red wolves consists of non-game animals," a federation official said. "An occasional deer or rabbit taken by wolves will not harm the populations of these animals."

But a change in attitude was relatively easy when the animals in question were ancient history—for most easterners, large predators were long gone, and coexistence was not something they'd had to consider for generations. Furthermore, with an increasingly urban and suburban population, the idea of coexisting with large predators was an easy thing to support, because these folks weren't likely to have the animals show up in their own backyards anytime soon.

The fact of the matter was that wolves continued to be a tough pill for ru-

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ral Americans to swallow. Ten years earlier, Michiganders had killed translocated wolves in that state's Upper Peninsula (and had delivered the carcass of one animal to the county courthouse); and in the Rocky Mountain West, ranchers continued to fervently oppose the idea of gray wolf reintroduction in Yellowstone National Park. It wasn't so long ago either that the Fish and Wildlife Service's endangered species biologists had been alerted to the plight of the red wolf because ranchers in Texas and Louisiana had nearly killed them all. ("Sympathy for wild animals, sympathy that is intellectual as much as emotional, has not been a strong element in the traditional American way of life," noted the Texas author J. Frank Dobie.) Those same ranchers and trappers were still managing their land and still proud of their work. But Curtis Carley and Warren Parker hoped that it would be different in North Carolina, way back east, and as FWS campaigned in the local area, they stressed the differences between the red wolves and the larger gray wolves. They hoped that Americans, and North Carolinians in particular, were ready for a new era of tolerance. After all, the species was *not* the big, bad wolf.

The refuge manager was John Taylor, who had just relocated to North Carolina from Alaska, where he'd helped establish another refuge. He made presentations at Rotary and Lions' Clubs and county commission meetings; in his khaki uniform, he stuck out like a sore thumb and was stopped on the streets and in restaurants to be given an earful on the wolf proposal. Taylor had help; at a community center in East Lake, neighbors gathered around the warmth of a wood stove while Warren Parker assured residents that red wolves wouldn't harm people, and that they'd never see more than their tracks. Red wolves were unlikely to eat deer, he said, and would subsist primarily on rabbits and other small game. (Based on experiences in Texas and Louisiana, he believed that that was true.) After years of trapping the animals, the service knew that the red wolf was smaller and more timid than the gray wolf. "They can hide behind a blade of grass," Curtis Carley had said. The recovery team also emphasized that the wolves would be wearing "capture collars," outfitted with radio transmitters and remotely activated tranquilizer darts.

Receptions were mixed. One resident warned that hunters might shoot the animals or set fire to the refuge in protest. The owner of a general store made an ominous prediction: "I think the hunters are going to take care of them . . . either poison or by shooting them."

For some, the hesitancy was less about wolves, and more about change: Many outdoorsmen liked the fact that the land had been in the possession of absentee owners, they liked being able to hunt and trap without restrictions

or needing anyone's permission—and they especially disliked the idea of an increased presence of federal agents. Warren Parker was aware of those sentiments, and to keep the peace, he said he would strive to maintain hunting and trapping traditions to the greatest extent possible—even if it meant that some wolves might be harmed in the process. "You have to be honest with the local people," he would later reflect. "You can't pull the wool over them and be a politician. . . . That is a hard task; to walk into an area where a predatory animal has been gone for a hundred years and say, 'We want to put these animals back where they were.' And then try to explain why this is in their best interest. . . . They really don't understand that." But his job was to make it work.

When Parker had tried to convince the people of Kentucky and Tennessee to accept red wolves at Land Between the Lakes, folks had been concerned about the consequences of accidentally shooting an endangered species. Would they be prosecuted and jailed? At the time, Parker didn't have a satisfactory response, but in all likelihood the answer was yes, if someone shot and killed a wolf, they would have been held responsible for the "take" of an endangered species. But in 1982, an amendment was added to the Endangered Species Act allowing threatened and endangered animals to be released as an "experimental population"; and the designation would relax federal protections if it would somehow benefit the long-term success of the species (the experimental population would further be defined as either "essential" or "nonessential"). The red wolf reintroduction at the Alligator River National Wildlife Refuge, should it be approved, was to be of an "experimental, nonessential" population, which meant that if someone in northeast North Carolina accidentally shot or trapped a red wolf, they would be forgiven if the circumstances were "unavoidable, unintentional, did not result from negligent conduct, and was immediately reported to authorized personnel." Parker wanted to assure the local people that the service would not rule with an iron fist—and the new rule was his proof.

At the Alligator River refuge, sportsmen would be permitted to continue hunting deer with their dogs, and if a hunter's dogs harassed or injured a red wolf, it would not be a violation of the Endangered Species Act (inappropriate "take," however, meaning killing or even harassment, would still be punishable with a fine up to $25,000 and up to a year in prison). Parker hoped that the "non-essential" designation would help local people relax—wolves might be chased and harassed, they might be accidentally trapped, and Fish and Wildlife would just have to live with that if the local people were going

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to tolerate their presence. Radical change was not afoot, and the red wolf would fit right in.

Ultimately, that provision would help to win over the local people. But there was a danger in that, too. On the eve of reintroduction, there were just seventy-six red wolves in captivity. *Nonessential* was a technical term—a bureaucratic one—but each individual animal was, in fact, critical to the continuance of the species. Red wolves, even a so-called experimental population, were among the rarest things in the world. So if a person were to take the official language literally—that the wolves were nonessential—it could undermine the effort to reestablish these wolves in the wild.

After four public meetings, only a few individuals voiced adamant opposition (although deer hunters would still be permitted to hunt with dogs on much of the refuge, some were upset that they wouldn't be permitted to train their dogs on the refuge in the summer). According to FWS, a majority of the hunters and trappers tentatively supported the reintroduction. Then, in May 1986, the North Carolina Wildlife Resources Commission formalized its approval of the reintroduction program on the condition that traditional hunting practices could continue on the refuge.

That kind of ceasefire in the long history of our national war on wolves was unprecedented. For the first time in American history, a community had agreed to live with wolves again.

On November 12, 1986, after a decade in captivity, eight red wolves were flown into Raleigh-Durham Airport. Seven of the animals came from the Point Defiance Zoo in Tacoma, Washington, and the eighth from the Wolf Sanctuary in St. Louis, Missouri. The wolves were shipped in cargo crates, and should anyone forget what was inside, they were stamped with bold lettering: "Endangered Species" and "Red Wolf." When an approaching storm delayed a connecting flight to Dare County, the Coast Guard offered to fly a helicopter below the storm to the Alligator River National Wildlife Refuge. Despite the rain, local residents, schoolchildren, reporters, and all kinds of onlookers filled the tarmac awaiting their arrival. As the cargo boxes were unloaded, the wolves cowered "fearfully in their cages." "They hardly looked like vicious predators," one reporter noted. The animals from Tacoma, two- and three-year-old wolves, had been raised entirely in captivity. (The one from St. Louis, meanwhile, had been chosen because she had exhibited "aggressive behaviors" and wasn't fitting in with the other captive wolves.) The animals were loaded onto trucks and driven to the refuge proper—a bumpy, muddy ride—and then

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driven farther to four separate pens at remote locations of the refuge. Inside the pens were crude wooden shelters covered with mud and debris, with narrow cutouts for entry. Before long, the crates were tilted up, and the animals bounded out: not yet free to roam but, after more than a century, back on eastern soil.

When the reintroduction took an eastward shift, Curtis Carley elected to stay in the western region; Warren Parker would be overseeing the project from his Asheville office, and for the next several months, there would be five caretakers living on the refuge full-time (most would live in campers, but one caretaker would live in a houseboat anchored in a small cove). The caretakers' job was to keep the wolves healthy and happy; because they were fenced into a pen, they needed to be provided with food and water, but that was at odds with a second imperative: that the wolves needed to learn how to live in the wild again, as quickly as possible. FWS maintained limited exposure to the wolves in captivity so they wouldn't become tolerant of humans ("a life-threatening trait for wolves about to be released in areas that might be used by some unsympathetic member of the public," field leader Michael K. Phillips would later write). One morning when a caretaker went to throw food into a pen, a wolf lowered its head and wagged its tail, much as a friendly domestic dog would, so the biologist snarled at the wolf as he tossed in the food buckets (tail wagging was a bad sign). Roland Smith, who coordinated the captive breeding program (formally known as the Species Survival Plan) at Point Defiance, said that wolves are naturally shy animals. "One thing you want to do is to have them maintain that shyness, so when they're in the wild, they don't go running up to people and getting their heads blown off," he said. "You want them to be afraid of people to a certain extent."

The wolves were subjected to feast-or-famine cycles, and eventually they were weaned off dog food and fed fresh meat, some of which was covered with vitamin supplements or deworming medication. Service employees kept their eyes peeled for roadkill—rabbits, raccoons, muskrats, opossums, and deer, anything fresh enough for the wolves to consume. In the spring, caretakers introduced live prey—small mammals such as rice rats and mice, and bigger ones such as the occasional raccoon, nutria, and opossum—so that the predators might learn to kill again. The wolves caught and killed them all. "They seem to have an inborn genetic instinct to hunt and feed," refuge manager John Taylor said. Likewise, they seemed eager to be wild and free, as they frequently attempted to dig under fences and wire cages. They even learned to climb.

Two females gave birth during the acclimation period. One of the pups was

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found in a puddle of water—apparently, the mother had carried it out of the artificial den. Biologists tried to put it back in, but the mother rejected it and took it back out, and the pup would later die. Other pups were unaccounted for, assumed to have been consumed by their mother. Some biologists believed that if females gave birth, the animals would have more incentive to stay put after the acclimation period was over—something the Fish and Wildlife Service was eager to achieve. On the other hand, the burden of raising pups might decrease the adults' survival odds that first year back in the wild, and so two other pairs were prevented from breeding in order to test the hypotheses. Wolf reintroductions were a brand-new science.

The original plan was to release the animals in May, well after breeding season, but delays in manufacturing the tranquilizer collars (the 3M Company was still troubleshooting the nylon housing to cover the darts) put the release on hold. Meanwhile, the plan to fatten the wolves before release was working—all had gained weight over the course of their ten-month acclimation period.

But there was a problem with waiting too long: Deer season was rapidly approaching, and if they waited much longer, the wolves would be released with little time to get acclimated to the landscape before a barrage of hunters and their well-trained dogs entered the woods with guns.

After ten months, the big day finally arrived. On a Sunday evening in September, using neck snares and nets, two wolves were pinned down, checked for ticks, and given vitamins, antibiotics, parasiticides, and several vaccines. After that, they were outfitted with radio collars. The next morning, the caretakers would approach the wolves and set them free.

Mike Phillips recorded the event in his journal. It was a clear, cool morning, eventually warming up to 80 degrees F. The lucky pair of wolves were in a location accessible by boat; the caretakers set off just after 9:00 a.m. Not wanting to alert the wolves of their approach, they turned off the engine and floated the final fifty yards to the pen. "Chris [Lucash] and I steadied the boat as Warren and John muscled the 110 lb. deer carcass out of the boat and began the wet walk through the sawgrass marsh to the pen," Phillips wrote. Warren Parker tossed deer meat into the enclosure as usual. Then, without any ceremony, he opened the gate. He and John Taylor then walked away, and the wolves were free to go. "At 0924 h they returned breathless, anxious, and nervous. Both were unusually quiet. Taylor said nothing, but Parker uttered 'we did it, we let them go.'" There were no crowds of onlookers, no professional photographers or reporters; it's unclear if there were even any high-fives.

Apparently, the wolves were quite acclimated to their pen. Using radiotelemetry, the biologists determined that in the late afternoon, the wolves were either still inside the pen or immediately outside; it took four days, in fact, for them to approach the gate and finally move beyond it. The lack of movement worried Warren Parker sick; he even dreamed that somehow the pen had closed behind him and the wolves were stuck inside without any food. But by Thursday, the radiotelemetry signals indicated that the female had gone to the northwest, giving Parker some relief. (The male, meanwhile, stayed near the acclimation pen for an entire week.) After two weeks, the wolves hadn't strayed more than two miles. The acclimation period seemed to have worked.

On day ten, Chris Lucash, another program biologist, was tracking the male wolf around the water's edge, where he'd been spending a lot of time. Lucash anchored his boat and set up his telemetry equipment—and the signal "came booming out." Jan DeBlieu, an environmental journalist who would soon join Lucash in the field, says he then noticed a stirring along the shoreline. "It was right in some trees, just a small movement," Lucash said. "A wolf nose. He stuck his head out of the brush and touched his nose to the water. Just in and out, like that, for a couple of seconds. I don't think I would have seen him if I hadn't been looking right there. I honestly don't think I would have known it was a wolf and not a deer. He almost moved like a deer."

As DeBlieu noted, it was the first time in over a century that anyone had seen a wolf, wild and free, in North Carolina.

Two weeks later, on October 2, the other three pairs were released. Each pair spent twelve to fourteen hours near the acclimation sites, but before long they found every nook and cranny of the Alligator River refuge; they wandered down to the federal bombing range, they traveled using roads and waterways, drainage canals, and roadside ditches; some of them wandered off the refuge and onto private property. Initially, they were tracked constantly with radiotelemetry—they sought the wolves on foot, from pickup trucks, boats, and airplanes (eventually, they'd log over a thousand hours of airtime). Local people reported sightings: One man, walking along a dirt road, saw a wolf briefly before it darted into the brush; another man got face-to-face with a wolf, thinking that it was a German shepherd, before noticing the 3M recapture collar. "[When] he realized he was eye to eye with a wolf," DeBlieu reported, "he shouldered his gun and began to yell. The wolf cringed and walked away sideways, its tail between its legs." The wolves were establishing home ranges. Before long, an assertive pair would run off a pair of interloping

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wolves from their newly established territory, which was a healthy, wolflike thing to do.

But there was trouble even in the first month. One of the wolves trotted through Manns Harbor, and a father watched as the animal poked around his family's yard and sniffed his little girl's bike. To scare the wolf off, the father shot a pistol into the air, but still it hung around. When program staff came to get it, the custom-made 3M recapture collar malfunctioned, so they resolved to capturing it the old-fashioned way. Warren Parker believed that the wolf would have returned to the refuge and that it posed no danger to the community of seven hundred—it had even passed several cats without giving chase—but he felt obligated to capture it nonetheless. "We promised we would keep these animals out of urban areas, and I think we have an obligation to those people," he said. At 5:00 a.m., after two and a half hours of stalking the wolf, he shot it with tranquilizer darts. Despite having lost some weight, it was otherwise in good condition, and it was rereleased with a new tranquilizer collar. Biologists hoped that the experience would deter it from returning to any villages; if it went to town again, it would be removed from the program. A few days later, a second wolf wandered twelve miles into a private farm near the Hyde County border. The biologists captured the wolf, and after a night at the refuge headquarters, the female was also rereleased near its original homesite.

By removing that wolf, the Fish and Wildlife Service was doing several things: keeping its promise, keeping local people happy, and setting a difficult-to-maintain precedent—that if red wolves wandered onto private lands, even a sprawling farm property, they could be removed. They were keeping their word, but in the process, setting an unbelievably high bar. Wolves, of course, have no way of knowing on which lands they are welcome and on which lands they are not—and they would continue to find farmlands attractive places to settle.

Remote as it was, the Albemarle Peninsula was still crisscrossed with roads, and one of them, a state highway, carried millions of tourists to the Outer Banks each year. A high-speed, heavily used road like that was lethal for all terrestrial mammals, but it was especially worrisome for a population of eight individuals. The red wolves didn't show any indication that they understood the dangers of modern highways: They didn't flee from vehicles, and if a car or truck approached from behind, they kept trotting, stepping aside only at the last minute. Regrettably, one of the wolves had established its territory near a

paved road. From the wolf's point of view, there were a couple good reasons for that: Roads were easier to travel down than dense pocosin thickets, and they supplied a steady source of road-killed meat. But like the raccoon and deer and other mammals splayed out on the road, the wolf was just as vulnerable as the animals it scavenged. In the first few months, Lucash came upon a pair of wolves loafing in the middle of a road and was horrified that they didn't flee. The female "walked up to the left bumper of the truck, sniffed it, crossed the road, and came along the door of the passenger side." He threw open the door and hollered at the wolf to make it go away. "The female, caught off guard, skittered sideways into the cane grass on the shoulder of the road," DeBlieu reported. "It was too dark to see her, but Lucash could tell by the rustling stems that she was crouched within ten feet of him. . . . She reminded him of a dog that had been beaten until its spirit had shattered beyond repair."

