WILD EARTH

Seeking Shelter

The National Wildlife Refuge System

The Journal of the Wildlands Project

WINTER 2003–2004

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WILDLANDS PROJECT

reconnect restore rewild

WE ARE AMBITIOUS. We live for the day when grizzlies in Chihuahua have an unbroken connection to grizzlies in Alaska; when wolf populations are restored from Mexico to the Yukon to Maine; when vast forests and flowing prairies again thrive and support their full range of native plants and animals; when humans dwell on the land with respect, humility, and affection.

Toward this end, the Wildlands Project is working to restore and protect the natural heritage of North America. Through advocacy, education, scientific consultation, and cooperation with many partners, we are designing and helping create systems of interconnected wilderness areas that can sustain the diversity of life.

Wild Earth—the quarterly publication of the Wildlands Project—inspires effective action for wild Nature by communicating the latest thinking in conservation science, philosophy, policy, and activism, and serves as a forum for diverse views within the conservation movement.

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ON THE COVER

"Solitude," acrylic by Steve Oliver, ©2003

The Rewilding Institute

I SET MY TOILET PAPER aflame and stand. A movement over my shoulder catches my eye. I turn my head. A black wolf walks past me less than 100 feet away. It glances at me and continues unhurried on its chosen path across the tundra. A minute or so later, it fades away over a rise.

I am standing with my pants around my ankles in the middle of tens of millions of acres of unbroken Arctic tundra between Hudson's Bay and the Great Slave Lake. My mind drifts back to Aldo Leopold in 1936. After a bow-hunting trip to Mexico's Sierra Madre, he understood that, for the first time in his life, he had seen a healthy landscape. So it is with me this August of 2003. The Thelon Game Sanctuary and a vast sweeping swath around it may not be pristine (nothing is in the twenty-first century), but it is as wild as land comes today—untrammeled, self-willed, self-regulating.

Although I've been in many wilderness areas over the last 40-some years, the Thelon has set a new standard of land heath for me, or, as Leopold would have said, a new "base datum of normality." With all native species present in ecologically effective population densities and free to wander over hundreds of miles of unfettered land—for whim or ancient urges—the Thelon is normal. It's what land should be like. It's what land was like before we began to stomp our will over it.

Canoeing the Thelon River for 17 days gave me an unmatched chance to mull over my past years and think about the next chapter in my conservation life. For the 33 years I've been in conservation, my strategy has been fixed to a pole star of finding and then pushing new approaches to protect wildlands and wildlife. I first helped to found American Rivers to focus more attention on the "forgotten" system of National Wild and Scenic Rivers. In The Wilderness Society I worked hard to get conservationists to prioritize Forest Service and BLM roadless areas. With Earth First!, I aimed to expand the terms of the land management debate and to create new issues. In all of these efforts, I worked with wonderful colleagues.

After leaving Earth First!, in December of 1990 John Davis and I sat down to plan a new conservation magazine—*Wild Earth.* One of our major goals was to blend traditional wilderness and wildlife conservation with the science of conservation biology. The first issue of *Wild Earth* in the spring of 1991 showcased that goal. As the first issue was being published, the eminent scientist Michael Soulé wrote me to suggest a small meeting of conservation activists and biologists to talk about an ecological vision for North America. That meeting was hosted by Doug Tompkins in the fall of 1991 and created what was to become the Wildlands Project. From their respective beginnings I have served as the executive editor and later publisher of *Wild Earth* and chairman of the Wildlands Project. I am proud of how *Wild Earth* and the Wildlands Project have helped to create a twenty-

pen-and-ink by Tracy Brooks

first century conservation movement that emphasizes ecological values.

Now it is time for me to move on—to continue paddling toward that pole star of effective Nature conservation, but to do so in a new canoe. This summer, just before my Thelon trip, I set up (with the support of the Wildlands Project Board of Directors) The Rewilding Institute—an independent nonprofit "think tank" dedicated to developing and promoting ideas and strategies that advance continental-scale conservation in North America. I have left the Wildlands Project to become executive director and a fellow of The Rewilding Institute, although I will continue to write for *Wild Earth*.

The Rewilding Institute's overarching goal is to combat the extinction crisis. But for me personally, it is a welcome shift that will allow me to step back from the very detailed kind of work that goes into drafting regional wildlands network designs so that I can focus more on the big picture, as Doug Tompkins has always encouraged me. In The Rewilding Institute, I will have time to work with conservation ideas and wrap them into new public presentations on continental-scale conservation. As a "think tank," albeit an activist one, The Rewilding Institute will work with the whole conservation community. We'll continue exploring the fundamental question Aldo Leopold raised a half century ago: What are the characteristics of healthy land, normal land?

Here, the Thelon country teaches. First, native species thrive in more or less their natural density. Highly interactive species, such as wolves, are here in ecologically effective populations. They play their role in shaping and regulating other species and the ecosystem. Second, an area the size of, say, New Mexico and Arizona, is unfragmented by the works of humans. Whether you are a muskox, Arctic tern, lake trout, or blackfly, the landscape is permeable for your movement for hundreds of miles. Ecologically effective populations of highly interactive species and landscape permeability are the foundation for continental-scale conservation—for rewilding.*

But even the Thelon is not big enough. The Thelon country and conservation experience, along with current scientific research and theory, tell us:

To do serious conservation in North America, we must do conservation on the scale of North America.

This is the message of The Rewilding Institute. In order to be quick and nimble to spread that message, The Rewilding Institute has an organizational philosophy to stay small, lean, and focused, with minimum overhead, staff, and bureaucracy. Much of its work will be done through Rewilding Institute fellows of two kinds: Science Fellows and Conservation Fellows. Science Fellows, including Michael Soulé and Brian Miller, will develop and advocate the ideas and strategies of continental-scale conservation, while Conservation Fellows will help to get these ideas and strategies embraced by the larger conservation community. We have a clear strategy of how to embed a hopeful vision of continental-scale conservation throughout the broader conservation community. (In 2004, Island Press will publish my book, *Rewilding North America,* which will cover the ideas and strategies of continental-scale conservation in detail.)

I look forward to working with friends and colleagues across North America on this exciting new project. In this dark political time in the United States, with a "shock and awe" war being waged against more than a century of bipartisan conservation achievement, we conservationists need a hopeful vision to buoy us through the attacks and to inspire people with hope for the future. And we need to be prepared with bold ideas and strategies when the political landscape changes for the better. I pledge to you that I will do my best to bring to more people that vision of continental conservation.

~ **Dave Foreman**

Lookout Point, Thelon Game Sanctuary (I know, I know, I'm sitting in Albuquerque writing this, but part of me is still—and ever will be—standing with pants down, blackflies all around, enthralled by the wolf so at home, so in place—a wildeor *in a* wil-der-ness.*)*

The Rewilding Institute will need your help. As do I. If you are interested in supporting The Rewilding Institute and being informed of ongoing projects, you can reach us at: The Rewilding Institute, P.O. Box 13768, Albuquerque, NM, 87192; 505-292-9764; eltigredave@comcast.net. Please provide a mailing address to receive a fact sheet that explains what we are going to do and how we are going to do it.

* Michael Soulé and his fellow researchers lay out the concept of ecologically effective populations of highly interactive species in a recent issue of *Conservation Biology.* Soulé, Michael E., James A. Estes, Joel Berger, and Carlos Martinez del Rio, 2003, "Ecological Effectiveness: Conservation Goals for Interactive Species," *Conservation Biology* 17(5) October: 1238–1250.

I JUST READ and thoroughly enjoyed Dave Foreman's Around the Campfire essay on American populism [summer/fall 2003]. I related deeply, being the spawn of Scots-Irish frontier/redneck/white-trash culture myself. I laughed numerous times while reading it, recalling the raucous, vehement arguments I've had over the years with very intelligent yet ultra redneck kinfolk, like the time one of my numerous uncles (I'll call him "Uncle Ponder" to confound the jackbooted thugs) shot a reintroduced fisher in Wisconsin as a "varmint."

That argument raged for the entire deer hunting season. This was in the early 1980s, when I was a graduate student radio-tracking pine martens, searching unsuccessfully for fishers in Washington State, and formulating strategies for recovering old-growth-dependent wildlife species. The argument ranged over all the expected diatribes: Wisconsin DNR biologists as communist conspirators, wildlife researchers as clueless college boys, wolves as devils with no place in America, etc. I countered with scientific evidence and logic, which Uncle Ponder brushed roughly aside as "nothin' but book learnin'."

I came real close to turning in my father's brother as a poacher, but the arguments had an effect. Several years later Uncle Ponder confessed to my father that I had influenced his way of thinking, and that he no longer shot fishers or other varmints on sight. Now he enjoys watching them from his deer stand and is excited that wolves have returned to the state—and hangs a fisher photo I took over his bed at our family log cabin.

Wayne D. Spencer
San Diego, California

THE LATEST Around the Campfire ["The Dark Side of American Populism," summer/fall 2003] is a gem. I come from a Scots-Irish, Scottish lowlands clan, many of whom fled to North Ireland. My da came to Canada in his early 20s, just before World War II. Our clan crest is an oak tree in fruit, with a crosscut (frame) saw on the trunk, and the motto "Through." It was struck to commemorate the escape from punishment of a "noble" ancestor (for a slaying), who posed as a woodcutter, and was not captured. This Hamilton, a forester by training, is still posing as a woodcutter, but is really a tree hugger or even a druid.

Lawrence S. Hamilton
Charlotte, Vermont

THE RECENT article in *Wild Earth* on redneck conservation ["Are Rednecks the Unsung Heroes of Ecosystem Management?" summer/fall 2003] was one of the most unusual and provocative pieces in a long time. I've passed it around my department in the College of Agriculture—where redneck-hood is considered, by and large, a moral virtue. With this sort of writing, the Wildlands Project may end up with some new allies!

Jeffrey A. Lockwood
Laramie, Wyoming

I'VE LIKED Charles Bowden since the *Frog Mountain Blues* days. He was always one of those writers that kept you on the page regardless of whatever else you needed to be doing. But his latest contribution to *Wild Earth* takes the cake. "Snaketime" [summer/fall 2003] is, perhaps, the most enjoyable article I've ever discovered in the magazine (and I say that with some reservation, not intending to slight the many other fine writers who populate the rag). More Bowden!

Ned Mudd
Birmingham, Alabama

THE "FACING THE SERPENT" issue [summer/fall 2003] is terrific, perhaps the best ever for my money.

Wes Jackson
Salina, Kansas

IN THE OTHERWISE excellent interview with Paul Ehrlich [summer/fall 2003], there was one thing that concerned me. That was Ehrlich's use of a figure of "409 million" for the U.S. population circa 2050. It seems to me that the reality is likely to be a lot larger number.

I'm not sure where the 409 million figure came from, but in articles on population in the mass media, a figure of 400 million seems to be popular lately. Perhaps this comes from the Census Bureau; if so, we should remember that this agency has consistently underestimated future population projections for decades. Whatever the source, the current rate of population increase simply does not support such low numbers. In the absence of any clear indication of a serious decline in either birth rates or immigration rates (and I fail to see either on the horizon), it seems to me to be wishful thinking to assume such a decline at some indefinite future date. After all, it's possible that future growth rates might even increase, due to unforeseen domestic or global upheavals.

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So let's look at current population growth rates. Between 1980 and 1990, U.S. population grew from approximately 226.5 million to 248.7 million. My very rough math shows this to be about a 10% increase. Between 1990 and 2000, the population grew at an even greater rate, to approximately 281.4 million. That's about a 13% increase in ten years. If we average the rate over the full 20-year period, we get a growth rate of about 11½% per decade. Add 11½% to the 2000 population, and do the same thing every ten years, and the figure for 2050 is very close to 500 million, not 400 million.

It is not at all out of line to compare the U.S. to China. A census of China in 1910 counted 323 million people. China was already considered a densely populated country, with substantial resource depletion. Even if the enumerators in 1910 missed millions, as they no doubt did, the fact remains that at present rates of population increase, in about two decades, the U.S. will be as populous as China was at the beginning of the last century. And during that century, China's population grew to well over a billion—this despite wars and natural disasters that killed tens of millions of Chinese, the out-migration of millions more, and virtually no in-migration.

Would most Americans really want their grandchildren to live in a country as densely populated as China, given the resulting urban overcrowding, diminished open space, and the probable loss of many of the personal freedoms that Americans have long taken for granted? I doubt it. By accepting, without criticism, overly "optimistic" population projections we help foster the complacency that most Americans seem to share today regarding population growth.

Ron Kezar
Ely, Nevada

THANKS FOR publishing the excellent piece of conservation history by Curt Meine ["Conservation and the Progressive Movement," summer/fall 2003]. He captures well the complexity of the movement and personalities. The Progressive Era offers many lessons for modern conservationists. I want to remark on just one: the problem of the state.

Progressives (and conservationists) have generally sought to use (and strengthen) the state as a means of counterbalancing and controlling huge aggregations of private power. More often than not this strategy has backfired. The state has indeed gotten stronger, but rather than checking private power it has usually become its servant. This isn't to say progressives haven't won important battles: there are many good laws on the books. But for every TR and FDR there have been half a dozen business hacks occupying the Presidency.

As progressives and conservationists, we need to rethink our strategy. Can the majority really capture and use the state? In many European countries 60–90% of the working class is organized compared to about 20% in the U.S. Even with that level of organization they have difficulty

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leveraging the state, although public policy is more democratic. Perhaps it is time to think about a more direct response to huge aggregations of private power generated by institutionalized greed.

In early America, corporate charters were granted by state legislatures only for a specific public good. Why else should the public give a group of individuals limited liability and perpetual existence so they might amass wealth if not in exchange for something of equal value? By the 1840s, charters were being passed out like candy, and with the Civil War and industrial revolution the states became positively promiscuous. Great fortunes were made with public protection in a regulatory vacuum until after the turn of the twentieth century. The courts held during this time that much regulation violated the Constitution and that corporations had constitutional rights. Teddy Roosevelt achieved some significant reforms but many historians believe that the corporations ultimately won that round. Another Roosevelt succeeded in checking corporate power decades later, but the last three decades have seen the dismantling of much effective regulation.

With Bush in charge private power can write its own ticket. Does the corporation serve a real public interest? Do its benefits really outweigh its extraordinary costs: the erosion of democracy, the withering of a free press, and the destruction of Nature? Why should their owners be shielded from responsibility for their self-aggrandizing and reckless behavior? Conservationists cannot withdraw from politics or the battle for control of public institutions. But when the other side owns most of the wealth, can pick the public's pocket because they have virtual monopolies, and then use the wealth gained thereby to buy candidates, the political battle is lopsided. Leveling the playing field requires dumping the corporation.

David Johns
McMinnville, Oregon

REMEMBRANCE

Margaret "Mardy" Murie, Voice for Wilderness

(August 18, 1902–October 19, 2003)

THE MORNING AFTER MARDY MURIE DIED I awoke to the sound of her voice. Perplexed at first, I later realized that this was the aspect of her I so admired and loved. Her voice was unforgettable. When we sat by her side for advice, she spoke to us in elegantly straightforward statements. At the end of each thought, she raised her voice slightly so that it became a question. Looking us in the eye with her steady and discerning gaze, she seemed to be asking, What are *you* going to do about this?

What are we going to do now that Mardy's long, illustrious life of service to conservation and community has ended and we can no longer benefit from her wisdom? Inspired by her example, we will move ahead, just as she did after her husband, Olaus, an astute naturalist, activist, and artist, left her some forty years ago. Devastated by his death, she knew she must accept the deep sorrow, build a new life upon it, and carry on. Although remaining gracious in manner, she developed a fierce determination and became a leading voice in the wilderness movement. For her steadfast dedication, she was honored repeatedly with the highest honors bestowed by conservation and environmental organizations and in 1998 received the Presidential Medal of Freedom.

The year 1924 was a landmark one for 22-year-old Margaret Thomas: she became the first woman to graduate from the University of Alaska at Fairbanks; she married a young naturalist with the Biological Survey named Olaus Murie; and by year's end had set forth on a 550-mile boat and dogsled trip to study caribou as their honeymoon. This adventure and many others are recounted in her 1962 autobiography *Two in the Far North*.

Although the Muries never lost their attachment to Alaska, where Mardy was raised and where they spent their early married life, they moved to Jackson Hole, Wyoming, in 1927 where Olaus studied elk, and in 1945 bought a dude ranch in partnership with Louise and Adolph Murie in what is now Teton National Park. It was here the Muries made their home, and raised their three children, Martin, Joanne, and Donald. It was here also that visionaries such as Aldo Leopold and Howard Zahniser met with the Muries to flesh out the basis for the Wilderness Act

More Reaction to the Mountain Biking and Wilderness Debate

ARE BICYCLISTS really so uninterested in protecting nature? Representing the majority opinion within the conservation movement, Dave Foreman, Michael Carroll, and Brian O'Donnell [Wild Earth Forum, spring 2003] seemed to answer "yes," and used

and the Arctic National Wildlife Refuge. The site is now a National Historic District and the home of The Murie Center, a foundation Mardy conceived in collaboration with Teton National Park that is dedicated to carrying on the Muries' legacy of mindful action in behalf of wild Nature.

Through the years, Mardy accepted short assignments for conservation organizations, but always returned to the embrace of her cabin at the foot of the Tetons to carry on her work. She communicated with others by phone or mail or in conversations on her porch or by the fireside, often solving persistent environmental problems over cookies and lemonade. Throughout her busy life, she also took time to judiciously mentor fledgling scientists, writers, and activists such as George Schaller, Terry Tempest Williams, and Ed Zahniser, who must surely carry the lilt of her wise words deep in their hearts.

Mardy spent her last days living in simple elegance with great dignity, close to Nature and friends. Although her passing has left a great void and aching hearts, we can be thankful for and celebrate the example of her life lived with such strength and passion and wisdom. Dedicated to keeping her ethical voice for wilderness alive, we honor this courageous woman and vow to carry her work forward. **—Flo Shepard**

Olaus and Mardy Murie after returning from their honeymoon dogsled trip in 1925

USFWS

Writer and conservationist Florence K. Shepard is professor emeritus at the University of Utah, and serves on The Murie Center board of directors.

that as a reason to write off bicycling as primarily a problem, rather than an opportunity, for wild lands.

Bicyclists stand accused of having a lightweight commitment to conservation. But the real issue at hand is a social conflict of hiking versus biking, and it has religious overtones: my solitude and manner of transcendent experience versus yours.

Foreman argued, "most bicyclists...want an outdoor gymnasium." Most cross-country riders want both nature *and* exercise. How different is that from the hikers who travel 20 miles in a day? Foreman alleged that because we enjoy speed and thrills, bicyclists are not contemplative or appreciative of "self-willed land." Yet he admitted that he routinely runs trails, an activity considered by some to be inappropriate in wilderness.

Carroll and O'Donnell wrote about the need for humility—in contrast with a "what's in it for me?" ethos—yet the wilderness movement is populated by people who love hiking and advocate the personal benefits of a hiking experience. Wilderness advocates also argue that the influx of hikers will boost local economies—an appeal to self-interest. Many wilderness advocates are unable or refuse to distinguish the problem of ecosystem conservation from their personal desires for the traditionally defined "primeval wilderness experience."

The most important consequence of the fight between bicyclists and wilderness advocates is the harm it does to the constituency for conservation. Although I believe that the arguments for banning bikes from wilderness are weak, what I care more about is the ability of the conservation movement to stem the tide of ecosystem destruction. With that in mind, is it worthwhile to alienate the second largest trail group who naturally love the outdoors and share 90% of hikers' values regarding protection of nature?

IMBA (International Mountain Biking Association) has tried to support wilderness as much as possible. We also advocate diversification of America's system of protected public lands. Already America has national parks, national monuments, national wildlife refuges, wild and scenic rivers and more—none of which have a blanket ban on bikes. Congress continues to invent new legal tools, such as the protection areas designated in Colorado.

Unfortunately, the wilderness

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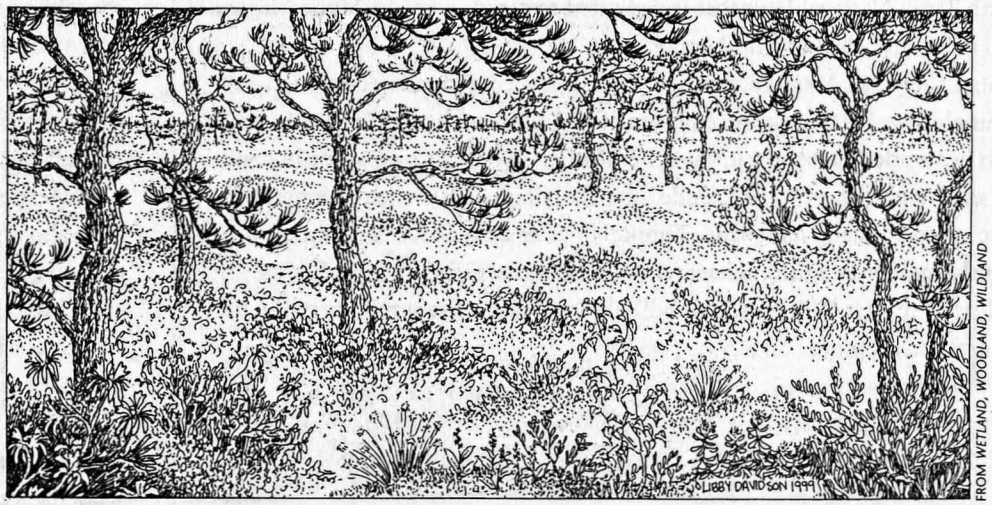


FROM WETLAND, WOODLAND, WILDLAND

Refuge System Centennial

PREPARING FOR THIS ISSUE, the *Wild Earth* editorial team spent a lovely fall day canoeing in the Missisquoi National Wildlife Refuge. (Ah, research!) Just a stone's throw from the Canadian border, the roughly 6500-acre refuge covers much of the Missisquoi River delta, where the river enters a large bay on the eastern shore of Lake Champlain. The refuge is a beautiful place; its wetlands, floodplain forests, and upland communities harbor a diversity of wildlife, from spiny softshell turtles to Vermont's largest colony of great blue herons.

The refuge manager, despite being busy preparing for a celebration later that week to break ground on the refuge's new visitor center, generously agreed to meet with us. Mark Sweeney is an affable and articulate public face of the U.S. Fish and Wildlife Service; a local who returned to manage one of only two national wildlife refuges in the state, he was both charming and forthright about the challenges facing the National Wildlife Refuge System. Some of those challenges are relatively new—monitoring and developing recovery plans for endangered species; coping with the ever-rising tide of invasive exotics; countering rampant illegal off-road vehicle abuse. Other challenges are as old as the system—inadequate funding and piecemeal land holdings; low public profile compared to the other public lands agencies; accommodating diverse users, from birdwatchers to trappers; keeping science shielded from political influence.

Equal parts biologist, police officer, administrator, game warden, environmental educator, and diplomat, few jobs require such an array of skills as a refuge manager. While I've had only passing interaction with Mark Sweeney, I suspect that his admirable professional qualities are typical of his peers who oversee 543 units comprising roughly 92 million acres in the Refuge System. Those refuge managers and their colleagues in the Fish and Wildlife Service (FWS) are charged with protecting an extraordinary array of natural habitats, and helping inculcate a conservation ethic in the body politic. A tall order, and all the more daunting as they work in the long shadow of giants: Rachel Carson, Olaus Murie, Ding Darling, Teddy Roosevelt...the list of conservation heroes associated with the agency is long.

In this *Wild Earth*, we honor that rich legacy—but even as we celebrate the Refuge System centennial, it is

pitch pine woodland bog, Missisquoi Refuge, Vermont, pen-and-ink by Libby Davidson

useful to acknowledge some darker moments in conservation history as well. Through the early decades of the twentieth century, Americans continued a massive anti-predator campaign that had commenced with European settlement, and they were abetted by federal agencies including the National Park Service and the Biological Survey (precursor of the FWS). While some progressive sportsmen and scientists such as Aldo Leopold, Victor Shelford, and Olaus and Adolph Murie challenged the dominant attitude that wild carnivores were "killers" and "vermin" that needed to be eliminated from the land, they initially made little headway. The Muries, two of the finest field biologists of their era, were decades ahead of most of their contemporaries in understanding the vital ecological role that large carnivores play in healthy landscapes.

Adolph, who wrote the definitive works on grizzly bears and wolves in Mt. McKinley (now Denali) National Park, was sent by the Park Service to Washington State's Olympic Peninsula in the mid-1930s to determine whether wolves were extinct there. Despite the creation of 600,000-acre Mt. Olympus National Monument by Teddy Roosevelt in 1909, the settlers' guns, traps, poison, and government bounties had taken their toll. Murie confirmed that wolves were gone from the area, and recommended the Park Service consider reintroducing them to the Olympic Mountains. The recommendation was ignored; it would take 60 years before wolves would be returned to a national park, in Yellowstone, in 1995.

Olaus Murie, who began his career with the Biological Survey in 1919, spent 25 years doing pioneering wildlife research before becoming president of the newly formed Wilderness Society. Olaus was more persecuted than Adolph for his enlightened views toward carnivores; for a time he was actively prevented from publishing and attending scientific conferences by his superiors.* In a private memo to Biological Survey Chief Paul Redington in 1929,† Olaus wrote of the "rising tide of protest throughout the country against the control activities of the Bureau....The public is more and more pleading for a place in our Nature scheme for our predatory animals" and he warned the agency not to ignore such sentiment, which is "an intimate part of the modern interest in wild life." A forward thinker about biological systems and the responsibilities of government agencies, he went on to issue a subtle challenge to the director:

> Here, it seems to me, is a fertile field for the Biological Survey. An opportunity to size up the trend of current popular thought, vision its outcome, and shape a policy that will meet with the approval of future generations. Popular feeling, like the "Balance of Nature" is not stable, but is growing in definite directions, and we would do well to anticipate the future whenever we can. It gives us a chance to use our utmost intelligence and skill as a fact finding body, and our best diplomacy in meeting conflicting demands.

Then or now, there could be no better advice for public lands managers: under an overarching mandate for conservation, use the best available science to inform public policy consistent with evolving public values. It's a tremendous challenge, of course, for an agency so intimately tied to one extractive use—hunting—to sustain that important tradition while shedding the archaic view of managing habitats to produce maximum yield of "game,"‡ and embracing ecosystem management that emphasizes the health of the entire land community. It will be particularly interesting to see how the Refuge System changes as some older refuge managers steeped in a "duck factory" ethos are replaced by a generation whose professional training has been informed by developments in conservation biology.

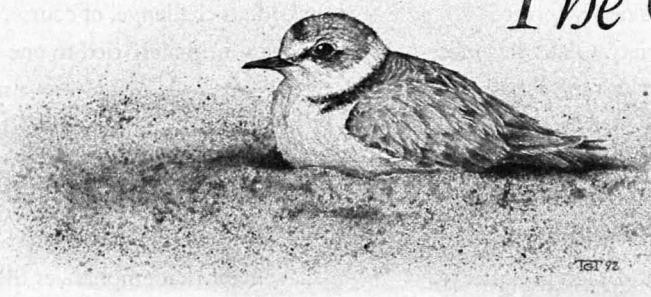
It is clear to me that popular feeling is "growing in definite directions"—toward accommodation and respect for predators, toward an ecologically oriented management approach for all public lands, toward an appreciation of wild places and creatures' intrinsic value. These sentiments will only continue to grow as Americans look to public lands to supply values that private lands increasingly do not, including opportunities for hunting and other backcountry recreation. As the National Wildlife Refuge System begins its second century, conservationists should keep working to curtail ecologically destructive activities such as livestock grazing, oil and gas production, and motorized recreation on this continental network of lands protected for wildlife. That would be a fitting way to celebrate the 100th birthday of the Refuge System.

~ Tom Butler

* Mark Madison, U.S. Fish and Wildlife Service Historian, personal communication, 10/30/03.

† That memo, dated April 30, 1929, was typed by Olaus's wife Mardy Murie at their home in Jackson, Wyoming. Mardy Murie, a legendary figure in the American wilderness movement, died in October at age 101 (see Remembrance, page 6).

‡ The industrial mindset of manufacturing "game" for sportsmen runs very deep in the agency, and is even reflected in land management designations ("national game range," "waterfowl production area," etc.).