The wolves were also a danger to one another. In late October, two pairs got into a fight, and one of the wolves ended up with a crushed foot and multiple puncture wounds. Two wolves were taken to refuge headquarters for treatment (the injured wolf wound up losing a toe) and eventually rereleased. The fight was likely over territory, which was a normal thing for wolves to do, but it was not ideal that some of the world's rarest mammals were trying to kill each other. (Another wolf, which was in a pen, had its foot ripped off through the fence by another aggressive wolf.)

Those injuries underscored a larger point: The Alligator River refuge was large, but its space was finite. Like Bulls Island, it had its limits.

The first nine adults had transmitters implanted into their abdomens as a backup to the motion-tracking collars. The biologists also implanted radioactive pellets under a wolf's skin, which would release a unique radioactive signature into their fecal matter, so that biologists could keep track of whose scat was whose. Through those techniques, the biologists soon learned that the wolves were eating marsh rabbits, raccoons, and deer. Supplemental feeding had continued only through the first eight weeks, after which the wolves had fended entirely for themselves.

The recovery team hoped to establish a wild population of twenty-five to thirty-five red wolves within five years. But by the end of 1987, after approximately three months of life in the wild, two wolves would die. The first was found dead on a beach on the Pamlico Sound, between Stumpy Point and Long Shoal River. "She had obviously been dead for some time," Phillips noted,

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"as the tides had nearly covered her with sand." Her stomach was empty, but the wolf's body appeared to be in otherwise good condition. The carcass was driven to Norfolk, Virginia, and then flown to a lab in Madison, Wisconsin; kidney failure was the approximate cause of death, and lab tests revealed a massive infection of an unknown cause. Ten days later, another wolf would die, this time as a result of management decisions: The animal had been moving off refuge lands onto private property, so it was to be recaptured. Unfortunately, it suffered a leg injury in the trap, and had begun gnawing at its foot, making it impractical for a return to the wild, and the wolf was euthanized. Despite those losses, refuge manager John Taylor remained encouraged. "We've been very pleased with the way the public has accepted them," he said. "No reports of hunters or the public trying to harm the animals. It's encouraging to hear, and we hope it continues."

On January 22, 1988, eight additional wolves arrived at the refuge. The reintroduction program was ramping up.

Mike Phillips was the field coordinator for the recovery program—with Warren Parker back in Asheville, he was running the show on the ground in North Carolina. He had first worked with wolves in the early 1980s in Minnesota Superior National Forest and at Isle Royale National Park; just before coming to Alligator River, he'd been in Fairbanks, Alaska, working with gray wolves and grizzly bears. He was not only a capable biologist, he was a charismatic storyteller, he was good with the media, and he had positive relationships with seemingly everyone: colleagues, private landowners, even local deer hunters and fur trappers. Years later, when local people look back on the early success of the Red Wolf Recovery Program, specifically the buy-in by Albemarle sportsmen, Phillips is given much of the credit.

In May 1988, Phillips was able to share encouraging news. While conducting a telemetry flight, he had observed a round ball of black fur hurrying to keep up with two adult wolves. "The pudgy pup, known officially as 344F but affectionately referred to as 'slick and steady,' was the first red wolf born in the wild in North Carolina in many decades," Phillips recorded in his journal. (A month later, the celebration for that firstborn pup was cut short when its mother was found dead. Fortunately, the pup had already been weaned, and the father was able to continue rearing the pup by regurgitating a "soft gruel" of raccoon and other prey.) "It's cute," refuge manager John Taylor said of the nine-week-old wolf. "It looks like a little dog puppy, only it's kind of mottle-colored, mostly reddish with spots of gray." Images of red wolf pups, whether

taken in the wild or at captive facilities, continued to capture animals with big ears, big eyes, massive paws, and indeed, a striking resemblance to man's best friend.

At the one-year mark, Mike Phillips noted that reestablishment was progressing well. "The wolves seem to be able to consistently feed themselves, and mortality and emigration from the reserve is minimal," he wrote. "We are confident that within a few years the refuge will support a self-sustaining population of red wolves and that one of the rarest mammals in North America will be a step closer to being removed from the endangered species list."

Yet despite that optimism, dead wolves remained par for the course—at the two-year mark, more than half of the introduced wolves had died. Biologists would come to expect it. "We're batting .500, which is a pretty good average," Warren Parker said, trying to put a positive spin on what was surely less than heartening statistics. Two females died within the first three months of the program; and the two that survived would give birth to a litter of pups, but only one pup from each litter survived. Of the two females that died, one was euthanized after it lost a leg in a fight (and a male was captured and brought into captivity to be treated for wounds). Five wolves were killed by cars. One wolf was caught in a trap meant for bobcats. A second was caught in a trap and drowned. More than one female wolf died of a uterine infection after giving birth to pups (which biologists believed was something that shouldn't happen to wild wolves). In subsequent years, wolves would die from ingesting poisons, from an impacted colon, from fighting and killing each other, from choking on a raccoon kidney, and from euthanasia due to blindness. Often the cause of death was undetermined, and only bits of fur and a pile of bones remained. Life was hard, and death came easy. "Ain't no way I'd want to be a wolf," Phillips said.

Although a number of wolves had been killed in traps, FWS did not want to make significant changes to existing regulations. Not even Defenders of Wildlife was yet calling for the elimination of trapping at Alligator River (although they did believe the deaths warranted an investigation of FWS policy). Officials continued to believe that it was essential to maintain hunting and trapping on the refuge, even if it meant a few wolves might die in the process.

Public support was tenuous. Because the landscape was so wet and dense, dogs were the most effective way for local hunters to flush deer, and some hunters had been complaining about not being allowed to hunt with dogs in specific areas of the refuge, and restrictions on training their dogs in the

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summer. Dog and motorized vehicle regulations hadn't been developed for the refuge solely to protect the wolves, but Taylor worried that angry hunters might take revenge on these endangered animals. Some sportsmen continued to express concern that further restrictions were on the horizon: "People are concerned about what's going to happen," Michael P. Daniels, the chairman of the Dare County Board of Commissioners, told a reporter in 1990. "Every time you have the federal government come in you start losing some control."

On a few occasions, local people exerted their own control, such as on October 20, 1990, when a property owner named Richard Mann shot and killed a red wolf that, he said, he had feared might harm his cattle. He was eventually prosecuted by the Fish and Wildlife Service and after pleading guilty was forced to pay a $2,000 fine and volunteer on the refuge building wolf pens. By and large, however, Phillips does not recall antiwolf resentments having a serious impact on the project. In fact, during his seven years at Alligator River, only four red wolves were known to have been shot and killed.

Despite the occasional poaching incident and the criticisms of a few hunters, the program continued to find allies. In fact, Phillips was soon releasing the program's first wolves onto private property, which was a significant milestone for the recovery program. The isolated property, an island just north of the Alligator River refuge, was owned by the Durant Island Hunt Club, and although the group used the 3,888-acre property as a hunting preserve, it was willing to share it with the endangered red wolf. (The first wolves, however, despite the warm welcome, would have a rough go of it. Translocated from a New York zoo, the adult male drowned and washed up on the shore of the Alligator River two weeks later; and two pups would likewise die. Only the female wolf would successfully swim to the mainland and live a while longer. Phillips believed that a longer acclimation period might have curbed their eagerness to roam, but perhaps it wouldn't have mattered—the wolves were curious, and in that tidal habitat, drowning was an everyday risk.) The release on Durant Island was a major turning point for the program, and the relationship with the hunt club would continue for many years to come. Mike Phillips knew that cooperation with other private landowners would be necessary to restore a sustainable population of red wolves—in fact, that point would come to define either the success, or failure, of the program—because there simply wasn't enough habitat on public lands alone. Regardless of space, the wolves simply would not confine themselves to the refuge, no matter how badly the recovery team wished they would: From day one, they had gone where they wanted to,

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whether or not it involved crossing a busy highway, swimming through dangerous waters, or setting up shop in the woodlot of a private landowner who might or might not have come to embrace the ecological value of wolves.

But the footprint of federal lands on the Albemarle Peninsula was about to get a major boost. In 1990, the Richard King Mellon Foundation donated a 93,000-acre tract to the Fish and Wildlife Service, land it had acquired in a bankruptcy sale of First Colony Farms for $8.8 million, to create the Pocosin Lakes National Wildlife Refuge. The new refuge, which was located west of the Alligator River and subsumed an existing parcel of public land, would total 104,000 acres, and the service would prioritize the restoration of the dredged and degraded peatlands by rewetting the pocosin swamps. The restored pocosins would improve wildlife habitat for both game and nongame species, store huge quantities of both carbon and rainwater, while also providing the red wolves a new foothold and relative safe-haven. As ever, those goals—restoring the wetlands and establishing wolves—had the potential to either satisfy or incense nearby property owners.

To appease the wolf weary, Phillips and his team continued capturing wolves that wandered off the refuge and relocating them back to Alligator River, but that was unsustainable from both a management and biological perspective. What the wolves needed more than anything was for local landowners to accept them as a restored component of the local ecology. To that end, in 1990, FWS entered into a so-called partnership agreement with the John Hancock Mutual Life Insurance Company, which owned thousands of acres of farmland adjacent to the refuge. (It had bought into the Albemarle Peninsula in 1974, the same year as First Colony Farms had, and had formed the 35,000-acre Mattamuskeet Farms in a joint venture with American Cyanamid Company.) According to the agreement, the company would "allow red wolves to wander onto their lands and remain if the wolves so desire," and upon termination of the agreement FWS would immediately capture and remove any wolves from John Hancock lands. A number of private landowners put their signature onto similar agreements, and by the end of 1992, private landowners had provided the red wolves a total of 187,000 acres. Several larger farms went on record saying that the wolves were good for their property because they ate small mammals that either depredated their crops or whose burrows damaged their infrastructure: "Our problems with nutria have decreased in the last three years," a partner with Mattamuskeet Ventures said. "The only reason I can give you for that is the wolves." The same property doubled as a hunting lease, and the landowners even went so far as to say that the whitetail

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deer population seemed healthier now that red wolves were chasing them down and thinning the herds.

No matter how good the red wolves were at securing prey or traversing a matrix of swamp, forest, and farmland, the species would now and forever depend on the acceptance of their human neighbors. No matter how rosy the Fish and Wildlife Service made it seem to reporters, the truth was that the open-minded, the adamantly opposed, and the indifferent lived side by side. In fact, most residents of the Albemarle Peninsula spent little time dwelling on the fate of the program; it was happening in the background of their lives and didn't require their direct participation or approval. But those who did mind the wolves, even if they were a minority, could exert an outsized influence on the day-to-day workings of the program. Some landowners who were outright opposed to the idea of wolf restoration continued to request red wolves be removed from their property, even when they weren't causing problems, which was a time-consuming errand for the biologists, and disruptive and dangerous for the wolves. But the Fish and Wildlife Service needed to keep the peace. The prosecution of Richard Mann had left a bad taste in the mouths of Albemarle landowners, and grumblings of displeasure were maturing into full-blown opposition. In 1992, just before the five-year mark, Hyde and Washington Counties adopted resolutions opposing the expansion of the Red Wolf Recovery Program, and the state legislature would soon pass a resolution allowing anyone to shoot a red wolf if they deemed it a nuisance (the law passed despite being in conflict with, and superseded by, federal law). When the regional director of the Fish and Wildlife Service warned that the service would respond by withholding the state's Pittman-Robertson funds, one of North Carolina's assemblymen is alleged to have said that "the feds can take their funds and 'stick them where the sun don't shine.'" "It's just another damn dog, as far as I'm concerned," a representative from Wilkes County said. In the fall of 1994, the Hyde County Board of Commissioners sent a letter to FWS demanding that red wolves be removed from the county by December 21, 1994. By the end of the year, at least two wolves would be shot dead.

Some people had genuine concerns about sharing the land with red wolves, but for a number of critics the wolf was merely a symbol—the introduction of these snarling predators was yet another example of federal overreach and endangered species conservation run amok. To address these sentiments, a congressional hearing on endangered species and wetlands was held in New Bern, North Carolina, on April 1, 1995. The hearing was sponsored by Richard Pombo, a US representative from California who had been inspired to run for

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office out of frustration over endangered species regulations that he felt were burdening his family's ranch. He was not alone. "My constituents constantly tell me of their frustration with government bureaucrats who issue protective orders for kangaroo rats and hold it in higher esteem than the lives of human beings," he said. ". . . [The] balance of wildlife protection may have swung too far from reality."

Nationwide, the conflict between private property rights and endangered species conservation had reached a fever pitch. In the early 1990s, old-growth forest advocates wanted to stop the clear-cutting of US Forest Service lands in Oregon, citing the devastating impact it would have on the threatened northern spotted owl (*Strix occidentalis caurina*), and they argued that failing to consider the owl had put the Forest Service into violation of the National Environmental Policy Act. When a federal judge agreed, all logging was halted and thousands of timber jobs were lost almost overnight. The spotted owl was not the only controversial endangered species case, but it caused a high-profile, hotly contested controversy (among the pro-logging bumper stickers from that area: "Kill a Spotted Owl—Save a Logger") and had significant economic fallout.

After the spotted owl showdown, the protection of endangered species became a polarizing topic. Even in suburban Chicago, where prairie stewards were cutting brush and gathering seeds, Stephen Packard encountered a distinct shift in attitudes pre- and post- spotted owl. "The spotted owl controversy changed America's mood," he wrote. Prior to the controversy, if a passerby had asked what the stewards were doing in the remnant prairies, they had learned to say, "saving habitat for endangered species"—at which point folks would typically brighten and say, "Oh, cool." After the spotted owl controversy, however, if Packard said anything about endangered species, half the people would adopt a sour expression and say something like "Yeah? What about jobs?!"—even though Packard was working in a preserve along a suburban bicycle trail. "The question had no application in our case, but those folks didn't like us. A former general public environmental positivity was splitting into angry divisions."

At the congressional hearing in New Bern was a property owner named Robert B. Kidd. "I am a Hyde County, North Carolina landowner who has been mislead [*sic*], deceived and now damaged by the actions of the U.S. Fish and Wildlife Service." He was one of many Albemarle landowners who'd been transitioning their farm to a hunting preserve, and 1994 was to have been "the first year of trophy hunting where we would reap the benefits of our hard

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work and conservation efforts." (The deer that roamed onto Kidd's property were free roaming and the property of all North Carolinians.) According to Kidd, the wolves had decimated the local whitetails and wild turkeys. Soon he had learned of other local landowners who felt similarly aggrieved. "Because of this, I have joined the CROWN [Citizens Rights over Wolves Now] organization . . . in the hopes of getting the rights to my property I own and pay taxes on back from the Federal Government, who have seen fit to destroy what I have worked so hard to create."

Among CROWN's founders was a wealthy Virginian named James E. Johnson, Jr., who owned a swath of land adjacent to the Alligator River refuge; White Tail Farm, as the property was known, was another of the Albemarle Peninsula's large hunting reserves. In 1993, Johnson had shot an animal he said he had thought was a coyote but that had turned out to be a red wolf. Mike Phillips had reportedly told Johnson he'd done nothing wrong, but federal game wardens had wanted to have Johnson indicted. Although charges had never been brought, the incident had driven the wedge between the red wolf program and the peninsula's large landowners deeper, and Johnson's group sued the federal government to rid the state of wolves. "It wasn't long before many of the things that the Fish and Wildlife Service had been telling us proved to be false," one neighbor would testify before the House Subcommittee on Fisheries, Wildlife and Oceans. "In fact, many of the citizens of North Carolina consider the Service to have maliciously lied to us in order to get the wolves established in the state."

Critics maintained that the recovery program had promised that the wolves would stay on refuge property, that landowners would not be prosecuted for mistakenly shooting wolves, and that the wolves would not eat deer. During the first five-year experimental phase of the project, FWS in fact stated that it would "exert every effort to recapture any red wolves that leave the confines" of the refuge (and it had made doing so seem like a sure thing by promoting the use of its state-of-the-art 3M recapture collars). But FWS had also said that if after the five-year phase the reintroduction had been successful, the animals "will remain as a threatened species and will be considered to be an integral component of the refuge ecosystem"—and, indeed, belong like any other indigenous mammal. Over the years, as new information emerged (and yes, biologists soon learned that red wolves kill and eat a fair amount of deer), the recovery team tried to change these perceptions. But when the goal posts moved—and when local people found themselves under investigation for shooting a wolf—they reminded the service of their original promises. If the

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recovery team had changed its rules internally, if the experimental phase had ended, these landowners hadn't agreed to the terms.

In January 1995, a red wolf was shot dead while feeding on the carcass of a deer. As one reporter noted at the time, "No one could have expected the red wolf truce on the Albemarle-Pamlico peninsula to last, and it didn't."