The Conservation of Wild Life

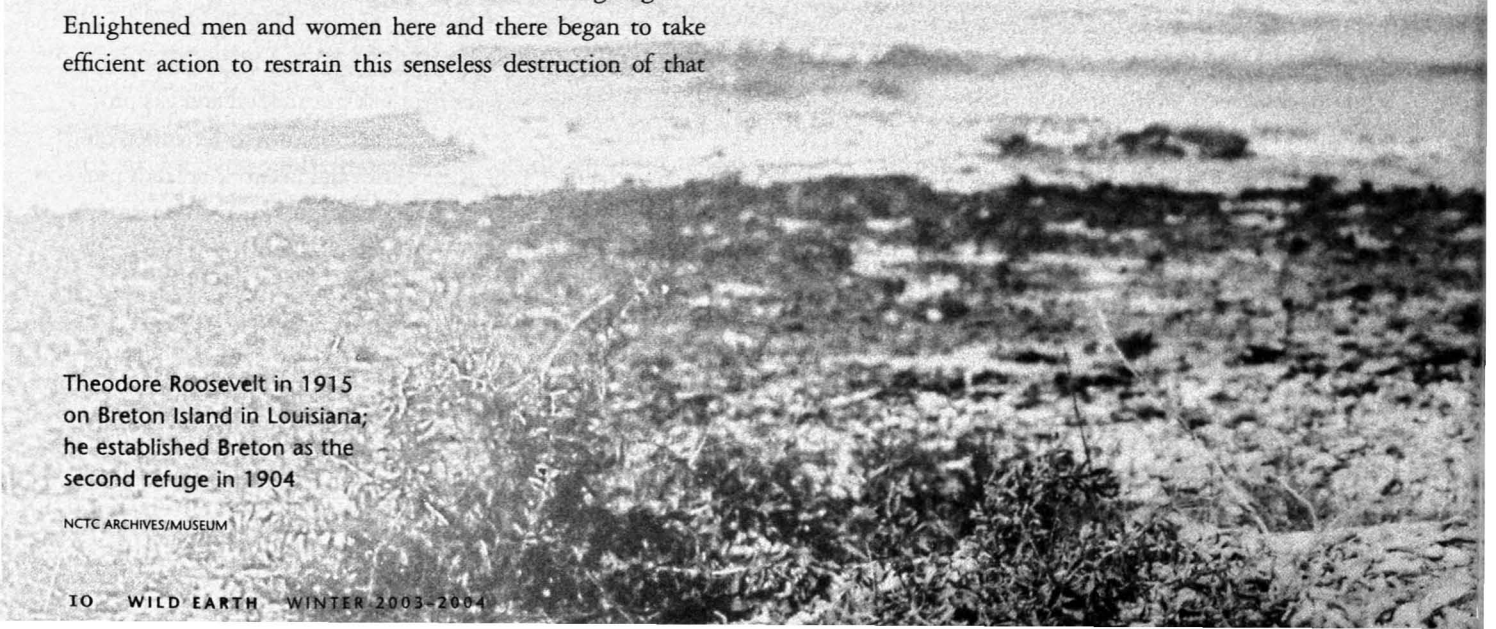
by Theodore Roosevelt

IT IS DEEPLY DISCREDITABLE to the people of any country calling itself civilized that as regards many of the grandest or most beautiful or most interesting forms of wild life once to be found in the land we should now be limited to describing, usually in the driest of dry books, the physical characteristics which when living they possessed, and the melancholy date at which they ceased to live.

Ever since man in recognizably human shape made his appearance on this planet he has been an appreciable factor in the destruction of other forms of animal life, and he has been a potent factor ever since he developed the weapons known to the savages of the last few tens of thousands of years. But modern weapons have given a tremendous impetus to this destruction. Never before were such enormous quantities of big beasts and large birds slain as in the nineteenth century. Never before was there such extensive and wasteful slaughter of strange and beautiful forms of wild life as in the century which saw the greatest advance in material civilization and the most rapid spread of the civilized peoples throughout all the world.

Towards the end of that century a few civilized nations wakened to a sense of shame at what was going on. Enlightened men and women here and there began to take efficient action to restrain this senseless destruction of that which, once destroyed, could never be replaced. Gradually they roused a more general sentiment, and now there is a considerable body of public opinion in favor of keeping for our children's children, as a priceless heritage, all the delicate beauty of the lesser and all the burly majesty of the mightier forms of wild life. We are fast learning that trees must not be cut down more rapidly than they are replaced; we have taken forward steps in learning that wild beasts and birds are by right not the property merely of the people alive today, but the property of the unborn generations, whose belongings we have no right to squander; and there are even faint signs of our growing to understand that wild flowers should be enjoyed unplucked where they grow, and that it is barbarism to ravage the woods and fields, rooting out the mayflower and breaking branches of dogwood as ornaments for automobiles filled with jovial but ignorant picnickers from cities.

In the present century the new movement gathered head. Men began to appreciate the need of preserving wild life, not only because it was useful, but also because it was beautiful. Song birds, shore birds, waterfowl, birds of all kinds, add by



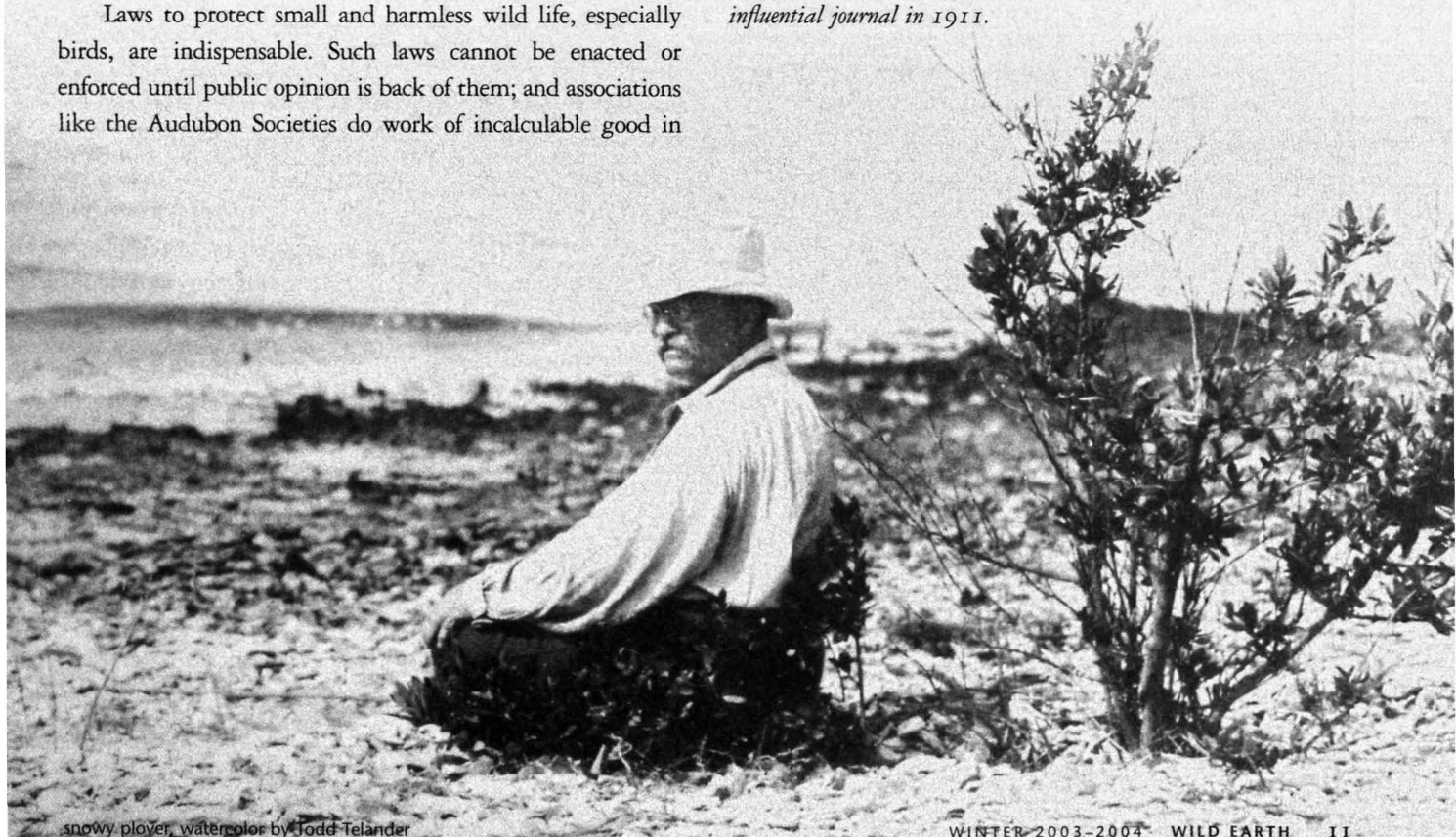
Theodore Roosevelt in 1915 on Breton Island in Louisiana; he established Breton as the second refuge in 1904

NCTC ARCHIVES/MUSEUM

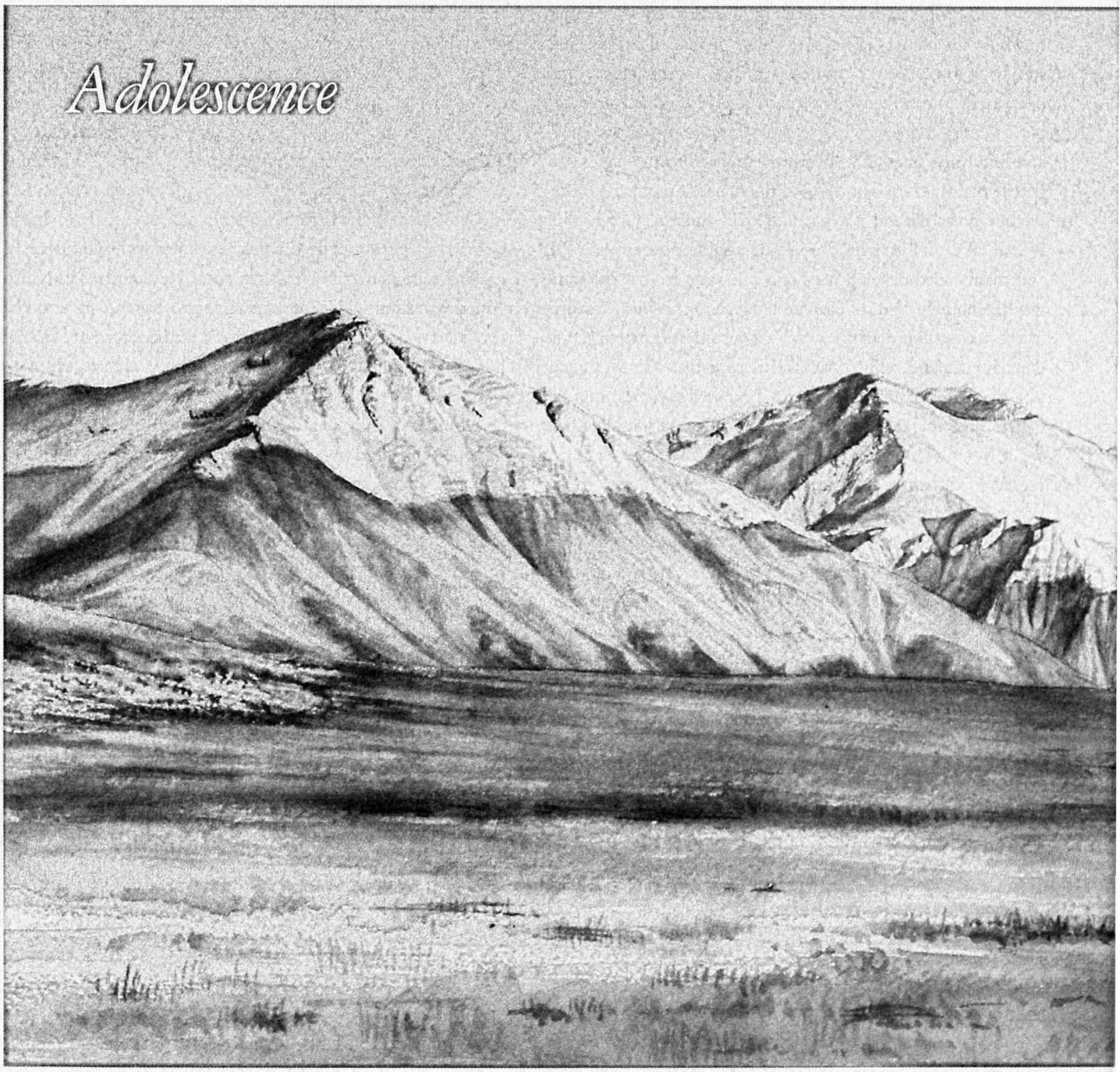
voice and action to the joy of living of most men and women to whom the phrase "joy of living" has any real meaning. Such stately or lovely wild creatures as moose, wapiti, deer, hartebeeste, zebra, gazelle, when protected, give ample commercial returns, and, moreover, add to the landscape just as waterfalls and lofty pine trees and towering crags add to the landscape. Fertile plains, every foot of them tilled, are of the first necessity; but great natural playgrounds of mountain, forest, cliff-walled lake, and brawling brook are also necessary to the full and many-sided development of a fine race. In just the same way the homely birds of farm and lawn and the wild creatures of the waste should all be kept. It is utterly untrue to say, as demagogues and selfish materialists sometimes unite in saying, that "the game belongs to the people"—meaning the loafers and market gunners who wish to kill it, and the wealthy and lazy gourmands who wish to eat it, without regard to the future. It is true that the game belongs to the people; but this rightly means the people who are to be born a hundred years hence just as much as the people who are alive today. In the same way, persons who own land, and, above all, persons who merely visit or pass through land, have no more right wantonly or carelessly to destroy birds or deface scenery than they have to pollute waters or burn down forests or let floods through levees. The sooner we appreciate these facts, the sooner we shall become a really civilized people.

Laws to protect small and harmless wild life, especially birds, are indispensable. Such laws cannot be enacted or enforced until public opinion is back of them; and associations like the Audubon Societies do work of incalculable good in stirring, rousing, and giving effect to this opinion; and men like Mr. Hornaday [author of *Wild Life Conservation*, published by Yale University Press in 1914] render all of us their debtors by the way they efficiently labor for this end, as well as for what comes only next in importance, the creation of sanctuaries for the complete protection of the larger, shyer, and more persecuted forms of wild life. This country led the way in establishing the Yellowstone Park as such a sanctuary; the British and German Empires followed, and in many ways have surpassed us. There are now many such sanctuaries and refuges in North America, middle and South Africa, and even Asia, and the results have been astounding. Many of the finer forms of animal life, which seemed on the point of vanishing, are now far more numerous than fifteen years ago, having by their rapid increase given proof of the abounding vigor of nature's fertility where nature is unmarred by man. But very much remains to be done, and there is need of the most active warfare against the forces of greed, carelessness, and sheer brutality, which, if left unchecked, would speedily undo all that has been accomplished, and would inflict literally irreparable damage. ☾

Theodore Roosevelt *(1858–1919) was the 26th president of the United States, holding the office from 1901–1909. This essay is excerpted from a review he wrote for the January 20, 1915, edition of the weekly* Outlook. *Roosevelt became a contributing editor for the influential journal in 1911.*

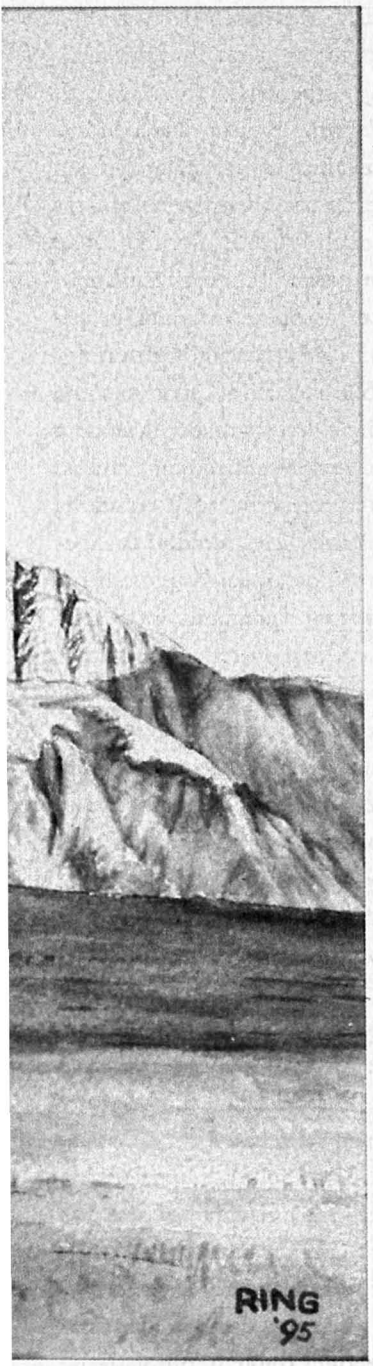


snowy plover, watercolor by Todd Telander



The Arctic Refuge debate, then, is a time to clarify. If self-awareness is actually going to prove biologically adaptive, and if technologies to manufacture oil are not within sight, we will need an alternative to engineering our way out of this predicament.

Arctic Refuge landscape, watercolor by Martin Ring



by Barry Lopez

THE BEAST LOOMING NOW on our horizon—the physical fate of human beings—is a specter few in Washington seem able to measure. In the burly metaphors of war and gamesmanship, human vulnerability is merely another enemy for America to defeat. And we know how to defeat an enemy. We can design and deploy smart weapons, boost consumption, and eradicate smallpox. We will certainly find a cure for AIDS.

In the long view, from *Australopithecus africanus,* scavenging hyena kills in southern Africa, to *Homo sapiens,* taking a six iron to a golf ball on the walled plain of Fra Mauro, such claims sound vainglorious. To put it tactlessly, the bravado is coach-talk, delivered to a team of young basketball players down by ten at the half at the state championships. In its place the pep talk is both appropriate and useful, but it is not equal to the breadth of this subject, the pending fate of humanity. "The fate of humanity" seems to many an overblown characterization of the problem, but this is only because we automatically assume we control our destiny in every crisis, that even biological problems—population growth, our essential need for fresh water and protection against solar radiation—are simply challenges, barriers through which we will engineer a breach.

It is sobering to consider in this context the quick extinction, the pull of the light cord, for *Pliopithecus vindobonensis* and ten or so other Miocene primates about 11 million years ago in what we today call eastern Europe. The still popular Victorian idea of "improvement" in the human line of descent does not figure in here. These apes ceased to exist because the climate changed and they were not adaptable. Other, related creatures, including our own Miocene ancestors, were.

In distinguishing ourselves from all other animals, we have put such emphasis on the development of the brain and consciousness, we've all but lost sight of the fact that we cannot, no more than *Homo neanderthalensis* could, think our way out of every tight situation. We must face the limitations of our biology, especially the measure of its resilience in a rapidly changing environment. It makes no difference, biologically, whether we ourselves change our environment by altering greenhouse gas chemistry or, as was the case in the Miocene, tectonic activity causes climatic change. Either way, the organism must prove adaptable if it is to survive.

What is unique for us as a species is that, to a degree unknown in any animal before us, our culture will affect our potential for survival. Our cultural behavior, which has helped create the environment we are now at pains to adapt to, will also limit, as a component of our biology, our ability to adapt. Consciousness, in other words, 40,000 years after its dazzling emergence in Aurignacian Europe, might ultimately prove maladaptive.

Many therapists have compared the rationale behind each obdurate defense of American consumerism to the elaborate strategies of denial employed by addicts. Their indictment is pointed at the rhetoric of government apologists and business promoters who, the thinking goes, routinely offer self-delusional explanations (from a biological perspective) for why we can't survive without increased consumer activity, additional oil-based technologies, faster data processing, and lunar mining ventures. Faced with

critical habitat issues—inadequate arable land, deforestation, the management of human and industrial waste—humanity needs these no more than an addict needs the next dose of heroin. Most everyone in government, however, is afraid to say this unequivocally; and many business people fear the economic consequences of the change that is implied.

All of us, of course, share that fear.

We are essentially addicted to petroleum. If prudence dictates we try to break the addiction before the last reserves are drained, then we have to draw a line in the dirt. It doesn't really matter where, whether it's with the high-profile reserve said to lie beneath the Arctic National Wildlife Refuge or at an obscure reserve known only to a few petroleum geologists probing the South China Sea. It matters no more than which site Gandhi chose for his initial Satyagraha, his first nonviolent act of civil disobedience.

When you draw the line, you proclaim simultaneously not one but two courses of action: reduced consumption, and an alternative economics that will allow solar power and other alternatives to flourish. This story—where and when do prudent people draw the line—has by now become a threadbare scenario. The intent of the Bush government to prospect for petroleum in the Arctic Refuge, however, creates the opportunity for an illumination. We can address our scary dependence on oil, even while reservoirs of that other, more precious liquid, water, are draining away the world over. If we have the courage to speak without mincing words, then the biological alert will sound: *Homo sapiens'* time is on the verge of radical rearrangement, if not eclipse.

The Arctic Refuge debate, then, is a time to clarify. If self-awareness is actually going to prove biologically adaptive, and if technologies to manufacture oil are not within sight, we will need an alternative to engineering our way out of this predicament.

Is there ground between "lock it up" and "drain it" that we haven't explored? I believe there is.

In many traditional societies, perhaps as far back as *Homo erectus,* people argued when seemingly intractable problems arose. In contemporary traditional societies, the process usually works like this. People (most often people who have cared well for children) present their views and then wait, as attentively and patiently as they can, while others present theirs. After everyone has had a chance to speak, a second group, recognized by everyone present as "senior" people or elders, does something undemocratic. It makes a decision. Everyone defers to this position, however, because, in essence, elders are not distracted by the present. They speak from an overriding past, the tested wisdom that has gotten everyone to this juncture. The difference is between weather-based thinking, with its fears and options anchored in the present, and climate-based thinking. (The elders listen, first, because their decision is not predetermined. Climate reflects the measure of *every* weather system that moves through.)

Our deep predicament in the Arctic Refuge stems from the collapse and obliteration of a coterie of senior people among us. The experts we routinely call upon for testimony—biologists, economists, bureaucrats of various sorts, philosophers, native leaders, the elderly—almost invariably speak from the perspective of present circumstances. Testimony from a transcending perspective, if it comes, is often dismissed as impractical. With such a (deadly) arrangement, opinion, well informed or not, overrides philosophy. Senior people are put on a footing with computer modelers.

We might argue, with respect to the Arctic Refuge, that elders from among the traditional occupants of that land might speak for all of us. But this will not work. What is at stake is multicultural. No culture has ever been in precisely this situation. We need a "wisdom of the elders" that we must in fact make up as we go along. (Given our blistering pace, of course, many believe we will be overtaken by disaster before we are able to implement any such supposed wisdom.)

The decision to be made on the Arctic Refuge, it seems to me, is not whether or not to prospect for oil. It's whether someone in nominal authority—a federal president, a state governor, a secretary of the interior—will have the courage to choose to draw the line. Beyond that declaration, we require people who can think in the great stretches of time that are the natural habitat of the elders. We require a council of such men and women, to restore the sense of composure that has distinguished valued human life since the advent of culture.

In the transition from *Homo erectus* to early *Homo sapiens,* it is striking to find that new tools do not turn up. The same Acheulean stone industry carries right through. But with the transition from archaic to fully modern *Homo sapiens* (perhaps due to a change in the organization of the brain among one population of *Homo sapiens* living 50,000 years ago in Africa), the most dramatic shift in the evolutionary line of *Homo* takes place. Whatever the subtle biological change, it brought with it the potential for Hammurabi's codex, the architecture of Chartres, the poetry of Blake, and the technologies of electronic processing and linkage. It is such a change in awareness as this, I believe, not a new tool, that calls to us now.

Wilderness outfitters have long known of a remarkable and haunting modern-day phenomenon. A confirmed government bureaucrat or big-business executive is introduced to a landscape undisturbed by any social or economic scheme of mankind. The response is frequently one of increasing discomfort, even bewilderment, that such places continue to go on the chopping block. It is as though they had found a lost perspective, rather than discovered an unknown one. Back in their offices, however, the recovered awareness diminishes, and it is finally extinguished before the modern insistence on expediency and conformity. What began as a profound repossession of human meaning becomes, once again, a vision for humanity narrowly defined by profit men and polls, programmers and paperbenders.

An awakening to transcendent views and a subsequent confusion about how to apply that wisdom is characteristic of an adolescent frame of mind. Typically, adolescents also believe adults have misconstrued this same wisdom, and that their decisions need to be questioned. Questioning the stance of the elders has worked well historically to keep human societies resilient, but only when elders have actually been present. In a culture like ours, where adolescent motivation, adolescent aspiration, and adolescent reasoning are essential to the continued growth of our consumer-based economy, and where many middle-aged people resist focusing on the essential tasks of parenting and providing (beyond financial support), adolescent orientation is a disaster. More than long-term stability, what an adolescent mentality wants is to win the state championship and to win big. It perceives ethics as a necessary inconvenience, self-denial as weakness, and wisdom as an impediment to innovation. It wants biological fitness to be only a problem in engineering.

We can't afford this anymore.

What should come out of addressing the fate of the Arctic Refuge is not a debate about drilling, but a group of adults strong enough to take an adolescent culture firmly in its grasp. ☾

For over thirty years, writer **Barry Lopez** *has lived on the McKenzie River in the Oregon Cascades. His most recent books include a collection of short stories,* Light Action in the Caribbean *(2000), and a collection of essays,* About This Life *(1998).* *This essay appeared in the collection* Arctic Refuge: A Circle of Testimony *(Milkweed Editions, 2001) and is used with permission of Sterling Lord Literistic, Inc. (©2001 by Barry Lopez).*

And They Thought We Were Talking About Caribou

In the dream geologists report there is a 95% chance
of drilling 16 billion barrels of dinosaur blood
from the Arctic National Wildlife Refuge,
the land Gwich'in caribou hunters call
"The sacred place where life begins."

So we drill and destabilize the Earth's rotation.

Next, there is a massive pole shift.
The Pacific Ocean flows into Phoenix, Arizona.
So the Phoenix Legend continues its circular story
until separateness is recognized as illusion
by some future remnant of humans.

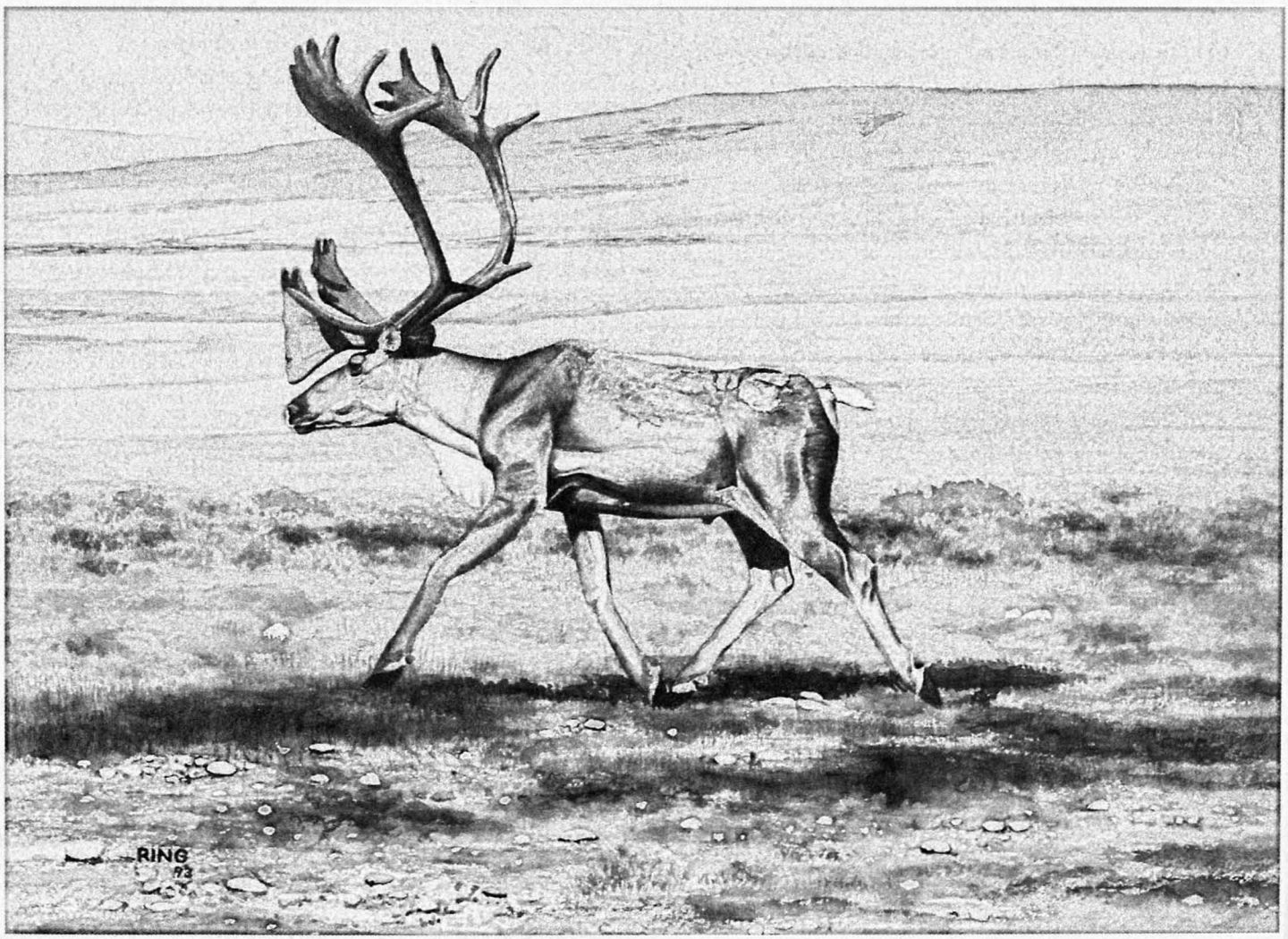
Scott T. Starbuck

Treat each bear as the last bear.
Each wolf the last, each caribou.
Each track the last track.
Gone spoor, gone scat.
There are no more deertrails,
no more flyways.
Treat each animal as sacred,
each minute our last.
Ghost hooves. Ghost skulls.
Death rattles and
dry bones.
Each bear walking alone
in warm night air.

Gary Lawless

We Are the Ones Who Have Everything To Lose

by Sarah James



caribou, Arctic Refuge, watercolor by Martin Ring

MAYBE THERE ARE TOO FEW of us to matter. Maybe people think Indians are not important enough to consider in making their energy decisions. But it's my people who are threatened by this development of the Arctic Refuge. We are the ones who have everything to lose.