Wolf resentment wasn't limited to the Albemarle Peninsula, and as recovery efforts gained momentum and supporters throughout North America, so too did the opposition. In December 1993, a plan to reintroduce gray wolves to Yellowstone National Park was gaining momentum, and after a series of public hearings, 80 percent of respondents came out in support for the project. The next year, after hundreds of public hearings and more than a decade of debate, the Department of the Interior finally gave Yellowstone wolves the green light. But a number of people who would be living near the animals were dead set against them and framed the controversy as a moral issue. Like the fervor around Frank and Deborah Popper's Buffalo Commons, they saw the return of wolves as a reversal of progress or, worse, a federal land-grab. One Wyoming man went so far as to say that people who supported these recovery efforts were "'vegetarians' who 'don't believe in God.'" The head of the American Sheep Industry Association questioned why the federal government wanted to reintroduce a predator "that our forefathers took extraordinary steps to remove." (Meanwhile, also in 1993, deer hunters around Canada's Algonquin Provincial Park staged an old-fashioned wolf drive and killed more than half of the park's radio-collared wolves; "one wolf's decapitated head was defiantly impaled on a post as a warning to wolf researchers.") In the Northeast, as the Adirondack Wolf Project gained traction for wolf recovery in upstate New York, some residents questioned the futility of turning back the clock: "If we're going to bring back the wolf, why don't we bring back smallpox, too?" The Adirondack Solidarity Alliance, a property rights group opposed to wolves, emphasized the increasing burden they felt in living among wild nature. "We come under regulations that no one else has to face, all in the name of environmentalism," one member said. "But it isn't environmentalism. It's socialism." In 1995, Senator Jesse Helms of North Carolina introduced legislation to eliminate federal funds for the red wolf program, a move that would have brought the recovery project to a halt. But the measure lost narrowly, with fifty votes opposing to forty-eight in support. There was neither overwhelming opposition nor unanimous support. On the issue of the wolf, Americans were deeply divided.

At the same time, red wolves were facing an even more grave threat to their

species. In 1991, a study published by the geneticists Robert K. Wayne and Susan M. Jenks argued that the red wolf was a hybrid of the gray wolf and the coyote; based on an analysis of mitochondrial DNA, they believed that ancestors of the captive population had bred with coyotes at some point before the animals were pulled from the wild, and were not a unique species. Ronald Nowak and a number of biologists and geneticists alike vociferously disagreed. The supposed red wolf specimens used in their study, Nowak pointed out, had already been known to be hybrids and not representative of true red wolves. In the early 1990s, Nowak and others had concluded that the red wolf was not a hybrid but rather "seems to represent an intermediate, surviving stage in the course of wolf evolution from a small coyote-like ancestor to the modern gray wolf." At that time, Nowak's morphological and fossil research indicated to him that the red wolf had inhabited the Southeast in a relatively unchanged form for the past 700,000 years.* The gray wolf had yet to emerge as a species 700,000 years ago, and as an emigrant from Eurasia constricted by glaciation, it couldn't have reached the Southeast. Coyotes, which were indigenous to the American West, had never entered the Southeast except for a brief period 10,000 years ago. "I see animals in the fossil record that have all the characteristics of the red wolf going back hundreds of thousands of years," Nowak said in 1991. Despite that evidence and despite Robert Wayne's admission that the pre-1930 sample had been limited—and that the work with mitochondrial DNA was inconclusive—he and his lab would continue to maintain his hybrid-origin theory in subsequent work.

For antiwolf activists, the fissure in the scientific community would be fuel for their cause. "These scientists are unwittingly playing into the hands of certain commercial interests, which will seize upon any suggestion that a species is no longer taxonomically valid, in order to argue that conservation efforts are not warranted and that the species and its habitat may be exploited," Nowak wrote in 1995. "None of these ideas has been accepted by the scientific community, but some are being related as fact in the media and are being turned against the wolf."

Among the tragedies inherent to killing every wolf that ever existed in the eastern United States, we also kept very few specimens. In the nation's records of historic eastern wolves, there were only eight complete skulls available to Ron Nowak's investigations—and not a single one of them belonged to the gray wolf or coyote. "Which has always been a problem, because Bob Wayne's

* Nowak did, however, revise this theory in his 2002 and 2003 publications.

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genetic people said the red wolf is a hybrid that formed in that area between the gray wolf and a coyote," Nowak says. "Well, I kept saying 'But there were no gray wolves and coyotes—the only thing we have at that time was this group of other kinds of animals, and those are the red wolf.'" To reach their conclusions, the geneticists seemed to be ignoring the physical evidence, the skins and bones, right in front of them.

Despite Nowak's protests and despite the work of geneticists who came to conclusions different from Wayne's hybrid-origin theory, the sensational headlines stuck around. The red wolves were of uncertain origin, and the taint of hybridization, of an impure lineage, would continue to plague recovery efforts for years to come.

Despite these divisions—and despite the state law liberalizing the take of red wolves—by the end of 1995 only three wolves were known to have been shot. One was shot on Pocosin Lakes National Wildlife Reserve, a brazenly illegal action, and another was shot while it attempted to dig into a dog pen, which was legal under the rules of the program. For all the heated rhetoric, there was a commendable amount of restraint. That same year, a North Carolina State University researcher published a public attitudes survey which showed that a majority of residents in the red wolf recovery area still supported the project (with the primary opposition clustered in Hyde County). There was one large, influential landowner with whom FWS would reach a compromise. Lux Farms bordered the Alligator River refuge to the south, and red wolves had settled on its property as early as 1990 (or as early as day one, depending on whom you ask). In 1993, Lux Farms entered into a partnership agreement with the FWS, which paid it a nominal fee in exchange for its formally acknowledging its acceptance of the wolves and the biologists who'd be tracking them. But recently, as wolves became increasingly controversial on the peninsula, Lux Farms had asked to have the wolves rounded up. After a meeting, cooler heads prevailed, and the two parties agreed to a plan wherein FWS would attempt to reduce the number of wolves on Lux Farms but not remove the animals altogether. They were neighbors, after all, and if wolves were to live on the refuge, they were going to live at Lux Farms, too.

The endangered red wolf now occurred on wildlife refuges totaling nearly 300,000 acres. The animals howled, mated, raised pups, and formed large packs. The wolves lived in pine woodlands and hardwood swamps. And yes, they hung around agricultural areas, because that blend of cropland and natural forest produced copious amounts of prey: Depending on the habitat, the

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wolves ate rabbits, rodents, raccoons, and nutria, but it also turned out that they did in fact eat a whole lot of whitetail deer (some studies indicated that they made up 60 percent of the red wolf's diet).

In hindsight, it probably should have been obvious that red wolves would be good deer hunters (and perhaps we should have taken the historical descriptions at face value, as when Mark Catesby described wolves in eastern North Carolina in 1733, traveling "in droves by night [hunting] deer like hounds with dismal, yelling cries"). Again, one of the obvious physical differences between red wolves and coyotes is the wolf's overall massiveness and proportionality—massive paws, massive skulls, and massive jaws. The wolves might have been quiet and elusive, they might have been smaller than gray wolves, but they were undoubtedly an apex predator.

Confronting that reality, the fact that wolves kill and consume other charismatic species—spotted fawns in grassy fields or even full-grown deer—was perhaps the most difficult thing to resolve in modern conservation. Ecologists extolled the role of predators in wild nature, and many believed that the animals possessed an intrinsic value and inherent right to exist. But putting that theory into practice, asking farmers and deer hunters to accept wolves for the good of the land and the sake of the species, was not just a difficult task, it could splinter communities.

But it was not impossible to do. For the first time in American history, we were in fact deliberately making space for predators, and that was no small feat. Reintroduction of small predators was now commonplace in the East, with fisher cats reestablished in West Virginia and Pennsylvania, bobcats from Georgia to New Jersey, and Canada lynx in upstate New York. In south Florida, recovery of the endemic Florida panther was among the Fish and Wildlife Service's most popular projects, and schoolchildren had voted to make the panther the official state mammal. (In 1992, the National Hockey League's newest franchise would be named the Florida Panthers, evidence of a culture not just embracing its wild carnivores but celebrating them in everyday life.) Fish and Wildlife was even discussing the reintroduction of eastern timber wolves to the Adirondacks and to the northern woods of Maine and New Hampshire. In northeast North Carolina, Mike Phillips was especially proud of the red wolf program's work with supportive landowners, deer hunters, and trappers. A number of deer hunters even supported the red wolf program directly by helping to build lodging for wolf caretakers at the Alligator River refuge; it wasn't a perfect relationship, but under his leadership, game hunters and endangered species biologists were able to find common ground.

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The Red Wolf Recovery Program was even looking to expand. According to the species recovery plan, at least three populations of red wolves needed to be established, with a total of at least 220 animals (with a captive population of 330), for the species to be considered officially recovered. (Although 550 animals was a far cry from the wolf population of 1492, it was a whole lot better than the forty mangy animals they'd found limping along in the Gulf Coastal marshes in the 1970s.) In 1991, red wolves were reintroduced to the Great Smoky Mountains National Park, which was the most visited, and one of the most beloved national parks in the nation. In addition to meeting species recovery goals, biologists hoped that red wolves would be partners in controlling the region's feral hog population. The Fish and Wildlife Service also had its eyes on three other potential sites, including the Okefenokee Swamp in south Georgia, the Big Cypress–Everglades parks in south Florida, and the Shenandoah National Park in Virginia.

Wolves were having a moment throughout the nation. Out west, the Fish and Wildlife Service would secure approval to release an experimental population of Mexican wolves in the southern mountains of Arizona. By 1999, not only had Minnesota's remnant population of timber wolves grown to an estimated 1,250 animals, there were at least a hundred wolves in both Wisconsin and Michigan's Upper Peninsula (where poachers had stopped the intentional reintroduction of wolves, natural colonization would succeed). The Endangered Species Act and the recovery of wolves were working.

But the flagship carnivore reintroduction project would occur in the Rocky Mountain West. Emboldened by the successful reintroduction of red wolves to North Carolina—and buoyed by an ascendent environmental movement, and a maturing ecological sensibility that embraced the recovery of all American wildlife, the Fish and Wildlife Service was ready to proceed with a gray wolf reintroduction program in Yellowstone National Park. Mike Phillips, the field coordinator of the Red Wolf Recovery Program—the man who had led the red wolf biologists on the Albemarle Peninsula—would be selected to lead the program in Yellowstone.

When the first twelve wolves were released into Yellowstone National Park, on January 12, 1995, the action was heralded as a pinnacle of ecological restoration—we'd saved natural land for various purposes, we'd restored and reintroduced game animals, we'd begun to embrace the full scope of ecological restoration, and finally, we'd restored the apex predators. The job was far from finished and the social acceptance of wolves was hardly a sure thing, but the reintroduction signaled a new era of ecosystem thinking. We'd moved

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beyond the profitable and the pretty, and begun to accept the complexity and totality of wild nature: the wolf program at Yellowstone National Park introduced many Americans to the concepts of trophic cascades and the role of natural predators in a healthy ecosystem.

We'd begun to think like a mountain.

The Red Wolf Recovery Program in Dare County, North Carolina, paved the way for the Yellowstone Wolf Project to recover gray wolves. "This was the first time a large carnivore had been declared extinct in the wild and then reintroduced in the United States," the Fish and Wildlife Service proudly noted. "It set the stage for several subsequent reintroduction efforts that were modeled after the Red Wolf Recovery Program, such as gray wolves in Yellowstone and central Idaho, Mexican wolves in the southwestern U.S., California condors, and black-footed ferrets." Among its accomplishments, the Red Wolf Recovery Program had pioneered the translocation technique of pup fostering—the placement of captive-born pups into wild litters—upending the conventional wisdom that mothers would reject those unfamiliar pups.

But the gray wolves of Yellowstone would soon overshadow anything happening in the Alligator River National Wildlife Refuge. The gray wolf was larger, it could be seen from the air as it hunted elk and moose, you could train your binoculars on packs of wolves and watch them loping in the valley from a distance, and the dramatic Yellowstone ecosystem was a backdrop to all of that. The day-to-day lives of red wolves were simply not as showy or picturesque. Even a red wolf biologist was unlikely to see one in the wild unless the wolves were painstakingly tracked with radio telemetry. The animals were reclusive and shy, they hunted in tangled swamps and forgotten woods, and they simply did not garner as much attention.

By 2002, all of the wolves on the Albemarle Peninsula were wild born. Although it would be difficult for casual wildlife enthusiasts to get their eyes on the animals, you could count on them to make their presence known in other spectacular ways. In the early 2000s, the Red Wolf Coalition, a nonprofit dedicated to the recovery of the species, conducted howling safaris at Alligator River, bringing a hundred people at a time into the refuge. Kim Wheeler, the coalition's executive director, walked into the dark woods, cupped her hands to her mouth, and howled. Moments later, the wolves responded. The chorus filled the night sky, haunting the pocosins and hardwood swamps, just as it had for millennia.

For more than two decades, the Red Wolf Recovery Program had been a

pioneer of wolf recovery. The program had survived dust-ups with local landowners, and had emerged the stronger for it. By 2011, the Albemarle Peninsula was home to 130 red wolves. The population was robust enough that biologists no longer treated wolves for parasites—and if a wolf died of natural causes, it was no longer a grave concern.

Perhaps red wolves did have a place in our modern world. Perhaps they could live among us, and we could coexist.

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CHAPTER 19

The Perfect Storm

For the better part of a decade, eastern North Carolina was bone dry. And so when a storm rolled through the Albemarle Peninsula on June 1, 2008, the place was a tinderbox. All it took was a single bolt of lightning to ignite a wildfire that quickly got out of hand; an abundance of dry fuels meant that the fire burned hot and fast and easily jumped containment. The fire soon spread to the Pocosin Lakes National Wildlife Refuge; it would rage for nearly three months and consume more than 40,000 acres of land. As the fires burned, the spongy peat soils and the dense vegetation that characterized the swamps hindered attempts to control the flames. Before long, the peat soil itself was burning. The fire and smoke produced fear and hardship. Black bears and whitetail deer dashed ahead of the flames, seeking refuge near human habitations; many animals perished. For three months, the people of the peninsula were on edge.

At the time, about a hundred red wolves roamed the peninsula. Refuge staff believed that the packs at Pocosin Lakes had likely survived. There hadn't been any evidence of denning activity in the area of the fire in the months leading up to the lightning strike. In the long run, the fire should even have benefited the wolves: The early-successional plant communities that emerge after a wildfire typically favor species such as rodents, rabbits, and whitetail deer, so it should have been a bonanza for both prey and predator.

But that wasn't the way it worked out. After the smoke cleared and the embers ceased to smolder, something else raged across the peninsula: a relentless campaign to rid the state of wolves.

In a sense, the problem began, as it had before, with coyotes. In March 1986, a year before red wolves were flown into Manteo, a state wildlife biologist shot and killed a coyote in a Hyde County cattle pasture. The following summer, more coyotes were spotted in Beaufort County, approximately a hundred miles from the Alligator River refuge. The North Carolina Wildlife Resources

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Commission believed they'd been trucked in from the West by sport hunters who had chased and shot the animals in fenced fox pens. A few more coyotes were found dead on the roads, and a female coyote and several pups were seen in a field near Terra Ceia: Coyotes were not just present, they were breeding. In response, the Red Wolf Recovery Program asked for more animals from the captive population to fend off coyote incursions on the peninsula. But they couldn't afford to saturate the landscape with red wolves; it was unclear how many animals the refuge would support, and the captive population wasn't so large that they could off-load a surplus of wolves. Instead, the reintroduction would proceed largely as planned, and thankfully without much trouble. In the early years, the number of coyotes on the peninsula remained negligible: Between 1987 and 1994, Mike Phillips and his team captured 106 wolves and just 4 coyotes.

But the animals were on their way. Coyotes had already been living and breeding in New York's Adirondack Mountains for more than half a century. They had settled as far north as Maine and the Gaspé Peninsula, and before long, they had hopscotched across sea ice to reach Newfoundland. After they'd settled the Northeast, they went south through the Appalachian Mountains and simultaneously proceeded east through the Gulf Coastal plain; eventually, they would reach the Florida Everglades and down into South America. In hindsight, the Albemarle Peninsula posed no insurmountable barriers to the coyotes. They soon filled it up.

The existential coyote problem had followed the wolves to North Carolina. After more than a decade of recovery, the Fish and Wildlife Service was once again face-to-face with the hybridization threat the wolves had been removed from twenty years earlier. The recovery team understood that if they aggressively trapped and killed coyotes, there would always be more to come; a century of wolf wars proved that they couldn't easily kill their way out of a coyote population. After much deliberation, they decided to take a different tack: Rather than attempt to kill all of the coyotes in the recovery zone, they would sterilize as many as possible and hope that they lived.