We are the caribou people. Caribou are not just what we eat; they are who we are. They are in our stories and songs and the whole way we see the world. Caribou are our life. Without caribou we wouldn't exist.

From the time I was very young, I remember my father going out hunting. He had a trapline up on the Salmon River, a hundred miles from his nearest neighbor. I had seven brothers and sisters and we had to work to survive. I helped with chores every day. I cut wood, snared rabbits, fished for grayling. Sometimes I'd go beaver snaring with my father, to help him and to learn the way. I never went to school until I was 13, but I learned from living out in the wilderness, our natural world. It's a good life—fishing, hunting, gathering berries and roots.

We never got bored. In fall we had ice skating and fishing. In winter we played in snow drifts. And in the evenings my older brother, Gideon—he's chief at Venetie now—would read to us. My dad would make snowshoes and toboggans and harnesses—everything that we used. And we would help with that. Our mom—everything that we wore, she sewed. And she did the tanning, fur sewing, and beadwork.

In June of 1988, our Gwich'in elders got concerned about the oil companies wanting to go drill where the caribou have their calves. So they called a meeting in Arctic Village. People came in from all our villages. Some paid to bring their whole families. Our chiefs went up into the hills and around a campfire they made a pact to protect the birthplace of the Porcupine Caribou Herd and our Gwich'in way of life.

We learned a lot from that Exxon *Valdez* oil spill. We've still got clean air and water and we want to keep it that way. There are places that shouldn't be disturbed for anything. Some places are too important, made especially for the animals. The calving grounds must be left alone.

We've heard Roger Herrera from British Petroleum say, "It's inevitable that these Gwich'in people will have to change." But we don't want to change our way of life. We have been here for thousands of years. We know the weather, the animals, the vegetation, and the seasons. We are capable of living up here if others would only respect our ways and our judgment.

The oil companies keep saying that all their roads and pipelines aren't going to bother the caribou. But we know the caribou. We know they don't like all that stuff, especially when they are having their calves. We are concerned about all the salt and chemicals they put on their roads. It can drain onto the tundra, get into the water, and be unhealthy for the young caribou. A report from the Canadian government tells us that the caribou have already been disturbed around the oil fields. If we lose the caribou there will be no more forever.

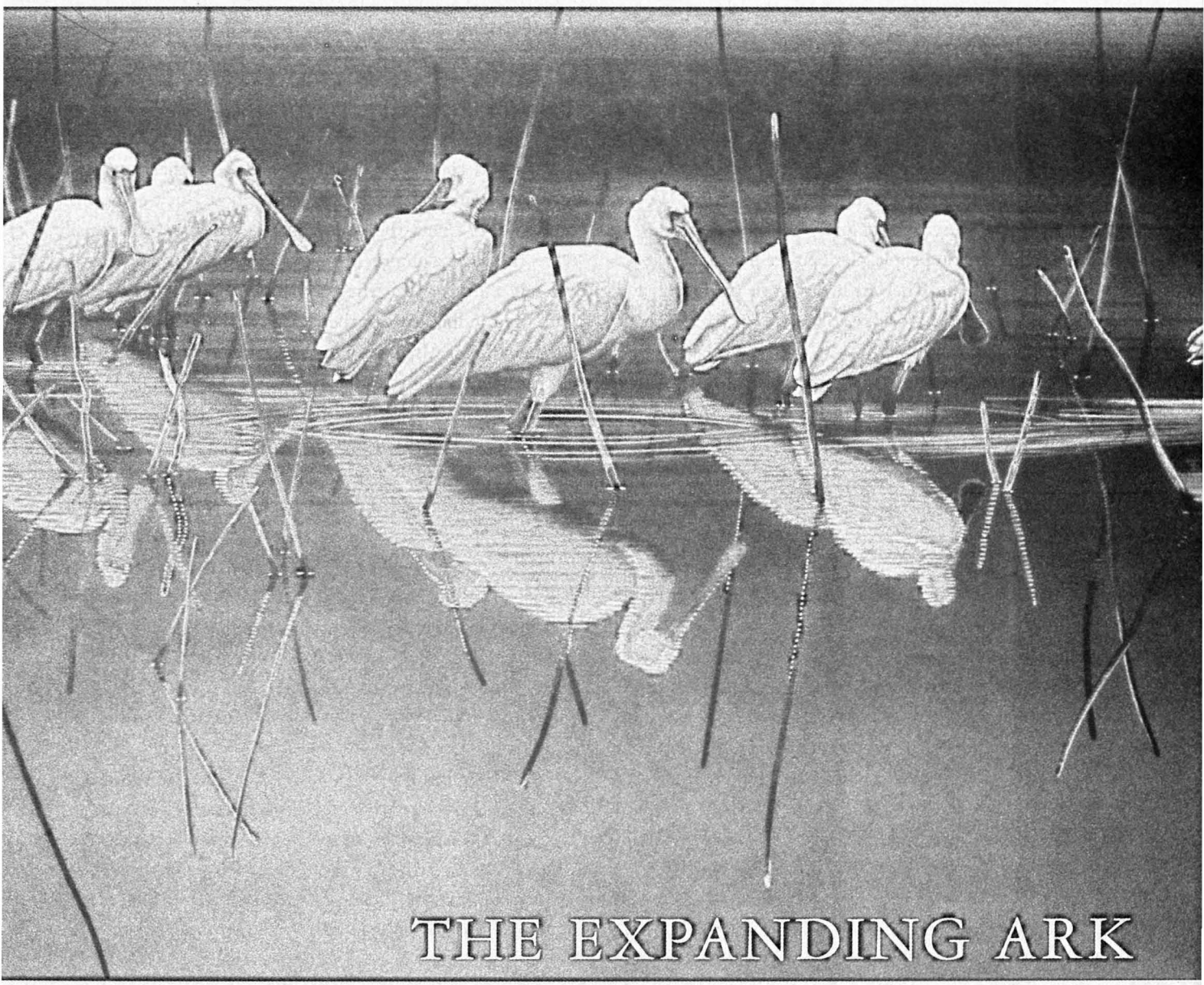
But our fight is not just for the caribou. It's for the whole ecosystem of Gwich'in country, which covers northeast Alaska, the northern part of the Yukon Territory, and the McKenzie Delta. And our fight is a human rights struggle—a struggle for our rights to be Gwich'in, to be who we are, a part of this land.

The coastal plain itself is a birthing place for so many creatures that we call it "Where Life Begins." Fish come here from the Arctic Ocean to spawn. Polar bears den along the coast. Wolves and grizzlies and wolverines have their young here. And many kinds of birds from different parts of the world come here to nest.

We have proposed a biocultural preserve to protect the land and Native people, and the wild creatures on both sides of the Alaskan-Canadian border. We've also asked for wilderness status in the Arctic Refuge because that looks like the best way to protect our culture from all this industrial pressure.

We know the oil companies will come at us again. More battles lie ahead. We have to protect the caribou. It will be hard. We have to work together. The Gwich'in are going to fight as long as we need to. We know that without the land and the caribou we are nobody. ☾

Sarah James *is a Neets'aii Gwich'in Indian from Arctic Village, Alaska, who serves as chair and spokesperson of the Gwich'in Steering Committee. She has traveled around the world to address the issue of oil drilling in the Arctic National Wildlife Refuge and to speak on behalf of the Gwich'in Nation. Her leadership has been honored with numerous awards, including the Goldman Prize and the American Land Conservation Award.* *This essay first appeared in* Arctic Refuge: A Circle of Testimony, *compiled by Hank Lentfer and Carolyn Servid (Milkweed Editions, 2001) and is used with permission of the author.*

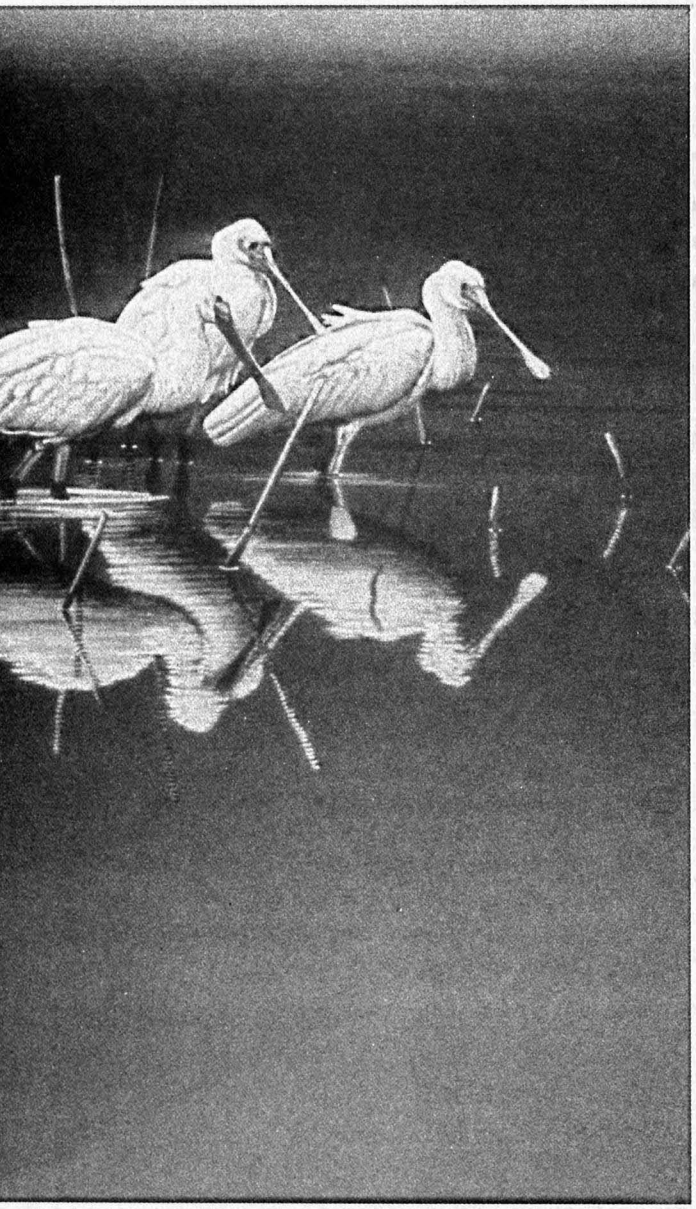


THE EXPANDING ARK

100 Years of Wildlife Refuges

THE MORNING OF MARCH 14, 2003, was bright and muggy as a crowd gathered along the sand and grass of a barrier island on the east bank of Florida's Indian River. The occasion was the opening of the new Pelican Island National Wildlife Refuge Centennial Boardwalk, the first of a series of refuge centennial events around the country. It was the culmination of two years' work for the Pelican Island refuge staff, whose dedication to the natural and human heritage of this place had made them the focus of the nation, if only for a few moments. The ceremony went quickly as the politicians cut a ribbon and posed for the cameras. Visitors then wandered up the long incline as the 100-year his-

roseate spoonbills, acrylic by Steve Oliver



by STEVE CHASE and MARK MADISON

tory of the National Wildlife Refuge System passed beneath their feet: more than 540 inscribed planks in total—a wooden timeline marking the creation of each national wildlife refuge. At the top, the guests were rewarded with a view of the tiny mangrove island that, on March 14, 1903, had become the nation's first national wildlife refuge.

Although a few acres smaller than 100 years ago due to erosion from powerboat wakes, the island had otherwise remained largely unchanged in the century since its protection. The pelicans and other migratory birds still rested on its small trees and tiny expanse of sand, presenting an illusion of a changeless system, keeping populations of wildlife safe amidst a storm of development and habitat loss. Yet Pelican Island, although iconic, does not capture the whole story of the National Wildlife Refuge System. While this first refuge has largely retained its original function as a preserve for migratory birds, the system continues to evolve from its initial mission. The newly installed planks of Pelican Island's boardwalk give the impression of a gradually expanding system reacting to the steady progress of a nation and its conservation priorities. But a closer examination of the inscribed refuge planks tells a different story.

Astute observers would note the paucity of planks in the 1910s and 1920s, the abundance of new planks reflecting the 1930s, the early 1970s, and 1980. Predictably inertial throughout most of its history, the National Wildlife Refuge System has undergone periods of dramatic change in response to ecological crises mediated through the science, politics, and culture of a dynamic nation. These periods of growth and stasis mirror the history of American conservation.

The Origins of Species Protection: 1903–1909

In 1881, a family of German immigrants built a house on the western bank of the Indian River near Sebastian, Florida. The Kroegels' teenaged son Paul reveled in this new environment, becoming fascinated with the pelicans that would fly by and congregate on the islands along the river. The large birds reminded him of Germany's native storks. Kroegel also witnessed neighbors and tourists sailing by the islands, shooting any bird they could see.

By the late 1890s, he had seen enough of this carnage, and began placing his boat between his favorite rookery, a tangle of mangrove called Pelican Island, and the shooters. The diminutive Kroegel attempted to add stature to his authority by wearing a large hat and bearing a double-barreled 10-gauge shotgun. Beyond the hat, gun, and gumption there was little substance protecting the island. This last great Floridian brown pelican rookery faced likely obliteration.

At the turn of the century, much damage had already been done to wildlife populations along the Indian River. For several decades, boatloads of market hunters would pass Pelican Island, shooting pelicans, roseate spoonbills, and white ibises that perched in the island's tangle of mangrove. This was a common pattern across the country in the years after the Civil War. The industrial revolution was creating enormous changes in

American society, which in turn put great stress on a spectrum of American wildlife—from bison to tiny shorebirds. The dawning realization that human action could cause the extinction of other species was one of the most important scientific insights of the late nineteenth century. The passenger pigeon's plight was the cautionary tale of extinction as billions of birds were killed through market hunting and habitat destruction, finally leaving a lone bird named Martha in a cage at the Cincinnati Zoo.[1] If one of the most gregarious and abundant bird species ever to exist on the planet could be extinguished in the course of a generation, naturalists wondered, did a similar fate await many other kinds of wildlife?

The brightly plumed birds of coastal Florida were certainly at risk. Many of these birds had limited and predictable breeding and feeding grounds and were easily decimated by greedy market hunters feeding urban stomachs and fashion's plume industry. Florida, at the turn of the century, was a rural place, and the frontier ethic of shooting what you need to survive was fully entrenched in the local culture. The problem at Pelican Island had not gone unnoticed by scientists at the National Audubon Society, the American Ornithologists Union, and the Bureau of Biological Survey. These parties went to work to secure federal protection for Pelican Island, but by 1903 they had made only modest headway in that goal. Rapid action was necessary.