The sterilized coyotes were going to be placeholders, designed to buy the recovery team just a little more time; if the program could continue growing the wolf population, perhaps that core of animals could hold their own, without the need to mingle with coyotes. In the meantime, if a coyote paired with a red wolf, the recovery team would sterilize the smaller animal and allow it to hold the territory without the risk of producing a hybrid litter. The recovery team hoped that a male red wolf would then enter that territory and overcome the

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coyote (it was typically male coyotes pairing with female red wolves). Juvenile red wolves were sometimes turned loose near a coyote-wolf pair to do just that. "We basically just kind of gave a slight advantage to the red wolf," says David Rabon, the director of the Red Wolf Recovery Program in those years. "And then the red wolf did the rest"—which was to kill or chase off coyotes from a territory.

Two years into the sterilization program, the population of wild red wolves reached an estimated 130 animals, and biologists believed that number would continue to grow as the animals fanned out and occupied more land. It was intensive management, and it was unclear how long it would be necessary, but it worked.

For the effort to succeed, however, placeholder coyotes would have to remain alive long enough for red wolves to replace them. That would prove to be a very tall order.

To understand the killing frenzy that was about to ensue, it's important to acknowledge how little value Americans have historically placed on the lives, and the ecological function, of coyotes. Because we have failed to appreciate that coyotes have a reason to exist—much less a *right* to exist—we have allowed people to do gruesome things to those animals. We have trapped them and wired their muzzles shut; on occasion we have even sawed off their lower jaws—before letting our dogs rip them apart. We have skinned them alive and we have even burned them alive. We have poisoned tens if not hundreds of thousands of them—innocent bystanders and vicious predators alike—in the quest to kill every last coyote. To be sure, not all coyote hunters engaged in torture, and not all trapping was unjustified, but the commonness of that cruelty illustrates just how little we valued the existence of coyotes.

Although wolves and panthers had been absent from the East for over a century, we resumed the tradition of predator hunting as soon as the smaller coyote arrived on the scene; our cultural memory of wolf hunting had primed us for that. Eastern hunters organized killing contests in which hundreds of animals were killed over just a few days and their carcasses piled high for photographs and celebrations. Many eastern sportsmen came to believe that those crusades were necessary to preserve the populations of defenseless game, the wild turkey and whitetail deer they'd worked so hard to restore, and the killing of coyotes became a righteous duty.

At the same time, coyote hunting became not just a means of controlling vermin, but also a pleasurable sport—hunters throughout the East welcomed these wily new foes that were fun to call and exciting to trap. (In fact, North

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Carolinians had been illegally importing coyotes for decades because they enjoyed chasing and shooting them, and in 2013, the state Wildlife Resources Commission legalized the sale and transport of live coyotes to "fox" pen operators.) For game departments, coyotes created a new constituency, and a resource that no amount of hunting seemed to diminish.

Because of the hybridization threat, it might seem odd that the life and death of individual coyotes would matter so much to the Red Wolf Recovery Program. But it turns out that there's something worse than genetic swamping, and that is being shot into oblivion. When local hunters started shooting coyotes with such zeal, they started shooting the similar-looking red wolf, too.

In the program's first sixteen years, only twenty-eight wolves, or fewer than two a year, were confirmed to have been shot and killed. But soon gunshot mortality would skyrocket, and over the span of just two years, twenty-four would be shot and killed. It was a worrying trend, and if the Fish and Wildlife Service failed to get ahead of it, it spelled disaster for the red wolf.

After two decades of wolves living and dying on the Albemarle Peninsula, biologists were developing a firmer sense of the ecological impact of wolves in the East. David Rabon, the red wolf recovery coordinator, noted that the populations of both wild turkey and northern bobwhite quail had increased in the Alligator River National Wildlife Refuge, and he attributed that to the wolves' predation of mesopredators—the raccoons, opossums, and other small mammals that raided birds' nests for eggs. But if there was a major impact on the peninsula's whitetail deer, they'd yet to see any evidence; it was not Yellowstone National Park, where packs of gray wolves had so dramatically reduced the number of elk that aspen and willow groves were finally regenerating in the degraded riparian zones. Unlike the West, the Albemarle Peninsula was wet and green and lush, and the downstream ecological impact of red wolves was proving to be far more subtle. In fact, the most significant population control on whitetail deer was likely to have remained the same as it had been for thousands of years: human hunters. "All of [the land] is managed to some degree," Rabon said—the Albemarle Peninsula was ditched, drained, cropped, timbered, and hunted heavily by human hands.

But that's not the way everyone saw it. Others believed that wolves were devastating the local deer herds and that the newly arrived coyote was poised to do just as much damage. Those deer hunters wanted action. Before long, the Wildlife Resources Commission would try to solve the coyote "problem" and, in the process, would create a much bigger one for the red wolves.

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Throughout the state of North Carolina, the mere sighting of a coyote was now a cause for alarm—a proliferation of game cameras, along with the amplification of social media, turned what might otherwise have been an interesting observation into evidence of a severe problem—to see a coyote was to have an infestation of coyotes. Deer hunters began piling all of their frustrations and failures onto coyotes. If they could only hit the coyotes harder, some believed, they would live in a game hunters' paradise. In early 2012, North Carolina's game agency proposed a new rule which would allow night hunting of coyotes, and feral hogs, with the aid of artificial lights (it's easier to shoot coyotes at night, when they are active and when their eyes can be illuminated with a beam of light). State biologists knew that aggressively targeting coyotes wouldn't lead to a reduction in the overall population in the long run. "Historically, that has not worked," one of them said. The commission likewise knew that the action was likely to devastate the red wolf population, and briefly considered omitting the five counties of the red wolf recovery area from the night-hunting rule. Ultimately, however, it decided against making any concessions. North Carolina hunters wanted to shoot coyotes because they enjoyed the sport and believed that whitetail deer needed their protection—and so the commission considered it its job to fulfill those expectations.

David Rabon said it was the worst possible situation: Mistaken identity had already led to an increase in dead red wolves, and night hunting would exacerbate that. And so he was surprised by the commission's actions. The Wildlife Resources Commission had never been thrilled about recovering wolves in the state. It had never even bothered to place the animal on the state's list of endangered species. But neither had it ever been so openly hostile.

If you wanted to shoot a red wolf, you were likely to get away with it. Despite being a federally protected, endangered species—one of the most imperiled mammals in the world—you were unlikely to face charges if you claimed that you thought the animal was a coyote. The first reason for that was the Department of Justice's McKittrick Policy, which stated that if the federal government could not prove that someone had knowingly and intentionally targeted an endangered species, that person should not be prosecuted. Second, the Red Wolf Recovery Program itself had sold the public on that reintroduction, twenty-five years earlier, based on the 10(j) rule, which had designated the red wolves as an "experimental, nonessential" population (because of the captive population, actions in the wild wouldn't technically jeopardize the survival of the species). In 1991, the Fish and Wildlife Service doubled down on that policy, stating that "when a taking was unavoidable, unintentional, and did not result

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from negligent conduct, no prosecution would be undertaken, provided the incident was immediately reported to the refuge manager (or other authorized personnel)." So when an increasing number of dead wolves started turning up killed by gunshot, federal prosecutors looked at the situation, said it would be very hard to prosecute, and rarely did so.

But in the United States, there aren't supposed to be simple cases of mistaken identity. One of the hard-and-fast rules of hunting in North America is never to pull the trigger unless you're absolutely certain of your target; that is one of the tenets of the North American Model of Wildlife Conservation and modern sporting ethics. Mike Phillips, who led the red wolf program through its earliest years, says he bought into the idea of mistaken identity until a conversation with a game officer changed his perspective. "We expect people to make very fine distinctions when hunting waterfowl, because not all ducks are created equal. And if you shoot a highly valued duck, thinking it's the less valued duck, well, friend, that's not an excuse—your ass is grass." "You are expected to know exactly what you're shooting before you pull the trigger," he adds. "And if you pull the trigger and you kill something that you had misidentified, that's not an excuse." (Furthermore, the red wolves of the Albemarle Peninsula were outfitted with reflective orange radio collars.) But for predators, we often play by different rules. These rules are found in the cultural norms of individual communities, and for the Red Wolf Recovery Program on the Albemarle Peninsula, that exemption was written explicitly into the program's rules. The "experimental, nonessential" designation had been deemed essential to get the program off the ground, but in the coming years, that legal mechanism would hamstring the recovery effort.

As if getting shot and killed weren't bad enough for the wolves, there was a secondary effect to all of that gunfire; the time of year when most red wolves were shot and killed—which happens to be deer and bear seasons on the Albemarle Peninsula—is also their mating season. If a wolf's mate is killed in the middle of this season, the survivor will quickly look for a new one, and once again, there were coyotes lurking around to fill the void. Biologists warned that increased killing and pack disruption would also lead to an increase in inbreeding because the few wolves remaining would be increasingly likely to be related, but the warning fell on deaf ears. For the surviving wolves, the effects were dramatic: Packs were broken up, cubs didn't have parents, the animals' life expectancy was significantly lowered, and the highly social animals weren't living long enough to behave fully like wolves.

In addition to mistaken identity, the red wolf team began to suspect that the

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animals were also being deliberately targeted. Between 2004 and 2012, gunshot mortality increased by 275 percent, and by the end of 2013, at least nine wolves were known to have been shot and killed. Few people stepped forward with information, and fewer still made claims of mistaken identity. The Department of Justice had its McKittrick Policy, but local people had adopted another: Shoot, shovel, and shut up.

In just three years, the wolf population on the Albemarle Peninsula had been reduced by a third.

Perhaps the Fish and Wildlife Service could have solved the issue of gunshot mortality. Perhaps they could have nipped it in the bud. But to do so, it would have required a fight—and at that point in time, the Fish and Wildlife Service's leadership was loath to battle with private landowners and their partners in the state. In the long run, they thought, aggressive enforcement would do more harm than good. Perhaps they were right about the value of avoiding conflict; endangered wildlife needs supporters, not enemies. But if the measure of success was a thriving population of red wolves, the program would soon be judged an abject failure. Instead of fighting for the recovery of the species, the underlying issues nagging the program began to fester, and the recovery effort rotted from within.

The folks who were going to dig in were the NGOs, and they had determined that the only course of action was to bring a lawsuit. In October 2013, the Southern Environmental Law Center filed motions on behalf of the Red Wolf Coalition, Defenders of Wildlife, and the Animal Welfare Institute contending that the new coyote-hunting rule not only threatened an endangered species but violated state law. A Wake County judge put a halt to nighttime hunting of coyotes in the five-county recovery area. Although the injunction was only temporary, it marked a turning point for the Red Wolf Recovery Program; the struggle for red wolves' existence would now be fought in a court of law.

The wolf advocates, however, weren't the only faction willing to roll up their sleeves and fight. Jett Ferebee, a real estate developer from Greenville, North Carolina, soon emerged as the de facto leader of the antiwolf landowners. A well-dressed, affable man, Ferebee was highly influential in the region; he was board chair for one of the largest banks in the state; he served on the board of the Coastal Resources Advisory Council; and he was heavily involved with the Republican Party in North Carolina. His landholdings in eastern North Carolina spanned from the Albemarle Peninsula down to Wilmington. But the property that mattered at the present time was the one he had bought in

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1997 in Washington County, adjacent to the Pocosin Lakes Wildlife Refuge—a couple thousand acres of croplands and wildlife habitat, used primarily for deer hunting and bird dog training. The land was squarely within the Red Wolf Recovery Area, and at the time, the Red Wolf Recovery Program was already ten years old and supporting an estimated population of forty-four wolves.

At first Ferebee enjoyed hearing the howl of wolves. But by 2013, he would change his tune. He claimed that the red wolves were causing a wildlife catastrophe and believed that the wolves and the emergent coyotes were decimating the peninsula's population of whitetail deer. "I am living a nightmare with the U.S. Fish and Wildlife Service," he said, "because this farm has been taken over by red wolves."

It was a wildlife catastrophe, a decimation of game. The Red Wolf Recovery Program had been down that road before. In 1995, at the height of that decade's antiwolf resistance, the North Carolina Wildlife Resources Commission conducted a spotlight survey of whitetail deer on the Lux Farms hunting preserve, which was adjacent to the Alligator River refuge, and had been occupied by wolves for several years. The investigation revealed that there was an adequate deer herd for the quality of habitat on the farm. Wolves were undoubtedly present and undoubtedly taking deer—as they had for millennia—but the whitetails had not vanished; predator and prey had coexisted there before, and they were coexisting once again.

Wilson Daugherty, who managed Lux Farms, had a front-row seat at the conflict; just as soon as the animals were turned loose at Alligator River, they found their way to Daugherty's property. He was alarmed at first and flustered with the Fish and Wildlife Service for bringing the animals there, but after the initial shock, he came to realize that it wasn't all bad, it was just different. "I don't think numbers dramatically decreased because of the wolves eating the deer," he says. "But what I do know is that the wolves changed the patterns of the deer." In their heyday, the deer congregated in large herds on Lux Farms. They were hunted with rifles only a few weeks each year, so they had no reason to be constantly on guard. But after the wolves showed up, the deer were on alert every day of the year. The deer had not vanished; they had simply adjusted to the return of their ancient foe. "It made it more difficult to hunt, unless you were doing it with dogs," he adds. "And I think that was a straight linear progression for these people that were saying the deer are gone. They couldn't see them, so therefore they're gone." Like the elk of east Kentucky, the whitetail deer of the Albemarle Peninsula were simply behaving like prey; they knew they were being hunted, and they acted like it. Although Daugherty

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was no fan of the red wolf program, he did not subscribe to the theory that the wolves had eaten all of the deer. "I can tell you from a farming standpoint, our crops were being damaged by the deer just as much after the wolves got here as they were before."

Nearly twenty years later, deer hunter harvests continued to be incredibly high, and they had only risen with the reintroduction of wolves. In fact, the deer harvest on the Albemarle Peninsula peaked with the rise in the red wolf population; the greatest number of deer harvested on the Albemarle Peninsula occurred at the point when the red wolf population was at its highest, and 2013 marked the record for whitetails in North Carolina. Two other indicators of herd size—deer/vehicle collisions and requests for crop depredation—were likewise as high as ever. Despite a modest dip in hunters' harvests, there were still plenty of whitetails to go around, and the highways and the cornfields had all the deer they could handle. The data compiled by the Wildlife Resources Commission, the same organization that was pushing for night hunting of coyotes, consistently told a story that differed from that of wolf-weary landowners: Deer hunting had never been so good.

Ultimately, it ceased to matter if deer were abundant; to so many on the North Carolina coast, it was an affront that the wolves were taking any deer at all. Nor did it matter to point out that there were other predators on the landscape. (The peninsula's black bears were just as proficient at finding fawns, after all, but they happened to be an abundant, and lucrative, game species.) It didn't matter that wolves and whitetail deer had coevolved and persisted for many thousands of years in the East. For the adamantly antiwolf locals, what mattered most was that the red wolf was being reintroduced by the federal government and that their presence was preventing local people from shooting coyotes day and night. The wolves were taking *their* deer—and the federal government was taking their rights.

Over the years, as more red wolves had made their way onto private property, field biologists and program administrators had asked their supervisors to update the rules to reflect the changing conditions—both that the red wolves were not confined to the Alligator River National Wildlife Refuge and that they had come to be tolerated on private property—but the updates never came or else fell short of explicitly stating that the animals *belonged* on private property (in fact, the experiment to establish red wolves in Great Smoky Mountains National Park was abandoned in 1998, in part because the wolves would not stay within park boundaries). Biologists had been given latitude to

do what it took to recover a sustainable population of red wolves, but the administration had never updated the program's governing rules. That omission would soon break the program.

Jett Ferebee was neither the first North Carolinian nor is he likely to be the last to seek an end to the Red Wolf Recovery Program, but he was the most committed and the most thorough, and he was motivated by a laundry list of grievances with the Fish and Wildlife Service. In addition to wolves, he believed that the restoration of wetlands at Pocosin Lakes National Wildlife Refuge was responsible for the flooding he experienced on his property. But the idea that he might not be allowed to shoot coyotes on his property day and night was the final straw. Ferebee told the service repeatedly and forcefully that they had better come and get the wolves. He met with David Rabon, the local red wolf recovery coordinator; numerous field biologists; the director of NCWRC, Gordon Myers; and eventually, the assistant regional director of the FWS's Southeast Region's Ecological Services Program, Leopold Miranda-Castro. He sent everyone involved in the program a list of grievances and resentments and posted all of it to the North Carolina Hunting and Fishing Forums website. (Around that time, a billboard went up on the peninsula's main highway: "USFWS . . . the lying neighbor nobody should trust." A cartoon image of a uniformed FWS employee bore a striking resemblance to Howard Phillips, the manager at Pocosin Lakes National Wildlife Refuge, who was overseeing the restoration of the pocosin wetlands. Fish and Wildlife Service employees told me they believed it was Ferebee's billboard; a second message directed viewers to an internet forum where Ferebee outlined his grievances with the Fish and Wildlife Service.)

In February 2014, Ferebee got a major win: Leo Miranda-Castro would grant him the first-ever permit to take an endangered red wolf. Ferebee had been after the permit for months, and his argument went like this: Because Fish and Wildlife would not remove wolves from his property, he was technically permitted, according to the legal rules established to govern the program, to "take" the animals himself. (Field biologists would counter that although FWS had removed animals for Ferebee on several occasions in the past, he would no longer allow them to access his property, thereby making recapture impossible.) Miranda-Castro reviewed Ferebee's case with FWS attorneys and concluded that he was right. He conceded the point, and the wolves, to Ferebee.

With the permit, Ferebee could now legally haze, harass, injure, trap, and even kill a red wolf, not because the animal was causing harm to his person or property but simply because he didn't want wolves doing anything at all on

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his property. According to Miranda-Castro, Ferebee never killed a wolf, and he never wanted to, but he was proud to have won the right. Ferebee had said that neighbors encouraged him to shoot the animals in the gut and let them wander off to die: "To be honest," he said, "it would make me sick. But the U.S. Fish and Wildlife Service should not be making us criminals." Instead, he hired a trapper. In less than twenty-four hours, three collared wolves along with two other unidentified canids were caught. (Ferebee would come to refer to red wolves as "supercoyotes" and believed that the additional animals were hybrids.) The wolves were eventually handed over to the Fish and Wildlife Service, and David Rabon said that Ferebee's relief would only be temporary: "They're going to come back. Something is going to come back." Indeed, the very next day, Ferebee photographed three more collared wolves on his property.

Ferebee had become a thorn in the side of recovery, but he was within his rights. The Fish and Wildlife Service had made that outcome possible at the very beginning. Looking back, Mike Phillips believes that the promise to remove unwanted animals from private property—even though it may have gotten the service's foot in the door—had been a misstep: "I think we made a mistake by going overboard and saying 'We will make doggone sure the red wolf program is so accommodating, if you don't want them, we'll come get them.'" Furthermore, neither red wolves nor coyotes were interfering with the livelihoods of North Carolinians; nor were they harming human life in any way. Shooting and trapping coyotes was a recreational pursuit. "There are no data to support that coyote numbers in northeastern North Carolina, for example, need to be significantly reduced," Phillips continues. "This issue has nothing to do with scholarship, and intellectualism, and your head. It has everything to do with your heart. And I have concluded people simply don't value predation. They're ecologically illiterate to the point where they don't see any value in the ecological process of predation. And consequently, it's very easy to place no value on the life of a predator."

A few months later, in May, the injunction against night-hunting coyotes was upheld. "By designating the red wolf as protected and dedicating funding and efforts for more than twenty-five years in a program to rehabilitate the once-nearly extinct species, Congress has repeatedly demonstrated that it has chosen to preserve the red wolf—not simply to let inaction determine its fate—and it is not for this Court to permit activities that would have an effect counter to this goal," Judge Terrence W. Boyle noted. Yet it was no immediate victory for the wolves, nor for the field biologist attempting recovery

in the wild; instead, the fight intensified. The ruling incensed the property-rights crowd and the coyote hunters in the Albemarle Peninsula—they believed that their rights and privileges were being taken away, and they were soon out for blood. Landowners who had previously cooperated with recovery efforts were now refusing to give biologists access to their property, and the North Carolina Wildlife Resources Commission—whose vocal constituents had been aggrieved—asked FWS to launch an "immediate" review of the recovery program. The commission soon barred FWS from sterilizing coyotes, claiming they didn't have jurisdiction over state wildlife; in addition to hampering the work of red wolf field biologists, the move had the potential to be as catastrophic to wild populations as the nighttime hunting of coyotes. Gordon Myers, the executive director of the Wildlife Resources Commission, argued that because the wolves could not be contained on federal lands and because of the continued threat of hybridization, the program should be abandoned and the wolves removed at once. The opposition was relentless and gaining momentum.

In the fall of 2014, as the swamp maples and sweetgums reddened across the peninsula, around a hundred red wolves persisted in the wild. But as the autumn deer and bear seasons opened, the woods and the cornfields swelled with hunters, many of whom were none too happy about sharing the land, and the deer, with wolves. By the end of October, more than four hundred lethal take permits had been requested; many wolves were shot without a paper trail.

The wolves had all the prey they needed, they had space to den and hunt and mate, but they were losing the hearts and minds of the people.

The Fish and Wildlife Service had to do *something*. To stop illegal poaching, it could beef up law enforcement and protection. It could increase public outreach and education. Or it could do something drastic, such as the listing of coyotes in northeastern North Carolina under the similarity of appearance clause of the Endangered Species Act. Or it could put away the sticks and try carrots instead; some conservationists considered providing direct payments to landowners for harboring red wolves (something it had done to a limited extent in earlier years). Instead, what the FWS did was take a step back and reconsider: Was the effort worth salvaging? Or was it time to retreat?

In the fall of 2014, Leo Miranda-Castro hired the Wildlife Management Institute (WMI), the venerable independent research group founded in 1911, to assess the program. They would interview program staff, private landowners, partner organizations, and wolf biologists; and they would review the

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scientific literature regarding the species' history and ecology. If WMI found a defensible program, the service might double down on recovery. But if they found a failing program, FWS leadership was likely to walk away. After several months of inquiry, WMI concluded that there were in fact problems with the program—primarily how it handled relationships with the public and how it had failed to adhere to its own rules. (For example, red wolves had been released on private property, which the FWS was technically not authorized to do, but the biologists had always done so with the consent and approval of the landowner, and they had done so to achieve a viable population of wolves, which was, of course, the purpose of the experiment and reintroduction.) According to the 10(j) rule, the service had agreed to remove unwanted wolves from private property, and unless they changed the rules, they were going to have to continue doing so, despite its futility and despite the associated risks. Meanwhile, the sterilization and placeholder strategy had been determined to be adequate to protect the red wolf genome so long as the placeholders lived long enough for the strategy to be effective. Furthermore, the program had pioneered predator reintroductions in the United States, and, at its peak, it had a sizable population of wild wolves to show for it. The recovery program had its share of warts, but it had been successful.

But the report was not a galvanizing moment for the Fish and Wildlife Service and its partners. Rather, despite the findings of WMI, regional leadership in Atlanta believed the program had been operating with too much autonomy and not enough oversight—and they began to clean house. The Red Wolf Recovery Program was moved out of the administrative purview of the Refuges division and into Ecological Services; and at the end of 2014, red wolf recovery coordinator David Rabon was reassigned away from the program, and the position of full-time recovery coordinator would remain unfilled for years to come. Soon the FWS would end its partnership with the Red Wolf Coalition, which was running the Red Wolf Center on refuge land, and close the facility. Relationships with advocacy organizations had frayed, and communication was either severed or impaired. In January, the state Wildlife Resources Commission doubled down on its opposition, and formally requested an end to the Red Wolf Recovery Program in northeast North Carolina. For some in the community, the conflict was one of local interests pitted against outsiders. As one local columnist put it, the "international animal rights advocates" were attempting to "bully North Carolina's hunters and fishermen [and] continue to shove the red wolves down the throats of the North Carolina Wildlife Resources Commission and the outdoor sportsmen of our state. . . . These groups

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find it difficult to accept the fact that their organizations have been backing the establishment of a known hybrid animal that has no business even being placed on the endangered species list in the first place." On June 17, Senator Thom Tillis called for an end to the program. Two weeks later, the Fish and Wildlife Service announced an immediate halt to red wolf reintroduction, further stripping field biologists of the tools necessary to support wild wolves.

"We recognize that there were misunderstandings, particularly about the non-essential, experimental population, and we did not always meet the expectations we set. Now, we need to do a thorough and deliberate evaluation of the red wolf recovery program," the FWS southeast regional director, Cindy Dohner, said in a statement. ". . . There will likely be some who will suggest we are walking away from recovery efforts for the red wolf and simultaneously there will be others who might say we're holding on too tight."

That same month, a "nonproblem" red wolf was shot by a landowner—a killing that was fully permitted by the Fish and Wildlife Service. The wolf wasn't attacking pigs or chickens, and it wasn't threatening the life or property of a private landowner; its mere presence was the objection. The wolf had mothered a known total of sixteen pups in four litters, and this wolf, which had found so much success in North Carolina, was now gone from the wild population. Once again, the Southern Environmental Law Center filed suit, but this time against the federal government, alleging that by issuing a take permit, the Fish and Wildlife Service had not just been negligent, it had broken the law.

In the recovery of the red wolf, such legal battles may have been necessary. But the immediate effect was to bring the recovery program to a screeching halt—and the last thing the wolf population needed was inaction.

As if things weren't bad enough for the wild red wolves, another genetic study published in 2016 by Robert Wayne and Bridgett vonHoldt argued yet again that the modern red wolf was not a true species. "The first large study of North American wolf genomes has found that there is only one species on the continent: the gray wolf," *The New York Times* reported. "Two other purported species, the eastern wolf [a Canadian species centered around Ontario's Algonquin Park] and the red wolf, are mixes of gray wolf and coyote DNA, the scientists behind the study concluded." For wolf advocates, that was a gut punch.

But as numerous scientists would soon point out, there were problems with the study. The samples it had used were sourced from posthybridization-event

populations: The eastern wolves (also known as Algonquin wolves, *Canis lycaon*) had gone through a well-documented hybridization event in the 1960s; and the two wolves from the captive red wolf program were from a population that had, of course, been removed from the wild because of the hybrid swarm arising on the Gulf Coast. In a sense, it was no surprise that they would find a hybrid origin for *those* animals. The original wolves of the East and South—prior to predator control programs and subsequent hybridization—were long gone. The animals included in the study were not representative of the past.

Theirs was not the final word, however. An assortment of scientists—a group of geneticists, biologists, and taxonomic specialists—soon argued in defense of the red wolf species. Published in *Science Advances*, their response began by acknowledging that hybridization was widespread in wild nature—perhaps far more common than biologists had previously understood—and that conservation policies such as the Endangered Species Act needed to include that "biological reality." Yet they strongly disagreed with the idea that red and eastern wolves were of a recent hybrid origin and even suggested that Wayne and vonHoldt's analysis had failed to test that hypothesis. "Furthermore, we argue that their data do not support 'a lack of unique ancestry in red and eastern wolves'; rather, substantial evidence still supports the conclusion that red and eastern wolves represent genetically distinct taxa among North American canids."

Meanwhile, Ron Nowak made another, far simpler argument. Every single historic specimen from Maine to Florida belongs to a group of animals intermediate between the gray wolf and the coyote, and that is the species we've come to call *Canis rufus*—the American red wolf. It was the same point he'd made a decade earlier, and it was a critical piece of evidence Robert Wayne's group of geneticists continued to brush aside. Without a doubt, those animals had begun to interbreed with coyotes, but the original—a species with an ancient history to which those Gulf Coast stragglers had belonged—had been the wolf of the East for a very long time.

But critiques of the study did not make big splashes. What persisted were the headlines from publications such as *The New York Times* ("DNA Study Reveals the One and Only Wolf Species in North America") and *Science* ("How Do You Save a Wolf That's Not Really a Wolf?"). Those perceptions cast a pall over the red wolf story, and Regina Mossotti of the Endangered Wolf Center says that misunderstandings permeated the scientific community, too. "Do you know how many scientists I've talked to, who haven't actually read the papers, who just read *The New York Times* article, said, 'Why are you guys

working on red wolf conservation? They're just hybrids.' . . . It's amazing how much damage misrepresentation of science can be."

Long before Wayne and vonHoldt's most recent study, folks in the antiwolf crowd had been pointing to the uncertain status of the wolf as they called for the plug to be pulled. "These animals most certainly should not be granted threatened species protection in NC because they are a human engineered wannabe red wolf hybrid," as one local writer put it. Those folks weren't waiting around for the Fish and Wildlife Service to come and get the animals. In December 2016, a red wolf was shot and killed on the Pocosin Lakes National Wildlife Refuge. There are no permissible reasons to kill a wolf there—no livestock to protect, no private property rights to exert, and no coyote hunting is allowed on the refuge. A reward for information grew to $16,500, but the phones never rang.

Every time a wolf was killed, a coyote was waiting in the wings to take its place. Whatever the wolf had been in the past, there was no doubt that the last wolves hanging on in the Gulf Coast area had begun to breed with coyotes; that was how they had adapted to the world we'd made for them. With every wolf shot dead on the Albemarle Peninsula, decades of progress were slipping away. The stain of hybridization, the fear that we might be conserving something whose lineage was not quite pure—the horrifying uncertainty—may have prevented a more robust and righteous conservation movement from picking up the cause of the red wolf. Instead, because we didn't quite understand their genome, they were allowed to be killed.

For the better part of a decade, the red wolf program would be tied up in litigation. The wild wolves continued to be shot and to be hit by cars, but there would be no supplemental releases from the captive population to offset the losses; by 2018, there would be just forty wolves living in the wild. Because the North Carolina Wildlife Resources Commission wouldn't allow the Fish and Wildlife Service to sterilize coyotes, hybridization was a constant, looming threat. (Field biologists, who had dedicated their lives to the recovery of these wolves, had their hands tied.) In the meantime, FWS biologists and administrators were not speaking freely to the press—which allowed all manner of theories and questions to arise: Was the Red Wolf Recovery Program being sabotaged by an antiwolf cabal, a coalition of private landowners and sympathizers within the service? Did the Fish and Wildlife Service actually want to work to recover the species, or were the upper-level administrators happy to acquiesce to private interests because they didn't believe that saving the wolf

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was worth the effort? The Fish and Wildlife Service even commissioned the National Academy of Sciences to conduct a taxonomic review of *Canis rufus*—proving that everything was up for debate, even the status of the species.

In the absence of strong language to the contrary, the Fish and Wildlife Service would be judged by its actions. In 2018, it proposed a new rule package for the Red Wolf Recovery Program. The plan was to remove the twenty or so remaining wolves from private property and place them into captivity, or to allow them to be killed. The Alligator River National Wildlife Refuge and the US Air Force's Dare County Bombing Range would be the exclusive recovery area and the only lands where wolves would be tolerated. Resources would be redirected to the captive breeding program. "Success is to keep this smaller population, as much as possible, on federal land," Leo Miranda-Castro said.

An attorney for the Center for Biological Diversity in DC called the plan "reckless and poorly conceived." Ron Sutherland, the chief scientist of the Wildlands Network, said it was cowardly. Mike Bryant, who had recently retired from his job as the manager of the Alligator River National Wildlife Refuge, spoke at a public hearing on behalf of the National Wildlife Refuge Association and explained how detrimental the plan would be for the red wolves. There was even a concern that the FWS might once again pull every animal out of the wild, as they had done nearly thirty years ago. As a Fish and Wildlife Service spokesperson said, "all options are on the table."

When something goes wrong—and red wolf recovery had taken a significant turn for the worse—it is appropriate to look for answers; in the case of programmatic collapse, someone to blame. Many wolf advocates I spoke with, including former field biologists with the Fish and Wildlife Service, do not believe that a few vocal landowners could have brought the program down without the cooperation of the Fish and Wildlife Service. In that regard Leo Miranda-Castro, who would serve as assistant regional director and then director of the Southeast from 2011 to 2022, is often named specifically. When I spoke with him in 2024, a year after his retirement from the FWS, he said that there had been no conspiracy to destroy the program and that he had no personal vendetta against red wolves. He also said that he had initially wanted to find solutions to the red wolves' problems—he had even worked to find the wolves a second release site outside of North Carolina—but the more he had looked into the situation, the more his feeling that the recovery program was running afoul of the law had been confirmed. But his approach to endangered species conservation more generally, regardless of the mess that red wolf recovery had

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become, was a significant departure from what most advocates believed was appropriate. In 2017, he circulated a memo titled "Wildly Important Goals" (WIG), which sought to conserve thirty species by "delisting, downlisting, or precluding the need to list them," which would effectively claim recovery and success by refusing to acknowledge a species' perilous status. WIG also called for allowing economic considerations—"for instance, estimating lost revenue from a prohibition on logging in a critical habitat—when deciding whether a species warrants protection"—not whether the species was in fact biologically endangered. If Miranda-Castro was not orchestrating the collapse of the red wolf program intentionally, his actions on endangered species more broadly allowed him to become a lightning rod for the frustrations of advocates.