Fortunately, the president of that era prided himself on being a man of action. Theodore Roosevelt was a proud hunter, angler, rambler, and birder. Each day in the White House, Roosevelt would reserve time for the study of ornithological journals.[2] Frank Chapman, founder of the journal *Bird-Lore* and a friend of Paul Kroegel, had informed the president of the great toll on Pelican Island's avian wildlife, and requested federal help. With reports from his Secretary of Agriculture and prominent naturalists about the endangered birds of Pelican Island, Roosevelt asked the critical conservation question, "Is there any law that will prevent me from declaring Pelican Island a federal bird reservation?"[3] Since there was nothing to prevent him from doing the right thing at the right time, Roosevelt signed the executive order protecting Pelican Island on March 14, 1903, and began a new era for wildlife conservation.

Paul Kroegel became the first refuge manager, and found that federal designation proved a more effective deterrent than his gun and big hat. He served in that role until he was forcibly retired in 1919 by a thrifty postwar government. Kroegel's untiring protection of the brown pelicans both before and after he was a federal conservationist stands as a worthy example to the thousands of refuge employees that followed. But Theodore Roosevelt's role was equally pioneering. Never before had land been set aside exclusively for wildlife protection by executive order. Not one to take half measures, Roosevelt institutionalized this novel idea, creating 51 bird reservations and 4 big-game preserves during his eight years in office. On one day—February 25, 1909—he set aside 17 different wildlife reservations throughout the Rockies and far West. Theodore Roosevelt and his progressive ideas had kindled a new conservation movement whose outlook he described in 1915:

> Defenders of the short-sighted men who in their greed and selfishness will, if permitted, rob our country of half its charm by their reckless extermination of all useful and beautiful wild things sometimes seek to champion them by saying that "the game belongs to the people." So it does; and not merely to the people now alive, but to the unborn people. The "greatest good for the greatest number" applies to the number within the womb of time, compared to which those now alive form but an insignificant fraction.[4]

Despite Roosevelt's flurry of activity, his patchwork of refuges did not emerge as a coherent system in the first decades of their existence. The individual reservations were largely isolated islands of conserved land without connection to other refuges or larger natural habitats. It took a combined economic and ecological disaster in the 1930s to create a system out of the parts.

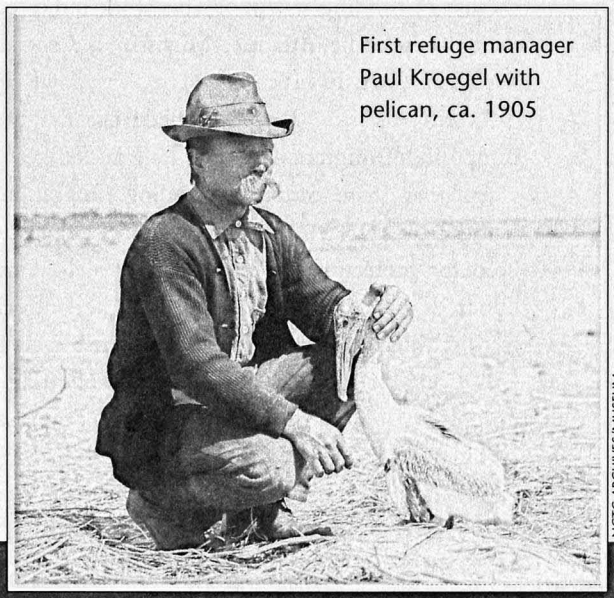
From Reservations to a Refuge System: A New Deal for Wildlife, 1933–1942

J. Clark Salyer II stepped on the accelerator, took another gulp of coffee, and pointed his car back onto the road. The setting sun was just above the horizon and directly in Salyer's face as he bumped along the prairie road, roaring past another abandoned farmstead, its metal windmill spinning wildly as it pumped only air out of the dry well. The land was tinder dry and a steady wind blew curtains of dust along the road. He rolled up his window, preferring to face the heat of the car rather than

choke. Afraid of flying, Salyer was used to the 36 hours of travel time it took him to go the 1600 miles from Washington, D.C. to North Dakota's Lower Souris region. It gave him time to think, to plan, to dream. There were still several hours to go before he reached his destination, an area south of the Canadian border that had once been covered by glacial Lake Souris. Ahead, over the horizon, he could see a descending flight of geese landing on a remnant wetland. He pulled a tattered map into his lap and drew a circle where he thought the birds might be settling down—another potential area of interest for the Refuge System.

As the point man on refuge acquisition for Bureau of Biological Survey Chief J. N. "Ding" Darling, Salyer would race his government-issued car from meeting to meeting, sometimes 600 miles apart, fueled by his passion to protect wildlife habitat. In 1934, during his first few months on the job, Salyer would drive more than 18,000 miles and conceive plans for adding more than 600,000 acres of prime habitat to the National Wildlife Refuge System. Salyer thought about the target wetlands scattered along a north to south ribbon called the Mississippi Flyway, a waterfowl migration route that started in the Arctic and ended in the shifting sediment of the Mississippi Delta.

Until now, refuge expansion had been more opportunistic than strategic. For three decades, habitat had been protected based on local or species-specific needs. Interconnected, continental-scale conservation was not in the vocabulary of government biologists. Darling and Salyer were able, for the first time, to implement a grander strategy, with a scientifically based plan to guide their decision-making—and a full purse. Salyer had $8.5 million to spend, an astronomical figure during the Great Depression, and proof of the persuasive prowess and luck of Chief Darling. With Salyer on the job, every dollar would be used strategically to move the National Wildlife Refuge System—the world's first system of protected lands for wildlife—in a new direction.



First refuge manager Paul Kroegel with pelican, ca. 1905

NCTC ARCHIVES/MUSEUM

American white pelicans, oil by Todd Telander

1916
North Platte

1921
Caloosahatchee
Ninepipe
Sullys Hill
Pablo

1924
Blackbeard Island

1925
Upper Mississippi River

1926
Johnston Island

1927
Savannah
McKay Creek

1928
Upper Klamath
Tule Lake
Pathfinder

1929
Bear River
Benton Lake
Cedar Keys

1930
Salt Plains
Cape Romain
Sonny Bono Salton Sea
Wolf Island

1931
Crescent Lake
St. Marks
Fallon

1932
Swanquarter
Bamforth
Hutton Lake
Long Lake

1933
Blackwater

1934
Mattamuskeet

1935
Red Rock Lakes
Squaw Creek
Oregon Islands
Lake Otis
Lake Andes
Arrowwood
Sand Lake
Sheyenne Lake
Muleshoe
Valentine
Hart Mountain

A scientific understanding of bird flyways, which Darling and Salyer used as their roadmap for land purchases, was only a decade or so old, based on a close study of waterfowl almost two decades earlier. With passage of the Migratory Bird Treaty Act in 1918, the ravages of market hunting had begun to slowly pass, and the Biological Survey was able to divert a small amount of funding away from its predator and rodent control programs to allow for more research work, including the establishment of migratory waterfowl banding programs.[5] Biological Survey researcher Frederick Lincoln had started tracking the migration of waterfowl through the use of banding in 1920. This work indicated four major routes: the Atlantic, Mississippi, Central, and Pacific Flyways. In his report "The Waterfowl Flyways of North America" Lincoln defined the flyway as "a composite of migration routes of all ducks, geese, and swans that share common breeding, migration, and wintering locales."[6] This flyway model suggested the need for protection on a landscape scale, connecting hundreds of northern "prairie pothole" wetlands critical for breeding ducks with the coastal marshes along the Gulf Coast that provided crucial wintering grounds for millions of northern pintails, gadwalls, canvasbacks, redheads, and blue-winged teal.

Some preliminary work to protect waterfowl along these newly mapped flyways was made in the 1920s. The creation of the Upper Mississippi River Wild Life and Fish Refuge (1924) and Bear River Migratory Bird Refuge (1929) had begun habitat protection along crucial flyways. The Migratory Bird Conservation Act of 1929 authorized the appropriation of up to $7.9 million for the purchase or lease of waterfowl refuges, but the funds never fully materialized; the system of flyway refuges remained merely a vision until a combined economic and environmental disaster—the infamous Dust Bowl of the 1930s—allowed implementation of this continental conservation plan.

Waterfowl habitat had been in drastic decline since World War I when farmers had been urged to "plow to the fences." The 1920s had seen a continuation of drainage, clearing, and other habitat destruction, which, combined with large bag limits, began to decimate waterfowl numbers. Waterfowl numbers plummeted to new depths in the 1930s with the arrival of catastrophic dust storms, the resulting habitat loss, and a newfound mobility for hunters to reach those places that still had birds. This problem did not go unnoticed by President Franklin Roosevelt. He was pressured by a number of sportsmen groups, who were enlightened by Aldo Leopold's new science of game management, to convene the "President's Committee on Wild Life Restoration," popularly known as the "Duck Committee." The members included Thomas Beck,[7] Aldo Leopold, and Darling. President Roosevelt charged the group to develop a plan for waterfowl enhancement that would utilize the huge numbers of "sub marginal" farmlands, victims of the Dust Bowl.

Darling's place on the Duck Committee turned out to be pivotal for federal wildlife managers, as the committee's discussions grew more contentious by the day. Beck preferred the demise of the Biological Survey because of their "incompetent science," while Darling and Leopold looked favorably on the continued role of the Survey in restoring drought-ridden lands. Things became so rancorous between the three that Darling finally wrote his own plan for a system of refuges to protect and restore migratory birds, envisioning a new direction for waterfowl enhancement.[8]

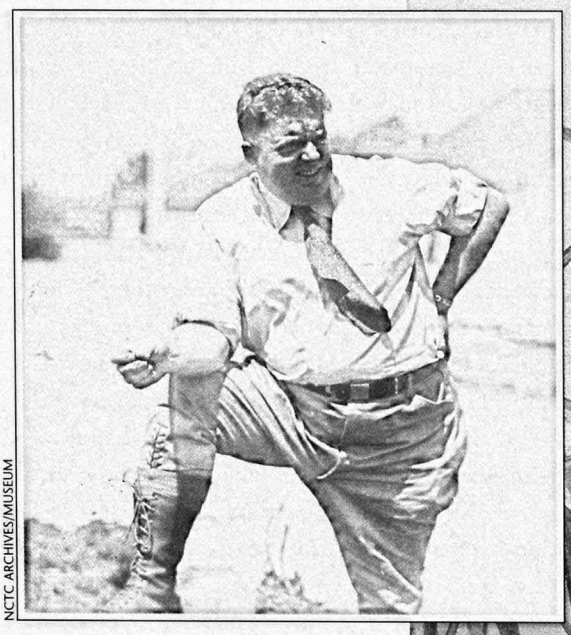
Biological Survey Chief Paul Redington, who had not cooperated well with the group, was especially critical of its findings, considering many of the problems the committee critiqued a result of weather—not poor management. Yet the Duck Committee demanded change, and since it was easier to change agency leadership than the weather, Redington resigned soon after the committee's final report. The spotlight swung to Aldo Leopold, who turned down the offer to head the Biological Survey, preferring to stay in Madison and guide the first generation of scientifically trained wildlife managers. Surprisingly, the director's baton was passed to Darling, a Pulitzer Prize–winning cartoonist and progressive Republican who had never led a government organization, and had been very critical of Roosevelt's New Deal conservation programs.[9] Yet Darling had the advantage of being an outsider with a clear vision of the waterfowl crisis and a possible solution:

> Game can be restored on this continent—some species of it to equal or even exceed the numbers that existed when the white man came—but the restoration will not be a gratuitous offering of Nature, as was the original stock. It will be a full-time job for a great many men who will have to be paid for their labors.[10]

Darling's insight—that funds and manpower were critical to creating the Refuge System—was first envisioned in 1903. His own considerable talents went a long way toward making this happen.

The conservation community in the 1930s consisted largely of sportsmen groups, birding clubs, and wealthy businessmen who loved to hunt, as well as a small collection of bold visionaries. Darling was a conservation renaissance man who had diverse contacts, from the powerful gun industry to Rosalie Edge's Emergency Conservation Committee, a radical offshoot of the Audubon Society. As a wildlife administrator, Darling would draw on skills he didn't know he had, and make decisions that would not always leave him on speaking terms with his friends in various conservation camps.

It was clear that in order to create an effective waterfowl restoration program, Darling would need three things: vision, money, and leadership within the Biological Survey that could make best use of every cent appropriated. Darling's vision was based on the results of the Duck Committee and his powerful conservation ethic. For more than two decades he had been drawing editorial cartoons that savaged the "slob hunter" and "game hogs." To obtain money to put his plan to action, Darling worked with allies in the Senate and used his personal correspondence with President Roosevelt to obtain needed emergency funds for his beloved ducks. In 1934, just six days after Darling took office, the Migratory Bird Hunting Stamp Act was passed;[11] Darling had long champi-



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Ding Darling's "salvation," J. Clark Salyer, at Seney Refuge, Michigan, ca. 1940

hooded merganser, acrylic by Steve Oliver

1935 (cont.)
Chautauqua
Delta
Rice Lake
Waubay
Rose Lake
Lostwood
Lacreek
School Section Lake
J. Clark Salyer
Medicine Lake
Trempealeau
Upper Souris
White River
Lake Isom
Des Lacs
Seney

1936
Okefenokee
Desert
Charles M. Russell
Bowdoin
Kellys Slough
Tewaukon
Swan Lake
Bosque del Apache
Wood Lake
Camas
Willapa
Ardoch
Storm Lake
Wild Rice Lake
Yazoo
Patuxent Research Refuge
Turnbull
Bitter Lake
Tamarac

1937
Montezuma
Sacramento
Moosehorn
Aransas
Lacassine
Bear Butte
Silver Lake
Lake Thibadeau
Bombay Hook
Rabb Lake
Sabine
Agassiz
Ruby Lake
Pea Island
Union Slough

1938
Black Coulee
Back Bay

oned the bill to provide funds for migratory bird habitat acquisition. The act created the Federal Duck Stamp Program, which almost immediately generated substantial funding for the purchase of wetlands across the country. (Darling's own sketch of two mallards was used on the first stamp.) Soon after, Darling named J. Clark Salyer II, a teacher from North Dakota and Biological Survey outsider, as Chief of Refuges. When reflecting on Salyer many years later, he wrote: "that boy was my salvation."[12]

With marching orders from Darling and a well-functioning government Oldsmobile, Salyer got to work.[13] He focused on developing a coherent system for waterfowl that followed three areas of interest: nesting marsh restoration in the North and Northwest; resting, feeding, and staging areas along the length of each flyway; and wintering marshes from the Chesapeake Bay to the Mississippi Delta to California's Central Valley. In less than two years, Salyer and his people were able to create 45 new refuges, and protect more than 1.5 million acres of land across the continent.[14]

This flurry of activity, driven by both ecology and economics, jolted the nation's refuges out of the stasis of the previous decades. The Great Depression was a low point in American history, and yet the economic chaos and ecological destruction of the time brought out innovation and creativity in the field of conservation not seen since the glory days of Theodore Roosevelt. In 1940, the Bureau of Fisheries and Bureau of Biological Survey were combined to create the U.S. Fish and Wildlife Service.[15] By the end of the New Deal, the Refuge System had expanded across the continent and begun the process of creating "duck highways" for migratory waterfowl. For the first time, a coherent system of protected natural areas was being developed to solve a continental-scale conservation problem.