Many of those problems were not unique to the red wolf nor to Miranda-Castro's philosophy. In 2020, the environmental journalist Stephen Nash noted that the red wolf program's collapse was "emblematic of a hunkered-down Fish and Wildlife Service, its upper-level administrative culture long broken. Through several national administrations, the agency has been chronically allergic to controversy about endangered species, often ready to kneecap its own mission with delays, evasions, and capitulations." Kierán Suckling, the executive director of the Center for Biological Diversity, believed that the DC office had purged everyone with an interest in endangered species: "The ones who are left look at endangered species as just a headache." To be sure, the red wolf *was* a major administrative headache. The plan to remove the animals from all private lands and any public lands that were not on the Alligator River was a major capitulation to landowners like Jett Ferebee. There was trouble on the peninsula, and the service wanted out.

Leo Miranda-Castro had come to be viewed as a coconspirator in the red wolf's demise. But if landowners wanted to kill the wolves, and if the federal government didn't want to prosecute those landowners in cases of wrongdoing, perhaps Miranda-Castro's plan to try to confine the wolves to the Alligator River National Wildlife Refuge was the most humane course of action for the individual animals. Otherwise, without robust protections, the biologists would be stocking wolves just to watch them die. The shortcoming of that plan, of course, was that it failed to meet the needs of the species as a whole. The Alligator River refuge is simply too small to be the exclusive home of a species that once ranged from the Atlantic Ocean to the Mississippi River and beyond; a single wildlife refuge, in a sea of hostile modernity, cannot conserve the full ecological potential of that wild, wide-ranging wolf. The red wolf, like

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all wild things in the East, was being forced into a box both genetically and physically, and the animal itself defied the boundaries we placed upon it.

In 2023, I spoke with Mike Bryant, the former manager of the Alligator River National Wildlife Refuge. I described for him the way I'd come to think of the problems facing the wolf: it was a perfect storm of coyote hysteria, of hybridization threats and genetic swamping, and of local landowners who were loath to cooperate with a federal government that they felt infringed on their private property rights. But Bryant thought the assessment was only partially correct, and he reaffirmed the critique of administrators at the Fish and Wildlife Service. "There was a storm brewing," he allowed. "But if the agency leadership is helping to brew the storm, and refuses to recognize that they were, red wolf recovery is lost."

The only thing that kept FWS from following through on the formal retreat to the Alligator River refuge was more lawsuits. But as the program navigated the legal morass, a number of public attitudes surveys would consistently show that a majority of Americans—and a majority of North Carolinians—supported the recovery of red wolves. North Carolina's newly elected governor even appealed to the FWS to keep the wolves in North Carolina. The courts would continue on the side of the Endangered Species Act and red wolf recovery. ("Wildlife are not the property of landowners but belong to the public and are managed by federal and state governments for the public good," Judge Boyle had reminded the Fish and Wildlife Service.) For red wolf advocates, those were glimmers of hope. But the reality on the ground was bleak: There would soon be fewer than twenty red wolves in the wild, and although they hadn't been formally relegated to Alligator River refuge, that would be their only haven.

In March 2018, the National Academy of Sciences published its findings on the taxonomic status of the red wolf; of all the reports and proclamations to come from an academy, that one had the potential to alter the course of the project indefinitely. If the academy had found that the red wolf was not a valid taxonomic entity, the FWS was likely to walk away from recovery.

The committee was made up of evolutionary geneticists and wildlife biologists and chaired by the ecologist and evolutionary biologist Joseph Travis. Its main job, above all else, was to answer the big question once and for all: Is the red wolf a taxonomically valid species, or is it not? Over the course of several months, the committee heard testimony from dozens of experts, reviewed the

scientific literature, and after much debate and considering the body of evidence, they concluded that yes, the red wolf was, in fact, a valid taxonomic entity. "The bulk of the evidence lay on the side of the red wolf being a separate species," Travis says. "It's the weight of all the evidence." Travis, whose work has straddled the disciplines of both ecology, and population genetics and evolutionary biology, says the integration of these disciplines is where you find the answer to such complicated questions. "Because the wolves are not geneticists, and the wolves are not ecologists," he says. "The wolves are wolves."

In 2020, following yet another lawsuit, the Fish and Wildlife Service was forced to resume releases of captive-born wolves back into the wild. The following year, two additional pairs of captive-born wolves were released, and four captive-born pups were cross-fostered into a wild wolf's den. By the end of the year, the FWS had dropped its plan to restrict the wolves to the Alligator River refuge, and a new Recovery Team had been assembled to update the recovery plan. In the spring of 2022, ten captive-born wolves were released in northeast North Carolina. After ten years of setbacks, after more than a decade of erosion, the red wolf program was getting back to the business of recovering an endangered species.

To gain perspective on the long arc of endangered wolf recovery, I spoke with Mike Phillips, who has been on the front lines of wolf conservation since the 1980s. As a student, he had worked firsthand with the remnant wolf populations in Minnesota's Superior National Forest and he had studied under L. David Mech at Isle Royale National Park. He had been there with Warren Parker on the day the first red wolves had been released into the swamps of Alligator River, and he had monitored the animals and overseen releases and recaptures for the next eight years. In 1995, he had led the reintroduction of gray wolves to Yellowstone National Park. In recent years, he had watched from a distance as the Red Wolf Recovery Program in North Carolina collapsed. "I was saddened, and I was maddened," he says. "It's absolutely beyond the pale that the program has largely blown up for one reason that I think is completely manageable, and that's this notion that you have to shoot the shit out of coyotes, so much so that you're shooting a bunch of red wolves. . . . And the Fish and Wildlife Service just stood there and watched it all happen. Beyond the pale. And it is fucking crazy that these guys believe they got to shoot the shit out of coyotes, including shooting at *night*, in order to exercise their rights as North Carolinians, and exercise their rights as landowners. It is crazy that the North Carolina Wildlife Resources Conservation Commission bought into that. . . . I mean, do we value life so little?"

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The question of value is where all of this rests. At the end of the day, Americans will only save the things they care about. The passage of the Endangered Species Act in 1973 was a watershed moment, but it never meant that conservation was a sure thing or that it might occur without sacrifice; so long as our economy, our very existence on this land, comes at the expense of other living creatures, we will need to continue debating which populations, which landscapes, and which species we're willing to sacrifice and which species we'll defend to the end. In a world of infinite distractions, in a landscape rich in diversity where there are no shortage of crises and species in peril, the hard work of endangered species conservation matters only if the American public demands it. If the red wolf is going to exist in this world, it needs a constituency that is as strong as those who are devoted to whitetail deer and elk, to waterfowl and grouse—a sustained and invested culture of admiration and desire—or else it doesn't stand a chance.

Conservation is work that never ends. Sportsmen who maintain the habitat of deer and elk understand this, as do the prairie stewards who scour the landscape for weeds and go to great lengths to conduct prescribed burns each spring and fall—and wolves in the East need this management, a kind of stewardship and caretaking, if they are going to remain on the land. What caring for an apex carnivore in the densely settled East looks like—an animal that doesn't need you to plant food for it, that doesn't need you to gather its seed or set it aflame like a wildflower—is yet unclear. But it's obvious that people must care for and care about these animals if they're going to have a future.

In the 1930s, conservationists failed to save the ivory-billed woodpecker from extinction because they could not convince the Chicago Mill and Lumber Company to spare even a few trees. An Endangered Species Act might have given the federal government—and the American people it represents—a few additional tools to sway the outcome of the Singer Tract. In the twenty-first century, there were federal laws and rules that were designed to prevent species like the red wolf from being intentionally killed. But even with these tools, the federal government, and the American people to whom these animals are entrusted, had failed to convince enough landowners on the Albemarle Peninsula that it was worthwhile to stop shooting coyotes for just a little while. There was and will be lots to debate, but the bare minimum for red wolf persistence was simple: If you stop shooting the animals, the species might have a chance.

In 2023, the Red Wolf Recovery Program was starting over. The Fish and Wildlife Service and the Southern Environmental Law Center had agreed to

a settlement, and the plan to confine a "boutique" population of wolves to the Alligator River National Wildlife Refuge was withdrawn (during the public comment period, 107,988 of 108,124 had favored strong protections for red wolves). FWS was even permitted to resume sterilizing coyotes in the recovery area. The antiwolf landowners had uncovered administrative errors—a program that was not always following its own rules—but the field biologists had been true to the intent of the Endangered Species Act. Their job was to recover the species, and the courts ultimately agreed with the intent and the spirit of those conservation efforts. The Fish and Wildlife Service needed to get its house into order, it needed to write new plans, and above all else, it needed somehow to get into good graces with its neighbors and landowners in the Albemarle Peninsula. Although Jett Ferebee did not return my requests for an interview, other private landowners I've spoken with indicate a level of mistrust and frustration that will be hard to overcome. Perhaps time will heal these wounds; but time is not something the red wolf has to spare.

It's tempting to conclude that the past thirty-five years were wasted—relationships destroyed, animals slaughtered, resources sunk—but an optimistic reading is that this recovery program—indeed, the reintroduction of all large carnivores—will emerge out of this crucible stronger, wiser, and more prepared to meet the challenges of coexisting with large animals among diverse human cultures that do not always see eye to eye. In December 2024, the North Carolina Wildlife Resources Commission voted unanimously to advance red wolf recovery—the most heartening sign that there is not only a willingness to restore this species in good faith, but also a path forward. (That same month, eastern North Carolina was awarded a $25 million federal grant to install wildlife underpasses along the US highway that bisects the Alligator River National Wildlife Refuge. If they are constructed, these underpasses should help to limit vehicle strikes, which are the second leading cause of red wolf mortality.)

Meanwhile, the wild, living wolves continue to live like wild, living wolves. Much of their ecology is literally shrouded by the thickets of the pocosin swamps. Unlike the West, we do not have aerial footage of red wolf packs hunting deer; we cannot look down upon them from the heights of a mountain. But we do get glimpses of their existence, especially at the northern end of the Alligator River National Wildlife Refuge. The most accessible parts of the refuge are adjacent to a US highway that brings a stream of beachgoing tourists to the Outer Banks. Just to the south of the highway are the sprawling

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agricultural fields that were carved out of the wilderness, where the wolves find a bonanza of prey. The fields are the vestiges of the incursions made by Malcolm McLean's First Colony Farms and Prulean Farms of the 1970s and '80s. They continue to yield good crops to the farmers who lease the fields from the federal government. But they also provide for wildlife. Bobwhite quail, a species in decline throughout the East, are abundant in the croplands, as are the Albemarle Peninsula's massive black bears, who eat a share of the corn. I've seen as many as fourteen black bears in the fields in a given day, scouring the fields for stubble, and for deer fawns too. Tragically, these agricultural fields, which yield rich crops for humans and wildlife, are adjacent to the highway that is the deadliest for red wolves; the highway yields access, the crops provide nourishment, but the death toll is perilously high. Such is the dichotomy of life in the East.

In recent years, a pair of white-faced female wolves emerged as the more visible wolves on the Alligator River refuge. They lingered in those agricultural fields, seeming to relish the sunshine and the long, linear views. As the population of red wolves was reduced to fourteen known individuals, those were the rare animals that wildlife photographers captured. One of the photographers is Aspen Stevanovski, a young conservationist and wildlife viewing guide (as the population of red wolves plummeted, interest in the animals has grown with their rarity, and business is booming). Stevanovski has spent untold hours watching these white-faced females—they are sisters, she tells me—but it was the younger of the two, with a blocky face and thickset body, that had captured her attention (and allowed herself to be photographed). She is the matriarch of the Milltail Pack, the last wolves on the Albemarle Peninsula. "She's probably a very good mouser at that age, just in the fields, catching small rodents," Stevanovski says. "It's very rare to see white-faced canids . . . just because so much can happen to them, disease, humans, of course, especially for red wolves; they've had such a struggle coming back. It's incredible having two white faced females out there just still thriving and still living."

Tenuous as it might be, the Alligator River property is still large, still an ecosystem, and still providing refuge. But the landscape has never been managed exclusively for red wolves; the combination of wild lands and crop fields attracts hordes of migrating waterfowl, neotropical migratory birds, and all manner of small mammals. Over the years, as the wetlands have been restored, both here and at Pocosin Lakes, as more water is held on the property, the refuges have become more resilient to catastrophic wildfires (if the peat soils

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are not drained and dried, they are less likely to burn for months on end) but less hospitable to the wolves; indeed, the wolves follow the prey, and the prey is most readily found in the agricultural fields.

Meanwhile, more private lands have opened to the wolves. A revamped landowner agreement program—Prey for the Pack—has enrolled a half-dozen landowners who agree to allow red wolves onto their property; they do this largely because they support the project, but the Fish and Wildlife Service, along with its partner, the North Carolina Wildlife Federation, also helps pay for habitat improvements that benefit game species, and other endangered species, such as the red-cockaded woodpecker—and all of this benefits the red wolf. The program has a long way to go, but relationships are improving and seem to be moving in a positive direction.

Equally important: The wolves are mating. Earlier in the year, Aspen Stevanovski had found a pair of wolf tracks; she returned to the area the next morning and saw a pair of younger wolves loping through the brush at the edge of the crop fields and the wooded wetlands. It was peak breeding season, and the male was never more than a few feet behind the female. Shortly after my conversation with Stevanovski, the Fish and Wildlife Service made an announcement: A wolf in the Milltail Pack that Stevanovski had photographed had given birth to the first litter of pups in more than two years. Despite all the problems, wolves were once again breeding in the wild in North Carolina. This new generation of wolves will be required to navigate this landscape, to understand the dangers of highways, to learn how to hunt deer, nutria, raccoons, and various small mammals. Some of it they'll master quickly, but many challenges will persist. The species is unlikely to learn a defense against long-range rifles anytime soon; so long as we have firearms, we'll have the upper hand on these wolves.

The red wolf is today like the bison of a century ago—a species on the brink of extinction, existing primarily in zoos and captive facilities. More than a hundred years later, the bison is thriving in captivity, and exists, to a limited degree, in the wild. After fifty years of recovery, the red wolf thrives nowhere. Do we have the courage—do we have the interest—to make the same choices to save the American red wolf?

In his book *Poquosin: A Study of Rural Landscape and Society*, the historian Jack Temple Kirby provided an account of the low-country landscapes that once sprawled from the James River in Virginia, down through the Albemarle Peninsula of northeastern North Carolina. In that economic, social, military, and environmental history, he wrote of the pocosin wetlands' destruc-

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tion, partial rehabilitation, and enduring resilience, and concluded, "There is no happy ending, but no end, yet, either." Of course, I am thinking that this applies to wild red wolves, too. More than fifty years have passed since the passage of the Endangered Species Act. In the 1970s, at the pinnacle of our modern environmental movement, we tried to save these wolves before it was too late. At the same time, we have worked tirelessly to restore game species, endangered woodpeckers, and entire landscapes, such as the pocosin swamps of eastern North Carolina. It's unknown if we will continue to decide to keep the wolves, the birds, or even the pocosin swamps. But for now, the wolves are home again.

EPILOGUE

I like to listen to them sing," Larry says. We are in the Calvary Cemetery on Galveston Island, Texas, and he is fishing for perch in a neglected bayou; a yellow-crowned night heron stalks a meal of its own just a few yards away. This body of water forms the western boundary of the historic burial ground. The cemetery is filled with Italian Renaissance– and Gothic-inspired mausoleums. It is an architecturally striking and, as Larry has begun to describe, interesting natural area, too. Few trees line the interior lanes, so the summer blooms of sun-loving prairie species carpet the lawns in vibrant yellows and reds. On this December visit, however, the sun is high, and it is the hundreds of white gravestones that shine the brightest. When the sun goes down, Larry often sleeps just over the cemetery wall in a makeshift camp, where coyotes are always present. Just the other day he watched a female catching rodents. "I hear them quite often," he continues. "At nighttime, when the sirens go off, they sing. There's several of them out there." Beyond the cemetery wall, along the bayou, there is a large vacant lot. Small trees and vines were bulldozed from the site a few years ago, but nothing has been built there just yet; this stalled development is one of the last areas in which coyotes can live a bit like wild animals (elsewhere in the city, when they're seen hunting rats too close to homes or killing and eating the occasional small pet, they can get themselves into a world of trouble). To the east of the cemetery is a six-lane urban highway; to the south and north are asphalt parking lots and the strip malls and big-box stores that are everywhere in America. But the coyotes, and folks like Larry who need someplace to sleep, make a living there anyway. "They don't bother me at all," he says. "And I have camped right with them."

Larry is not the only wildlife observer on this island. In fact, the coyotes of Galveston have become quite the sensation of late. "Not only do we have happy, healthy coyotes," says Josh Henderson, the supervisor of the city's animal services unit, "but we've actually got some pretty *fancy*, happy, healthy

coyotes." He is not referring to their sleeping quarters or dining habits; he is referring to their pedigree.