The Natural Resources of the Nation

by Theodore Roosevelt

CERTAIN THINGS WERE DONE [during my years as president] of which the economic bearing was remote, but which bore directly upon our welfare, because they add to the beauty of living and therefore to the joy of life. Securing a great artist, Saint-Gaudens, to give us the most beautiful coinage since the decay of Hellenistic Greece was one such act....

Even more important was the taking of steps to preserve from destruction beautiful and wonderful wild creatures whose existence was threatened by greed and wantonness. During the seven and a half years closing on March 4, 1909, more was accomplished for the protection of wild life in the United States than during all the previous years, excepting only the creation of the Yellowstone National Park. The record includes the creation of five National Parks—Crater Lake, Oregon; Wind Cave, South Dakota; Platt, Oklahoma; Sully Hill, North Dakota, and Mesa Verde, Colorado; four big game refuges in Oklahoma, Arizona, Montana, and Washington; fifty-one bird reservations; and the enactment of laws for the protection of wild life in Alaska, the District of Columbia, and on National bird reserves. These measures may be briefly enumerated as follows:

The enactment of the first game laws for the Territory of Alaska in 1902 and 1908, resulting in the regulation of the export of heads and trophies of big game and putting an end to the slaughter of deer for hides along the southern coast of the Territory.

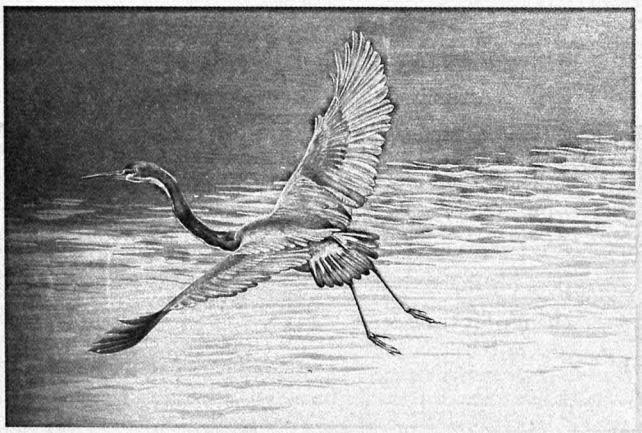
The securing in 1902 of the first appropriation for the preservation of buffalo and the establishment in the Yellowstone National Park of the first and now the largest herd of buffalo belonging to the Government.

The passage of the Act of January 24, 1905, creating the Wichita Game Preserves, the first of the National game preserves. In 1907, 12,000 acres of this preserve were inclosed with a woven wire fence for the reception of the herd of fifteen buffalo donated by the New York Zoological Society.

The passage of the Act of June 29, 1906, providing for the establishment of the Grand Cañon Game

Eagles, Ecology, and the Endangered Species Act, 1962–1973

To the average citizen in 1962, a time of rampant technological optimism, the message was startling: the indiscriminate use of synthetic pesticides is harmful to more than just the insect pests they were designed to eradicate. Rachel Carson, a long-time employee of the U.S. Fish and Wildlife Service,[16] warned in clear eloquent prose that creatures ranging from fish to birds and even humans were at risk from this new form of chemical warfare. Carson's *Silent Spring* signaled the emergence of a new, popular environmental movement. The next decade and a half witnessed the passage of an array of new environmental laws, and another pulse of refuge system expansion. A fresh environmental vocabulary was established, with terms such as ecology, environmentalism, habitat, NEPA, endangered species—and DDT.



great blue heron, acrylic by Steve Oliver

This "wonder chemical" DDT devastated populations of North American bald eagles, a bird especially susceptible to contaminants. As eagle numbers reached their lowest point in the 1960s they helped draw attention to the new science of endangered species. In 1966, the Endangered Species Preservation Act was passed allowing the listing of native animal species as endangered and providing authorization for limited land acquisition for such species. One of the first refuges established to protect endangered species was Mason Neck National Wildlife Refuge in Virginia.

In 1965, group of local citizens formed the Conservation Committee for Mason Neck to counter the threat of development along the shores of this peninsula in the Potomac tidal basin. The home of Virginia patriot George Mason, the peninsula land was ripe for development as farming became less critical to the area economy. Huge projects were proposed in the area, with names like Freestone Point (the "Pleasureland of the East") and Kings Landing, shocking many long-time

Preserve of Arizona, now comprising 1,492,928 acres.

The passage of the National Monuments Act of June 8, 1906, under which a number of objects of scientific interest have been preserved for all time. Among the Monuments created are Muir Woods, Pinnacles National Monument in California and the Mount Olympus National Monument, Washington, which form important refuges for game.

The passage of the Act of June 30, 1906, regulating shooting in the District of Columbia and making three-fourths of the environs of the National Capital within the District in effect a National Refuge.

The passage of the Act of May 23, 1908, providing for the establishment of the National Bison Range in Montana. This range comprises about 18,000 acres of land formerly in the Flathead Indian Reservation, on which is now established a herd of eighty buffalo, a nucleus of which was donated to the Government by the American Bison Society.

The issue of the Order protecting birds on the Niobrara Military Reservation, Nebraska, in 1908, making this entire reservation in effect a bird reservation.

The establishment by Executive Order between March 14, 1903, and March 4, 1909, of fifty-one National Bird Reservations distributed in seventeen States and Territories from Porto Rico to Hawaii and Alaska. The creation of these reservations at once placed the United States in the front rank in the world work of bird protection. Among these reservations are the celebrated Pelican Island rookery in Indian River, Florida; The Mosquito Inlet Reservation, Florida, the northernmost home of the manatee; the extensive marshes bordering Klamath and Malheur Lakes in Oregon, formerly the scene of slaughter of ducks for market and ruthless destruction of plume birds for the millinery trade; the Tortugas Key, Florida, where, in connection with the Carnegie Institute, experiments have been made on the homing instinct of birds; and the great bird colonies on Laysan and sister islets in Hawaii, some of the greatest colonies of sea birds in the world.

Excerpted from Theodore Roosevelt: An Autobiography, *first published in 1913 by Charles Scribner's Sons. Teddy Roosevelt served as president of the United States from 1901–1909.*

1938 (cont.)
Hewitt Lake
Cape Meares
Great White Heron
West Sister Island
Tybee
Wheeler

1939
Kofa
Little Pend Oreille
McLean
Johnson Lake
Piedmont
Hiddenwood
Sibley Lake
Little Goose
Half-way Lake
Lost Lake
Necedah
Susquehanna
Lords Lake
Brumba
Hobart Lake
Edwin B. Forsythe
Pleasant Lake
Canfield Lake
Carolina Sandhills
Shell Lake
Bone Hill
Lake George
Dakota Lake
Lake Patricia
Hutchinson Lake
Stewart Lake
Rock Lake
Maple River
Buffalo Lake, ND
Lake Zahl
Camp Lake
Lambs Lake
Lake Ilo
Florence Lake
Cottonwood Lake
Lake Nettie
Appert Lake

1940
Noxubee
Lake Alice
Cabeza Prieta

1941
Horicon
Pretty Rock
Willow Lake
Reelfoot
Stoney Slough
White Lake
Havasu
Lake Mason

landowners into action. With Carson's words ringing in the ears of America, area citizens, led by an energetic, well-spoken activist named Elizabeth Speer Hartwell, began to push back against the developers. Hartwell, who would be "mocked by the flapping arms (wings) of developers"[17] when she entered public hearing rooms, spoke relentlessly for the preservation of Mason Neck and its resident bald eagles. The committee contacted Secretary of the Interior Stewart Udall and demanded that he do something.

Bill Ashe, an ascertainment biologist for the Fish and Wildlife Service's southeast region, was sent up from Atlanta to evaluate the feasibility of protecting Mason Neck for migratory waterfowl. In the mid-1960s, the focus of the Fish and Wildlife Service remained the creation of waterfowl refuges, with funding from the Duck Stamp program to finance new acquisitions. After studying the area, Ashe determined that the land was unremarkable for ducks and geese, and was prepared to report to his office that conditions were not right for a migratory waterfowl refuge. No funds could be used from Duck Stamp monies to protect the land from development.[18]

But Ashe was not ready to give up on Mason Neck. He knew from talking to local residents and reading about the natural history of the area that George Mason's journals spoke of bald eagles frequenting the peninsula's huge old-growth pine trees in the eighteenth century. Although those ancient pines had all been cut during the next hundred years, the forest had grown back as 8,000 acres of mixed hardwoods and conifers. Ashe wondered, could the land be considered an historic habitat for eagles? He suggested the novel idea that Mason Neck might qualify for refuge status under the new Endangered Species Preservation Act (which authorized funding for land acquisition), even though there were no eagles on the property and probably had not been for decades. This justification worked, and the Fish and Wildlife Service had an approach that would protect the land. Mason Neck National Wildlife Refuge was established in 1969 and, true to the promise of the new law, the eagles returned. (When one observes eagles in the capital region today, there is a high likelihood they nested at Mason Neck.) In the years that followed, more refuges would be created to protect endangered species, creating a new category of refuges, much as the 1930s had seen the establishment of new flyway refuges. The passage of the expanded Endangered Species Act in 1973 added the task of critical habitat protection to the mission of the Refuge System.

THE PULSE OF CHANGE spurred by Rachel Carson's words began to slow in the mid-1970s. But the period of stasis for the National Wildlife Refuge System was shorter this time, leaving only a few years until the next pulse, spawned from a powerful legislative initiative called the Alaska National Interest Lands Act (1980). A landmark in American conservation history, the act protected more than 100 million acres of federal public land in Alaska, including roughly 50 million acres added to the National Wildlife Refuge System. The Fish and Wildlife Service, long accustomed to conserving a small prairie pothole here and remnant coastal wetland there, was now faced with overseeing vast wilderness ecosystems, stimulating development of a new management approach—letting natural systems work without intensive human intervention. In 1997, another landmark was reached with passage of the National Wildlife Refuge System Improvement Act; this new "organic" legislation codified the overarching purposes of the Refuge System, and possibly marked the start of another cycle of growth and change for the system.[19]

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Rachel Carson conducting marine research with Fish and Wildlife Service illustrator Bob Hines, 1952

As the Refuge System enters the next century it will look to new locations for expansion. Already, urban refuges and former toxic waste sites have shown remarkable resilience and potential for certain kinds of wildlife; they will be testing grounds for innovations in ecological restoration. New refuge visionaries will have to seek out nontraditional niches and fresh initiatives to protect wildlife in the midst of future challenges. Like their predecessors, future conservation leaders will need to be a combination of scientist, realtor, negotiator, partner, and innovator able to see refuges where none had existed and then, most important, have the wherewithal to implement their vision. Once again we return to Theodore Roosevelt, who laid out this imperative to all future federal conservationists: "Our duty to the whole, including unborn generations, bids us restrain an unprincipled present-day minority from wasting the heritage of these unborn generations."[20] The next century will see if this great land legacy embodied in the National Wildlife Refuge System is protected and expanded, as insurance against extinction and degradation of the natural world. We can only hope we succeed as well as the first century of refuge pioneers in carving out at least one small part of this continent where wildlife comes first. ☾

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NOTES

1. Martha the passenger pigeon eventually succumbed in 1914.
2. Curt Meine, 2001, Roosevelt, Conservation, and the Revival of Democracy, *Conservation Biology* 15(4) August: 829–831.
3. Eric Jay Dolin, 2003, *Smithsonian Book of National Wildlife Refuges* (Washington, D.C.: Smithsonian Press), 46.
4. Theodore Roosevelt, 1924 (1916), *A Book-Lovers Holiday in the Open* (New York: Charles Scribner's Sons), 299–300. In 1915, six years after his retirement, Roosevelt visited Breton Island Bird Reservation, which he had established as the second unit of what became the Refuge System. On Breton Island he mused about bird reservations and enjoyed bird watching and searching for turtle eggs.
5. The Bureau of Biological Survey entered the field of predator and rodent control in 1915 with an appropriation of $125,000 to kill wolves, prairie dogs, and other "vermin." Following this appropriation, predator and rodent control became a guaranteed funding source and an increasingly important part of the Bureau's work. For more information on the effects of predator and rodent control see James Trefethen, 1975, *An American Crusade for Wildlife* (Alexandria: Boone and Crockett Club), and Donald Worster, 1977, *Nature's Economy* (Cambridge: Cambridge University Press).
6. Frederick Lincoln, 1936, *The Waterfowl Flyways of North America*, U.S. Department of Agriculture Circular 342. For more information on flyways, see A. S. Hawkins, R. C. Hanson, H. K. Nelson, H. M. Reeves, editors, 1984, *Flyways: Pioneering Waterfowl Management in North America* (Washington, D.C.: U.S. Printing Office), 73. Written by many of the pioneers of federal waterfowl protection, this book is an excellent anthology of reflections on the study and management of waterfowl in America.
7. Thomas Beck is the least remembered of the original "Duck Committee." An important adviser to Franklin Roosevelt, Beck was editor of *Collier's* magazine, member of the Connecticut State Board of Fisheries and Game, and president of More Game Birds of America. In a 1954 *National Parks Magazine* article, Darling describes Beck as "neither a duck hunter or a scientist; but he was a violent and outspoken representative of those whose one and only cure for the duck situation was to throw the Biological Survey out of the window, body and britches."
8. Jay Darling, 1954, The Story of the Wildlife Refuge Program, Part II, *National Parks Magazine* 28(117) April–June: 55.
9. Trefethan, *An American Crusade for Wildlife,* 220.
10. J. N. Darling, 1934, Gun Fodder, *Country Gentleman* December: 8.
11. Darling was fond of telling the story of Senator Peter Norbeck, who, before standing to ask unanimous consent for the passage of a rider providing $6 million in unexpended funds to the migratory bird program, had removed his false teeth. This action, combined with his thick Swedish accent, made his words unintelligible to his Senate colleagues, who nodded in agreement and passed the rider. Franklin Roosevelt, in a rush to get out on a fishing trip, signed the bill without reading it. When he realized what had happened he said, "This fellow Darling is the only man in history who got an appropriation through Congress, past the budget, and signed by the President without anyone realizing the treasury had been raided." See *Flyways*, 111; and Trefethen, 222 for more on this feat.
12. David Lendt, 1979, *Ding: The Life of Jay Norwood Darling* (Ames: Iowa State University Press), 71.
13. Eventually Salyer upgraded to a red convertible, and he continued his marathon drives and energetic refuge acquisition program until his retirement in 1961.
14. J. Clark Salyer II, 1936, Practical Waterfowl Management Wildlife Restoration and Conservation, *Proceedings of the North American Wildlife Conference* 3(7) February: 584.
15. Secretary of Interior Harold Ickes had sought, in the midst of the New Deal, to reinvent the Department of Interior as the Department of Conservation incorporating all natural resource agencies into a central institution. His vision foundered on the opposition of Gifford Pinchot and the U.S. Department of Agriculture (USDA) to relinquishing the U.S. Forest Service. A consolation prize of sorts involved bringing the Bureau of Fisheries (formerly in the Department of Commerce) and the Bureau of Biological Survey (formerly in the USDA) into the Department of Interior in 1939. In 1940 the two bureaus were combined, with the resultant name change to the Fish and Wildlife Service.
16. Rachel Carson was an employee of the Bureau of Fisheries (later the Fish and Wildlife Service) from 1936–1952. She rose quickly from writer to chief editor of publications. Through her government writings Carson mastered the translation of complex scientific ideas into clear prose accessible to the general public. During her 16 years in the FWS, Carson had access to numerous studies at Patuxent Research Refuge, beginning in 1944, involving the deleterious effects of DDT on birds and their eggs. She also developed a network of field biologists who reported first-hand bird and fish die-offs resulting from DDT. By the time she published *Silent Spring* in 1962, Carson had 20 years of data to help support her claims about the dangers of pesticides. The definitive biography of Carson is *Rachel Carson: Witness for Nature* by Linda Lear, 1997 (New York: Henry Holt and Company).
17. Pamphlet on Elizabeth Speer Hartwell, author unknown. Housed at the National Conservation Training Center Archives/Museum, Shepherdstown, WV.
18. Bill Ashe's involvement is chronicled in written memoirs composed on September 2, 2003, and housed at the National Conservation Training Center Archives/Museum in Shepherdstown, WV.
19. These changes in the last two decades are still too close and complex for anything more than a brief treatment in this article.
20. Theodore Roosevelt, 1924 (1916), *A Book-Lovers Holiday in the Open* (New York: Charles Scribner's Sons), 300.