It is exciting, but not unexpected, to discover that this is a place with interesting coyotes. This corner of the Gulf Coast is where the red wolf, *Canis rufus*, made its last stand fifty years ago. The species had been forced into hiding among the salt marshes and sand ridges—it had also been forced into breeding with the diminutive coyote—and when it had become clear that it was headed for extinction, the Fish and Wildlife Service had rounded up all the wolves it could find and placed them into captivity.

Fifty years ago, Galveston, Texas, and the adjacent ranches and marshland of Louisiana were the end of the road for the red wolf. Or so it was thought.

Recent discoveries have begun to suggest that the landscape and the wild animals that live upon it were not quite finished.

Although the animals that Larry listens to outside Calvary Cemetery are still considered coyotes, it's not far from here, on the wildest lands of the Gulf Coast prairies, where there are some really big canids. And it turns out that the genes of these animals can be found in the coyote populations all throughout the region—including here on urbanized Galveston Island.

This persistence has produced a kind of hope.

Perhaps a few wolves escaped the trappers. Perhaps they're out there now.

It is common to see phantoms in the woods. For the past hundred years, folks from Vermont to Alabama have sighted mountain lions and black panthers; they swear on their life that they've heard their piercing screams, they've been stalked, and in some cases, they've even been pounced upon by the retreating animals. Wildlife agencies have historically rejected these sightings out of hand: For nearly a century, there's been a conspicuous lack of physical evidence, and wherever big cats exist, whether in the Florida Everglades or the Black Hills of South Dakota, their road-killed bodies provide the evidence.

Nor are the phantoms exclusively cats. Bird lovers have scoured the swamps of the Southeast for decades, searching for ivory-billed woodpeckers; occasionally they return from the cypress domes and gum woods to exclaim that they've sighted this holy grail, that the Lord God Bird is back from the dead. But like the panthers, the evidence is less than satisfactory.

And then there are those who continue to cry wolf.

In this corner of the Gulf Coast, especially in the extreme southwest of Louisiana, local people have been consistent: The coyotes there are big, so they

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kept calling them wolves, and they suggested that biologists ought to come and take a look. Eventually, they did, and around 2018, two separate teams, which were initially unaware of each other's investigations, started giving credence to the claims. "I kept getting pictures from people that live down in southwestern Louisiana," says carnivore biologist Sean Murphy. "They kept sending me pictures of these coyotes that were pretty damn big, and they generally have like a darker pelage color. They just did not look like pure coyotes." Murphy, who was working in the state on the Louisiana black bear, contacted the US Fish and Wildlife Service, and Leopold Miranda-Castro approved a study to find out exactly what the animals were.

But they weren't exclusive to Louisiana. In Galveston, a local photographer named Ron Wooten had captured photos of animals behind an apartment complex that looked quite a bit different from the typical coyote (when one of these animals ate his pet dog, he became even more invested). Wooten, who is a biologist by training, contacted L. David Mech—arguably the world's leading wolf expert—who not only agreed that they looked different from a typical Western coyote, he thought that they might even be red wolf hybrids. Soon a second team of investigators was down on the Gulf Coast—they would organize themselves as the Gulf Coast Canine Project—likewise attempting to figure this out.

Before long, those two groups of investigators would come to the same conclusions: that the animals were the descendants of the hybrids that had begun to fill southeast Texas and southwest Louisiana in the 1970s; that for the past fifty years, red wolf genetics and red wolf phenotypes—large skulls, long legs, and body proportions that begin to approach that of a wolf—had persisted in this landscape. We're still learning to what extent they're a self-sorting population—if they are at all—but what's becoming clear is that historic red wolf genes have persisted on the landscape without any human intervention for more than half a century. Red wolf advocates, looking for a glimmer of hope in a world of gunshot mortalities, vehicle strikes, hybrid swarms, and bureaucratic stalemates, were encouraged by this potential persistence and even allowed themselves to wonder: Is it possible that the animals can take care of themselves? Is it possible that the red wolf, this ancient American species, can persist within a coyote-saturated landscape a little better than we thought?

Indeed, the hybrid swarm remains the critical threat to red wolf existence. As Mike Phillips reminded me, one of the central questions of the Alligator River reintroduction was to find out if a core population of red wolves could

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maintain its genetic integrity in the presence of an expanding population of coyotes. By 2011, the red wolf population on the Albemarle Peninsula had grown almost large enough to answer that question—and then we nearly killed them all. We never got a chance to find out.

And so if red wolf genetics, if not actual red wolves, had survived after all these years, it might help us finally answer the question of persistence.

What we know for sure is that the Galveston coyotes, like coyotes everywhere, are capable. On the island's urbanized east end, they eat squirrels, rats, and rabbits; they get into garbage and outdoor cat food. Farther west, where there is less development, they subsist to a greater degree on natural prey; they eat rabbits and nutria, and they consume fruit and berries and all manner of plant matter, as omnivorous coyotes are wont to do.

The animals are constantly on the go. Josh Henderson has outfitted a few coyotes with tracking collars, and one animal has traveled more than two thousand miles over the course of a year and a half. They live on an island, but they are in no way isolated from other populations. They swim across the coastal bays to each and every island in the gulf. (In the undeveloped lot adjacent to Calvary Cemetery, Larry says, he has seen them diving underwater.) They are cosmopolitan, yet they've retained some of these unique characteristics, which is all the more impressive.

But even if we'd never sampled their blood or weighed their bodies, these animals are interesting. In the shadows of the strip malls, Larry watches them often, and there is a particular female that seems to enjoy resting on a grassy knoll above Greens Bayou; she watches Larry just as intently as he watches her. Larry wants to connect, but he is reluctant to feed her. "They're wild," he says. "In a metropolitan area such as we have, they're wild."

The Galveston Island coyotes live natural lives and in relatively large groups wherever development is minimal and people are few: on the fringes of cemeteries, on the island's undeveloped western beaches, and around the east end lagoon. But many of these undeveloped areas are unprotected, and a building boom is converting the city's green spaces to RV parks, condominiums and vacation resorts, and developments of all kinds.

The situation on Galveston reflects a larger truth: If every square inch of the land is developed, there will be no home for large wild animals. As our human settlements continue to sprawl into every rural corner of the eastern United States—the same six-lane highways, big-box stores, and endless tracts of suburban homes like those that surround Calvary Cemetery—there will be no future for any of the species whose biology requires a semblance of wild land.

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On Galveston Island, migrating birds still flock to the remnant green spaces. The flowers of the coastal prairies still bloom in the cemeteries, the sandy ridges, and the fields of the lagoon. But like the remnants of the tallgrass prairie, the original ecosystems cannot function if they remain fragmented and without connection to larger landscapes. If they are paved and built upon, these final refugia will cease to exist. The habitat specialists, the prairie obligates, and the fancy coyotes, too, will have nowhere to live.

Although the island's coyotes are interesting—and they are the most accessible to wildlife watchers and professional biologists alike—they are not the biggest animals on the Gulf Coast. To find these animals, the biologists have had to get farther away from the city. Through their investigations, we've begun to understand that the biggest animals live where canids live long lives—and that is where people are few.

Despite the intrigue, coyotes are not a protected species, not even on Galveston Island. "This is South Texas, sir—twelve gauge is a religion in this part of the country," Josh Henderson tells me. "And so we do have a lovely old-school generation that absolutely, hands down, science can all go to hell—if I got a problem with a coyote and I see it, I'm gonna blow his little head off." When he took the job in 2013, his marching orders were to catch and kill every coyote he could. "I didn't appreciate those marching orders. It pissed me off." But he was also reminded that he was not the chief of police and in addition to his other responsibilities, he would be catching and killing all coyotes. "And so I methodically murdered coyotes at every beck and call," he says. (At Calvary Cemetery, coyotes were shot by sharpshooters on the roof of the mausoleum.) But he also did as much research as he could, and he learned that when one coyote is killed, another young one quickly moves into its territory and likely gets into the same trouble. He compiled data, and an argument, that that style of management—what he called "knee-jerk vengeance killing"—was not working. "Even if I was to mobilize the entire police department, and we were to absolutely simply go to war, it's going to be just a giant drain on resources," he says. "And looking at the crimes committed by coyotes, this amount of waste in tax dollars, waste in resources, manpower, time—it's not worth the cost of the bullets." Before long, Henderson was able to change the city's coyote policy to one of monitoring, mapping, and hazing. ("We have coyotes on this island," he says. "Having coyotes on this island doesn't mean we have a coyote *problem* on this island.")

One of the pieces of information that's emerging from the Gulf Coast inves-

tigations is that the biggest coyotes—the ones that most resemble wolves—live where they are not routinely shot, trapped, or otherwise killed. Historically, this has been not on Galveston Island but rather where there is the most protected space—out in the country, on the coastal wildlife refuges, and on a few private properties. The tract of land that might be the most significant is the FR Ranch Preserve on the historic Moore-Odom Ranch, in a place called Gum Cove, Louisiana; it is nearly 20,000 acres, and it is surrounded by the 124,000-acre Sabine National Wildlife Refuge, where coyote hunting is not permitted. The family that had owned this land for more than a century prohibited the shooting of coyotes—and red wolves, too.

A mosaic of rice farms and cattle pasture, remnant prairie and marsh, the Gum Cove ranch has long been a respite for wild creatures. In 1967, when the American alligator was listed as an endangered species, those massive reptiles were abundant on the ranch's canals and waterways. When whitetail deer were scarce in Louisiana, Gum Cove was home to a herd of nearly five hundred. When crested caracaras left the rest of Louisiana as the coastal prairie was plowed up, they could still find habitat at Gum Cove. Great kiskadees, large yellow-breasted songbirds common throughout South America, were known to nest only as far north as south Texas—and Gum Cove.

And there were wolves. In the early 1930s, Cameron and Calcasieu Parishes were known for their wolves. In the 1960s, hunting parties hit the adjacent ranch lands hard. But the Odom family didn't want wolves to be killed by government trappers or private hunting parities. They wanted them to be left alone. When Curtis Carley and his Fish and Wildlife biologists came looking for wolves to remove for their captive breeding program, the family resisted that, too. The landowner, Rucie Odom, took pleasure from knowing that the red wolves were there. "If we lost a calf for two year, [Odom] was still okay with that," says Bill Bruce, who has been the preserve's land manager for many years. But there were few losses anyway. When Bill first came to the ranch, he witnessed "wolves" lying in pastures with cattle.

And perhaps they've hung on, a few animals, after all these years.

Before I go to Calvary Cemetery in Galveston, I go to FR Ranch with the wildlife photographer and researcher Amy Shutt. She allows me to tag along as she collects data cards from her camera traps. We spot scat at the intersection of dirt roads; we see evidence of hogs in a mud spring. We linger in a place where her collaborators trapped "Big Girl," a large female canid with a large percentage of red wolf ancestry. As we approach a gate, a canid stops in its tracks. We

watch it through binoculars, but it's too far away to see much detail. And soon it's gone into the brush of a marsh—another phantom.

The persistence of large, wild canids is testament to the capacity and resilience of wild nature. The FR Ranch is not unmanaged, but neither do its owners seek total dominance. With enough space for natural processes—and with the tolerance of large carnivores—a drama has unfolded that would not otherwise have been possible.

The excitement over these Gulf Coast coyotes is the product of our environmental tragedies; we have squandered so much of our natural heritage that we're clamoring to preserve the scraps of our wilderness legacy. In the excitement, in the mad dash to save the last of the wild things, we might be losing the plot.

The awareness of these animals—which biologists still acknowledge to be coyotes, though many are introgressed with significant amounts of red wolf DNA—is not actually new. Since the 1970s, they have been known to be everywhere in the coastal counties of Texas and Louisiana. Curtis Carley and his team of trappers knew them well; it was the hybrid swarm that the recovery team was scrambling to get ahead of. Again, the recent investigations hadn't found packs of red wolves; what they had found was big coyotes, a few of which retained significant red wolf ancestry. It was fascinating and it was encouraging, but it wasn't entirely new.

But enough time had passed—and enough new technologies had been developed in the world of genetic science—that it became newsworthy again. "It was like we discovered a *Tyrannosaurus rex* running around," Ron Nowak says. "All they did was find some genetic influence of the red wolf in that population of wild *Canis* in Texas; we knew that all along. I mean, anyone familiar with it knew it." Indeed, mammalogists had been saying that those things were down there, and in the 1990s and again in the early 2000s, the Fish and Wildlife Service had trapped animals and come to the same conclusion: Yes, there were some big animals but nothing approaching a wolf. But advances in genetic sciences had given us new ways of describing what the field biologists had already told us—and so the new discoveries made headlines and attracted more funding. Perhaps the research into the animals was in fact newsworthy, but to consider the knowledge of their existence novel was to forget that field biologists have held these canids in their hands quite recently.

One of the researchers investigating the Galveston area coyotes is Princeton geneticist Bridgett vonHoldt; her mentor was Robert Wayne, and together they

published a report claiming that the red wolf was not a true species but rather a recent hybrid entity. Although neither Wayne nor vonHoldt had said that the red wolf was *not* worthy of conservation ("I think red wolves are so critically important," vonHoldt told me in 2021. "In terms of biodiversity, it is absolutely a distinct entity compared to the other canines that live in North America."), her celebration of these introgressed coyotes is nonetheless surprising.

Kristin Brzeski, the founder and a codirector of the Gulf Coast Canine Project (GCCP), and vonHoldt have been on a determined campaign to conserve Galveston's coyotes and their undeveloped urban habitats. They say that these coyotes are important because the red wolf is inbred. Genetic drift and the deleterious effects of inbreeding may lead to trouble down the line, and the genes of the Gulf Coast coyotes could be used to offset those challenges (gene editing, they say, might be necessary).

In one of their papers, the research team used a relatively uncommon phrase to describe these red wolf genes—"ghost alleles"—and before long they had begun referring to the Gulf Coast canids as "ghost wolves." (As with the coyote hunters of the early twentieth century, it sounds more impressive to say you are going on a wolf hunt.) They are fond of the ghost wolves moniker even though living red wolves still exist in the wilds of North Carolina and in captivity throughout the nation. (The staff and advocates who have dedicated their working lives to conserving the red wolf in the wild and ensuring its viability in captive breeding facilities would remind you that *Canis rufus* is still very much alive and in the flesh, and not an apparition.) As the notion of ghost wolves captured headlines and research funding, the geneticists soon partnered with a biotech company whose work seemed to come not from the tradition of wildlife conservation, but from that of science fiction.

A few years ago, vonHoldt and Brzeski began a partnership with a private biotech company, Colossal Laboratories & Biosciences, and that company cloned a pair of coyotes that Gulf Coast Canine Project wildlife ecologist Joey Hinton had captured. Once it had cloned those animals, it went so far as to claim that it had cloned red wolves—which was false—and touted its efforts as critical to saving the vanishing red wolf. It said all of that while the last wild red wolves in America withered on the vine in eastern North Carolina; while the unglamorous work of conserving wildlife and wild ecologies played second fiddle.

Those experiments in gene editing and cloning and their celebration as a replacement for the work of conserving biological diversity upon the earth

echo the concerns I had heard from Cody Considine at Nachusa Grasslands about the enterprise of ecological restoration—that if people believe that wild nature can be replaced, why bother fretting over the destruction of indigenous natural areas? Considine, who is enamored by the practice of ecological restoration and is among the discipline's leading practitioners, was quick to note that no matter how good the stewards had become at planting prairies in northern Illinois, they were not replicas of old-growth grasslands—and that ecologists are unable to capture, preserve, and replicate the species composition and function of the remnant biological communities.

Indeed, those suspicions were borne out. In fact, while Colossal saturated the internet and social media with videos and press releases heralding its experiments, receiving widespread coverage in national media, the federal government was slashing funding to national wildlife refuges, the US Forest Service, and the National Park Service; the Department of the Interior announced its intention to strip away protections for endangered species by redefining "harm" under the Endangered Species Act; and an effort to liquidate and privatize public land made its way through Congress. On April 9, 2025, just days after Colossal announced that it had "resurrected" a dire wolf (when in fact it had genetically modified a gray wolf to resemble what some scientists believed a dire wolf might have looked like), the secretary of the interior called for an end to the Endangered Species Act as we know it. "If we're going to be in anguish about losing a species, now we have an opportunity to bring them back," he said. "Pick your favorite species and call up Colossal."

But genetic modification is not what the species needs most desperately at this moment, nor would it be good for the social acceptance of red wolves; detractors already label the animals "Frankenwolves," and to begin editing the genome of this endangered population would only add fuel to the fire. It's also unclear if this genetic work is even necessary.

Joey Hinton is the senior research scientist at the Wolf Conservation Center in South Salem, New York, and has worked with red wolves in the Albemarle Peninsula for decades. Until recently, he was also a codirector of the Gulf Coast Canine Project and personally trapped forty-four coyotes for the study; several of the animals he trapped in 2022 were used as donors for the Colossal cloning project (Hinton removed himself from the group after he learned of the biotech partnership). "Although cloning has some potential to serve among existing conservation tools, there are more immediate and effective methods to promote long term survival and well-being of Red Wolves," he wrote. "Cloning is a solution in search of a problem that doesn't

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exist for Red Wolves." He pointed to the wild wolves in North Carolina and the 270 red wolves in captivity waiting to be released. "They represent the historical Red Wolf, which resulted from thousands of years of natural selection," he continued. "They reproduce naturally in captivity and in the wild—we don't need to clone them."

But the popular narrative had begun to lose sight of those facts. Some media accounts even described the coyotes as ancestors of the extinct red wolf—as if the forty-year-old project on the Albemarle Peninsula were not ongoing, as if those animals, in the wilds of eastern North Carolina and in captivity around the nation, did not exist.

Twenty years ago, the biggest debate in red wolf conservation was whether the animals were a valid species with a deep history on this continent. This question is now largely settled, with the National Academy of Sciences and most conservation geneticists upholding the validity of *Canis rufus*. But we're rapidly approaching a new inflection point. Institutions and their funding are finite, and we will be asked to decide where our resources are better utilized: Will the conservation community decide that the best way to conserve these animals is within a land community, an ecosystem approach that embraces their existence in the wild? Or will it decide that the best way to conserve the species is in a laboratory?

My hope is that we side with the land. Indeed, I believe we ought to preserve more lands for the unknown, for the phantoms, for the descendants, for the hope of ivory-billed woodpeckers, for the return of cougars and wolves, for the possibility of bison, and for the inherent worth of the cypress swamps, the grasslands, and the forests themselves. If the ivory-billed woodpecker still exists, let it reemerge from the shadows of a primordial swamp. If it is extinct, let the land be a memorial, a preserve dedicated to the unknown life that has yet to evolve. Likewise, we ought to preserve more of the Gulf Coast ranch lands and coastal prairies where the big coyotes have persisted—and create at least one location where evolution and natural selection might dictate what kind of wild canid is best for the land. And perhaps we should establish an additional population of *Canis rufus* there, too, right where we found them fifty years ago. We might be surprised by what we learn.

We have reason to put our hope in the land: We've been surprised before. When Wood Buffalo National Park was set aside in Alberta and the Northwest Territories in 1922, it was the last remaining habitat and occurrence of the wood bison subspecies (*Bison bison athabascae*). The animals could have been

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rounded up and placed in captive breeding facilities, but they were protected in their native habitat. It was good for those bison, but it turned out to be critical for other species, too: North Americans did not know that Wood Buffalo National Park was the only remaining breeding grounds for the critically endangered whooping cranes when the land was preserved; it wasn't until 1955 that they discovered that fact. A similar saga unfolded on the cranes' wintering grounds on the Gulf. Early-twentieth-century sportsmen pushed for the creation of the Aransas National Wildlife Refuge in south Texas as waterfowl habitat, but it was also the whooping cranes' wintering grounds. Because Wood Buffalo National Park was preserved and Aransas National Wildlife Refuge was set aside in Texas, 2,500 miles away, there was enough space on this vast continent to meet the biological requirements of whooping cranes—and they did not blink out of existence. Had those two preserves not been dedicated in the early twentieth century, the whooping crane might very well now be extinct.

We must also act urgently in the present—for the life that we have pushed to the brink and that is desperately hanging on. On the coast of North Carolina, climate change and sea-level rise are not theoretical problems of a distant future—they are the here and now. The Albemarle Peninsula is subsiding, and salt water intrudes on it daily. When I drive to the eastern edge of the peninsula, I encounter a ghost forest; salt water creeps into it through canals, and as the ocean reclaims the wetlands, trees are dying en masse. On the outskirts of Engelhard, North Carolina, on the eastern edge of the Alligator River National Wildlife Refuge, there are acres after acres of dead trees, killed by salt water intrusion. The red wolf is the charismatic mammal that often captures our attention, but it is the entire system that is in peril.

Sooner rather than later, we'll need to find additional homes for the red wolf—not just because of the changing environmental conditions on the Albemarle Peninsula but also because the recovery plan for the red wolf requires it. Ron Sutherland, the chief scientist with the Wildlands Network, would like to see red wolves established in the South's bottomland hardwood forests, in the productive habitats that are full of prey and possibility. The Roanoke River National Wildlife Refuge, just a bit farther inland, he says, is the next logical place where we could think about establishing wolves. (Just eighty miles west, they might even colonize the site themselves; another longtime North Carolina conservationist I spoke to said she'd thought they'd have found their way there by now.) But this refuge is not very large, and it is too near to the Albe-

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marle Peninsula to accomplish recovery goals—so the search must include a far greater sweep of the eastern United States.

Warren Parker, who had coordinated the red wolf recovery effort in the 1980s, once said that his only regret about the program is that it didn't try a second site for the red wolves after the short-lived attempt at Great Smoky Mountains National Park. Pressed to name a site, he mentioned the Francis Marion National Forest north of Charleston, South Carolina. Combined with Cape Romain National Wildlife Refuge, where red wolves were experimentally released in the 1980s, there are over 330,000 acres of public land. It's heavily used for hunting, trapping, ATV riding, hiking, and birding, but it's big and it's a productive habitat, which means that there are a lot of whitetail deer. And wherever there are deer, there can be wolves.

Others want to try again in western North Carolina. The habitat in Great Smoky Mountains National Park was not ideal for the wolves; the forest was too dense, too unbroken, and there was scant prey. Viruses and parasites were also a problem there. But the truth of the matter was that the release in the Great Smoky Mountains failed because the program rules forbade the wolves to occupy private lands. It was appropriate for game species to live upon private lands, but not their natural predators. Regardless of why reintroduction was abandoned in the Smokies, the greater ecosystem has changed significantly over the past thirty years. In the Nantahala National Forest, adjacent to the national park, robust logging operations have produced an abundance of early-successional habitats. These conditions favor deer and would in turn favor wolves.

There's also now a population of elk in the Cataloochee Valley. They have expanded out of National Park Service lands and have entered private property, as well as adjacent state, tribal, and federal lands. They regularly amble through the towns of Cherokee and Bryson City, crossing main streets and parking lots. Wolves, like the black bears that kill and eat a significant number of elk fawns, would surely find the valley and its adjacent lands a good place to live.

Meanwhile, the Nature Conservancy has expanded its footprint in the central Appalachians, recently purchasing more than 250,000 acres in the Cumberland Mountains of Kentucky and Tennessee; the acreage is composed of mature timberlands and reclaimed surface mines, and I can't help but think that these lands, with their low human population densities and ever-growing herds of elk, would make fine wolf habitat. Teri Jacobs, a wildlife biologist at

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the University of Cincinnati, has already studied the feasibility of reintroducing red wolves to eastern Kentucky's Daniel Boone National Forest. Her work identified the potential of the Red Bird District, which had been the site of an elk reintroduction twenty years earlier. "The elk have the same requirements as a wolf," she says. "Large territory range, forest cover, water." But the Red Bird District wasn't the only viable candidate. "We can definitely find more areas that they can survive in," she says of the red wolf. "The problem is people."

Linda Rutledge is a molecular ecologist who has spent considerable time working with red wolves and the eastern wolves of Canada's Algonquin Provincial Park. Rutledge has tried to find the shared values between the wolf advocates and the hunters, anglers, and fur trappers they are often at odds with. "The common ground is that everybody really wants to have this connection to the outdoors, they want to maintain and preserve this outdoor landscape for their children and their children's children," she says. "And so the interesting thing is that wolves are so important for maintaining these ecosystems and the outdoors, and they need big spaces. So if you're conserving wolves, you're going to be conserving big spaces, because they need big spaces. And we all want that. That's the common ground I always try to find, but it seems to not quite be enough."

Before we can establish a second population of red wolves in the East, we will need to find that common ground. This is the work that is paramount, more than any investigation of canid genetics, more than any study of wolf diets and denning habits; finding the common ground that will ensure the tolerance of wolves among the rural populations that will live among them is the most important work that remains.

Otherwise, we're going to watch the wolves die.

Until his untimely death in 2008, Dave Maehr had been the University of Kentucky's researcher studying Kentucky's elk reintroduction program. Nine years earlier, on the eve of the reintroduction at the Starfire mine complex, he had spoken to reporters about the other mammals still missing from Kentucky, naming the bison, the gray wolf, the red wolf, the black bear, and the mountain lion. "I hope that we don't stop with the elk," he said. "Kentucky has a tremendous natural heritage, and I hope we can all work together toward bringing it back as best we can."

In 2001, four years after the elk introduction, he published an article entitled "Restoring the Large Mammal Fauna in the East: What Follows the

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Elk?" "This ecological restoration will be a test of elk resiliency and of human tolerance for an animal that has the potential to be a garden pest, a road hazard, and a target of poachers," he wrote. ". . . Given the ability of elk populations to grow quickly and to become accustomed to human activity, are all of the ecological components in place to facilitate a naturally regulated herd? If elk restoration is to be promoted as ecological, what other work is left for us to do?"

Maehr believed that elk reintroduction was justifiable because they were a native species and because they were ecologically different from white-tailed deer. "The elk both modify deer behavior and consume plants and plant parts that are uneaten or otherwise out of the reach of deer. These influences, given sufficient elk numbers, time, and space, will result in measurable changes across the landscape. This is the work of elk in Kentucky and elsewhere in the East." Indeed, in addition to providing opportunities for sportsmen, this was the scientific rationale for elk reintroductions in the East.

But Maehr believed that the work of the elk—and the work of the biologists and land managers—was incomplete without the complexities and "regulatory potential" of large carnivores that were also native and integral to eastern landscapes. "Herbivory without predation will demand increasing attention from managers as forests suffer the consequences of a missing large carnivore," he wrote. "Human vanity or strictly utilitarian purposes are insufficient justifications for promoting large mammal restoration. . . . We have jump-started the process with elk." But we hadn't finished the job.

In the twentieth century, we created an eastern United States that was filled to the brim with whitetail deer, and the herbivory of those vast, browsing herds contributed to a decline in biodiversity. Many of our natural lands lost quality, and even where the canopy was composed of native species, the understories became thick with invasive brush that was unpalatable to the deer. In central Appalachia, where our largest unfragmented forested landscapes remained, we'd marred that legacy with sprawling surface mines and left hundreds of thousands of acres in a state of arrested succession—and then, to top it all off, we'd introduced another browsing ungulate.

And so, as Dave Maehr had begun to tell his fellow biologists, it was time to take stock of our landscapes and plan for the future. "Is it time to let the cougar get back to work?"

In 1995, when elk were translocated from Michigan to northern Wisconsin, Professor Ray Anderson asked similar questions—and suggested that perhaps

the cougar should in fact be next; it was all part of the dream "to complete biologic diversity of the landscape," he said on the day of their release.

Before he retired in 2019, Laine Stowell had been Wisconsin's elk biologist for nearly twenty years. It was his job to sustainably manage the elk population and to inform the state's hunting policies. Yet he simultaneously supported the conservation of wolves, even in the elk territory where he worked so hard to restore elk and even when those wolves became specialist hunters of elk. He never begrudged them their kills. "My personal opinions are that wolves belong here just as much as elk belong here. They deserve to be on the landscape," he says. "Bugling is a natural sound. The howl of a wolf is a natural sound."

Stowell does believe, however, that wolves should have a healthy fear of humans, and he is of the opinion that some level of wolf harvest is appropriate. But he also contends that Wisconsin's current population of 350 wolves is actually too low; it should be not a target but a minimum. "There's room for both of us here," he says. "Wisconsin hunters and Wisconsin wildlife enthusiasts and wolves. There's plenty of deer for wolves and for hunters here. People tend to be greedy, and they should be less greedy and share."

A few years ago, I went into the wilds of Pennsylvania's northern tier with Jeffery Larkin, who is now a professor at Indiana University of Pennsylvania. He was the first graduate student at the University of Kentucky to work on elk reintroduction; his mentor and PhD adviser was Dave Maehr. He was the one tracking the animals in a Cessna the day after the first seven animals were released. His research interests have expanded well beyond elk—he is deeply involved in songbird ecology and conservation and tracks migrating populations to Central and South America—but he hasn't left the world of large ungulates behind. He offered to go out into the Pennsylvania forests with me and show me several research projects that he and the state's elk biologist, Jeremy Banfield, were collaborating on.

Throughout the day, we toured reclaimed surface mines; we inspected a shelter-wood parcel that's being managed to increase regeneration of oaks. We hiked through habitat that's home to one of the state's highest densities of rattlesnakes. (Larkin bent down to pick up a stick and handed it to me: "It often makes people feel more comfortable.") As we toured, I asked about the future of these lands. I had in mind, specifically, Dave Maehr's words about finishing the job of ecological restoration. I had in mind the large predators that were still missing from Pennsylvania. Banfield had done his graduate work on

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mountain lions in Alberta, Canada. "If they ever get here," he said, "they need cover and deer. Which they got."

"I don't know if it'll happen in my lifetime or career," he said. "But mountain lions are coming back." Larkin agreed: "The landscape is just too perfect. I mean: deer and cover." Banfield, like many other biologists, follows the data on cougar migration. As the population has rebounded in the West, the animals have been pushing south and east. The Mississippi continues to be a significant barrier for mountain lions, but it is not insurmountable. Mountain lions are now often seen in Wisconsin, and they have even turned up in Chicago; a few years ago, a male lion made it as far as Connecticut before getting hit by a car. (If the majority of panther sightings were myths and phantoms throughout much of the twentieth century, the eastward expansion of this species is sure to result in a fair amount of "I told you so"s.)

A few weeks earlier, Larkin and his son had gone to the Adirondack Mountains of New York. They had gone on a walk to some of the high peaks. "You get up to some of those high elevations and look across that landscape, and you just go: There is no freaking reason why a wolf and a mountain lion and anything else that wanted to live here could not be here right now." Banfield agreed. "Northern Wisconsin, northern Michigan, all has wolves now," he said. We know that wolves can survive, ecologically speaking, in a modern East. But as Banfield says, the question will become "Will we allow them to?"

In the fall of 2024, my family and I traveled back to the Pennsylvania Wilds, to the same north-central counties where I had spent the day with Banfield and Larkin. We had come to see and hear the elk. We visited Benezette, a small town that turns into a carnival during bugling season, and we saw a bull elk and his harem of cows on a reclaimed strip mine. We counted nearly forty wild turkey that weekend and, in a nearby wetland, dozens of mudpuppies swimming in a pool of water. They were the same woods that Jim Jacobs had hunted in in the 1800s. We've gone there on other occasions and watched the morning mist burn off Sinnemahoning Creek to reveal a bull elk in the tall autumn grasses. We've seen elk on public lands and in the yards of hunt camps (and no shortage of black bears, either; adults and cubs scrambling across the country roads).

The next morning, on our way to another reclaimed mine site, we passed a field where a vehicle was pulled over onto the side of the road. Suspecting that there might be something to see, we pulled over and saw at least fourteen bull elk locking horns and battling one another. They didn't bugle—perhaps

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because there weren't any females present; I can only guess—but they sparred with intensity.

Later that day, we took a walk in one of the state's game lands. A decades-long ban on Sunday hunting was still in effect, and we were joined on the land by a few local hunters, likewise scouting, likewise enjoying the land. The logging roads and footpaths were littered with deer and elk scat, and bear and coyote scat, too. The fall color was vibrant, and the waters in the rhododendron-shaded creeks ran crystal clear.

In 1913, Pennsylvania sportsmen had the wild idea of capturing some elk in the West, putting them onto a train car, shipping them to the cutover timberlands of the northern Alleghenies, and turning them loose. The population passed through a genetic bottleneck, survived brainworm infestations, evaded the gunshots of farmers and would-be poachers—and recolonized the Pennsylvania wilds. A century later, we continue to benefit from the hubris of those early-twentieth-century sportsmen and from the establishment of this vast estate of public lands.

These habitats are managed with prescribed fire and timber harvests; endangered species biologists keep tabs on rare populations and do their best to get ahead of emerging threats. Our game agency tells us how many deer and elk and bear and grouse we can harvest so as not to remove all of them. This is the work of defining the kind of world we want to live in and the kind of wildlife that will exist. We here in Pennsylvania have elk and bear and eagles and fisher cats; we have brook trout and hellbenders; we have big game; and we have rare mussels and snails. And because we have deer, and we have cover, we still have important decisions to make.

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NOTES

In the course of writing this book I conducted more than 230 interviews. Any quotation in the text that is not attributed to a previously published source should be understood to have come from the author's original reporting.

Prologue: Eastern Wilds, Eastern Beasts

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