By the early decades of the twentieth century, increasing efforts at drainage and reclamation had led to a noticeable decline in ducks throughout the United States. These declines helped stimulate a national interest in conserving waterfowl and the habitats that they depended upon, just while the conversion of wetland and riparian habitat to farmland was accelerating. The Malheur Lake Basin in the Blitzen River watershed of southeastern Oregon—a wetland the size of Massachusetts, Connecticut, and Rhode Island combined—became a critical flashpoint in these conflicts over the transformation of riparian habitat in the West. After years of frustrating reversals, preservationists won a major victory in 1934, when the failed cattle and irrigation empire along the Blitzen River was sold to the federal wildlife refuge system, beginning the expansion of an empire of ducks at Malheur. This event signaled the growing power of a preservationist vision of riparian areas, a vision that was increasingly able to transform policies while influencing the transformation of landscapes as well. In their quest to control natural boundaries between water and land, preservationists, like ranchers and reclamationists, also struggled to control natural metaphors.

In 1904 and 1905, the Oregon biologist, photographer, filmmaker, and writer William Finley toured the great marshes of the southern part of the state. Finley was soon to become prominent in western wildlife conservation. Several years after this voyage, in 1911, he established Oregon's first Fish and Game Commission, and eventually he became state game warden, state biologist, and commissioner for fish and game. Finley had transformed his youthful passion for collecting birds into a love for photography, journalism, and conservation activism.[1]

As Finley paddled a little boat through the marshes of Malheur in the first years of the twentieth century, he found himself lost in a maze of marshes so trackless, vast, and confusing that he nearly persuaded himself he was the first person ever to ply their waters. Just as he was telling himself that Malheur was still an untouched Eden, Finley stumbled onto a scene of devastation that shocked him into action that would change his life: a colony of egrets slaughtered by plume hunters, the young left to starve slowly to death.[2]

Finley reacted to the site of ransacked colonies as if he had stumbled into the Garden of Eden just after Eve took a bite of the apple and passed it on to Adam. Paradise had been plundered, sullied with the stain of sin. Out of hundreds of thousands of egrets that had once nested in Malheur Lake, only 121 were left when Finley toured the region. His horror at the decimation motivated him to begin a campaign to save the great marshes of southeastern Oregon—a campaign that soon led to dramatic clashes with homesteaders, ranchers, and irrigation developers. On his return to Portland, Finley wrote feverishly, trying to publicize what he had found at Malheur before it was entirely diminished: the greatest concentration of ducks, shorebirds, egrets, herons, cranes, and ibises in the country, perhaps even the world.

Although Finley was a skilled ornithologist, his most powerful tool was not science but rhetoric. His task was to publicize the marshes of Malheur, and in the process to rouse public opinion within the state and across the nation in favor of their preservation. Yet this was no easy task, for reclamationists had already borrowed Edenic rhetoric for their task of redeeming the marshes from their watery grave. Finley had to subvert centuries of rhetoric that linked marshes with fallen nature and their drainage with redeemed nature. He had to convince a nation that drainage was destruction, not reclamation. To do this, he borrowed language from the reclamationists to create a new myth of Malheur that incorporated Edenic images with a particularly American myth of origins: that of the romantic cowboy.

Preservationists painted a portrait of Malheur as a place from the first days of creation, a place captured in the new light of dawn, when only the "red men" plied the waters. Alva Lewis, an inspector for the federal refuge system, wrote of Malheur in 1912:

> In Malheur it would appear that the Creator had exerted a special influence looking to the creation of a water fowl paradise. Almost every acre, even the open water of the lake has an abundance of vegetable life, while the tules of the marshes are rarely so dense as to prevent the growth of the various plant life on which water fowl feed. Tules, millfoil, pondweed, duck weed, wocus [pond lily], goose grass, cattail, burreed, sugar grass, arrow plant, smart weed, wire grass, pepper mint, camas, water hemlock, and many other plants, the common names of which I am not familiar, can be found everywhere in abundance, I might say superabundance.[3]

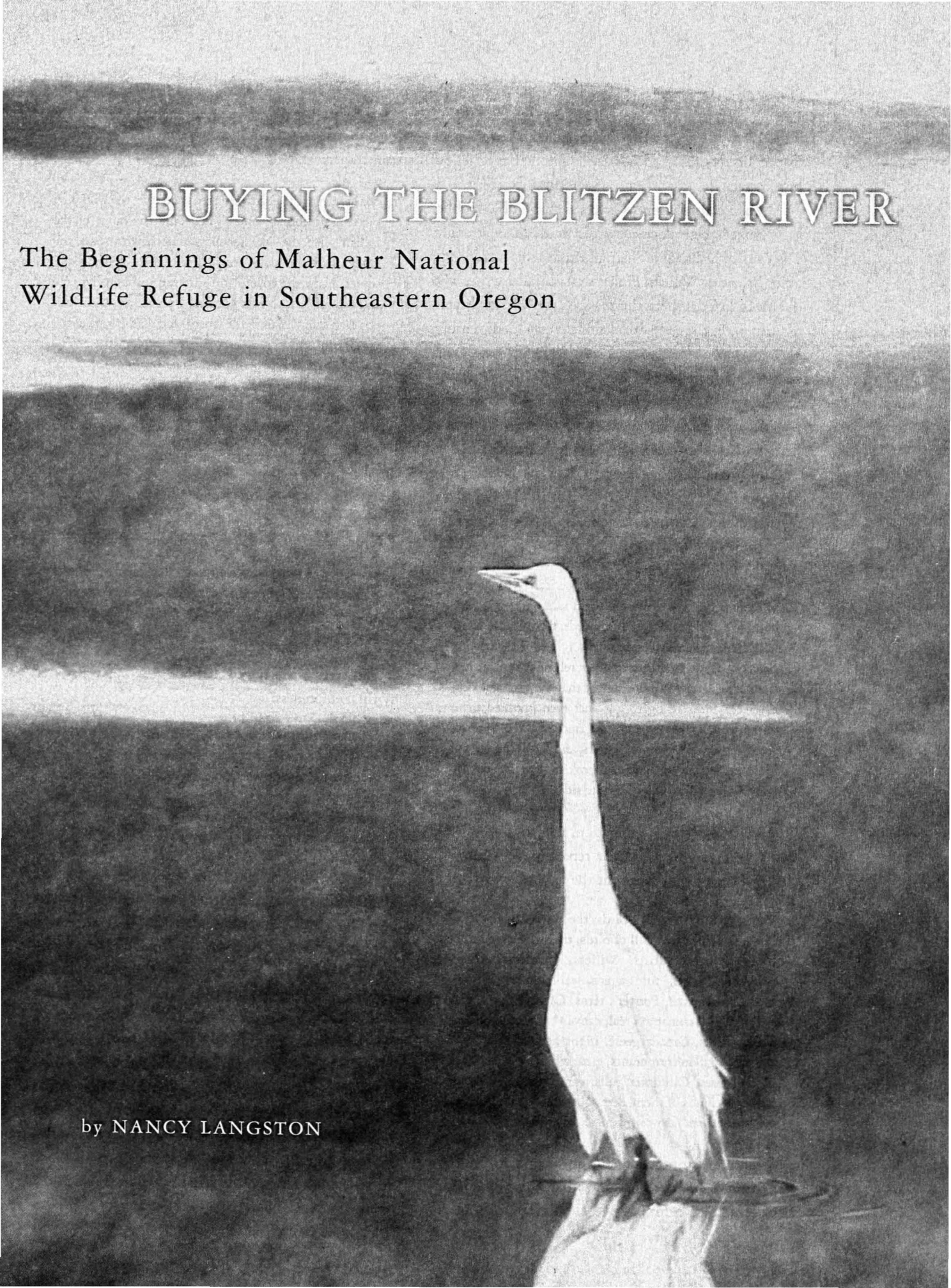
For the conservationists, the cattle barons were part of this myth of Eden, as characters in a primitive drama, much like Indians. Lewis wrote:

> On her immense stock ranches can still be seen the cowboy in his primitive glory, with the customs and methods of work of a half century ago.... 'Tis true there are cultivated areas—grain lands and tame grasses, but the farmer who tills the soil hardly counts. The stockman who pastures his cattle, horses and sheep on the public domain—who cuts the wild grasses of the natural meadows to feed his halfwild herds—he is the man who has made Harney county what it is today.[4]

great egret, oil by Todd Telander

BUYING THE BLITZEN RIVER

The Beginnings of Malheur National Wildlife Refuge in Southeastern Oregon



by NANCY LANGSTON

1941 (cont.)
Imperial
Springwater
Sunburst Lake
Snyder Lake
San Andres
Wintering River
Creedman Coulee
Tomahawk
Kenai
Chassahowitzka
Parker River

1942
Halfbreed Lake
Hailstone
Lamesteer
Santee

1943
Santa Ana
Missisquoi
Chincoteague

1944
Great Meadows
Colusa
Monomoy
Slade
Columbia
Mingo

1945
J.N. "Ding" Darling
Sutter
Tennessee

1946
Tishomingo
Hagerman
Laguna Atascosa

1947
Crab Orchard
Wertheim
Middle Mississippi River
Great River
Port Louisa
Two Rivers
Michigan Islands

1948
Stillwater

1951
Arthur R. Marshall

1951
Loxahatchee
Pinellas
Merced

1952
Monte Vista

This was extraordinary language for a government inspection report aimed not at the public but at fellow bureaucrats.

When conservationists wrote for the urban public, they evoked these Edenic images much more strongly. The work of Dallas Lore Sharp illustrates this well. Sharp, a close friend of William Finley, was a popular writer who did much to focus the national eye on the wild landscapes of Oregon. In the early decades of the twentieth century, he wrote about wilderness for an educated East Coast audience (his publisher was the Riverside Press in Cambridge, Massachusetts). A great sense of loss pervaded Sharp's writings, just as had Finley's essays. Both men felt as if they were witnessing a fall from paradise.

In *Where Rolls the Oregon* (1914) Sharp wrote of Malheur, "Here was a page out of the early history of our country." Once, all of America was an Eden, a place of unimaginable abundance:

> The accounts of bird-life in early American writings read to us now like the wildest of wild tales—the air black with flocks of red-winged blackbirds, the marshes white with feeding herons, the woods weighted with roosting pigeons. I have heard my mother tell of being out in a flock of passenger pigeons so vast that the sun was darkened, the birds flying so low that men knocked them down with sticks. As a child I once saw the Maurice River meadows white with egrets, and across the skies of the marshes farther down, unbroken lines of flocking blackbirds that touched opposite sides of the horizon.[5]

But in less than a generation, industrialization had destroyed this Eden. Malheur represented to Sharp all that had been lost throughout the nation:

> The sedges were full of birds, the waters were full of birds, the tules were full of birds, the skies were full of birds: avocets, stilts, willets, killdeers, coots, phalaropes, rails, tule wrens, yellow-headed black birds, black terns, Forster's terns, Caspian terns, pintail, mallard, cinnamon teal, canvas-back, redhead and ruddy ducks, Canada geese, night herons, great blue herons, Farallon cormorants, great white pelicans, great glossy ibises, California gulls, eared grebes, Western grebes—clouds of them, acres of them, square miles—*one hundred and forty-three* square miles of them![6]

Sharp's history was one of an imagined American Eden, but no matter how unfactual, this was a history of great power, for its myths resonated with meaning for Americans who were witnessing rapid industrial transformation.

> For here in the marsh of burr reed and tule, the wild fowl breed as in former times when only the canoe of the Indian plied the lake's shallow waters, when only the wolf and the coyote prowled about its wide, sedgy shores. I saw the coyote still slinking through the sage and salt grass along its borders; I picked up the black obsidian arrowheads in the crusty sand on the edge of the sage plain; and in a canoe I slipped through the green-walled channels of the Blitzen River out into the sea of tule islands amid such a flapping, splashing, clacking, honking multitude as must have risen from the water when the red man's paddle first broke its even surface.[7]

For Sharp's urban audience, the remoteness of Malheur was a powerful trope:

> But it was the air, the aspect of things, rather, the sense of indescribable remoteness, withdrawal, and secrecy ever retreating before us, that seemed to take on the form as something watchful, suspicious, inherently wild, something wolf-like. This was the wildest stretch of land, the most alien, that I had ever seen.

In 1914 Sharp hoped that Malheur would be saved by this remoteness:

> Separated thus by the deserts from any close encroachment, saved to itself by its own vast size and undrainable, unusable bottoms, and guarded by its Federal warden and the scattered ranchers who begin to see its meaning, Lake Malheur Reservation must supply waterfowl enough to restock forever the whole Pacific slope.[8]

But he underestimated the developers. Rather than Malheur's being saved by its own vastness and remoteness, those qualities seemed to make it an even greater prize to speculators. Just a few months after Sharp's tribute to Malheur was published, a battle over the basin's riparian riches began that would drag on for 20 years.[9]

FINLEY AND SHARP'S writings about the glories of Malheur convinced the state Audubon Societies, and through them, President Roosevelt, that the marsh was a tremendous resource for the future of American wildlife. Earlier, in 1908, Roosevelt had established Malheur Lake Bird Reservation, which did not include the rivers that ran into the lake but only the lake itself. At the time few saw the riparian areas along the Blitzen

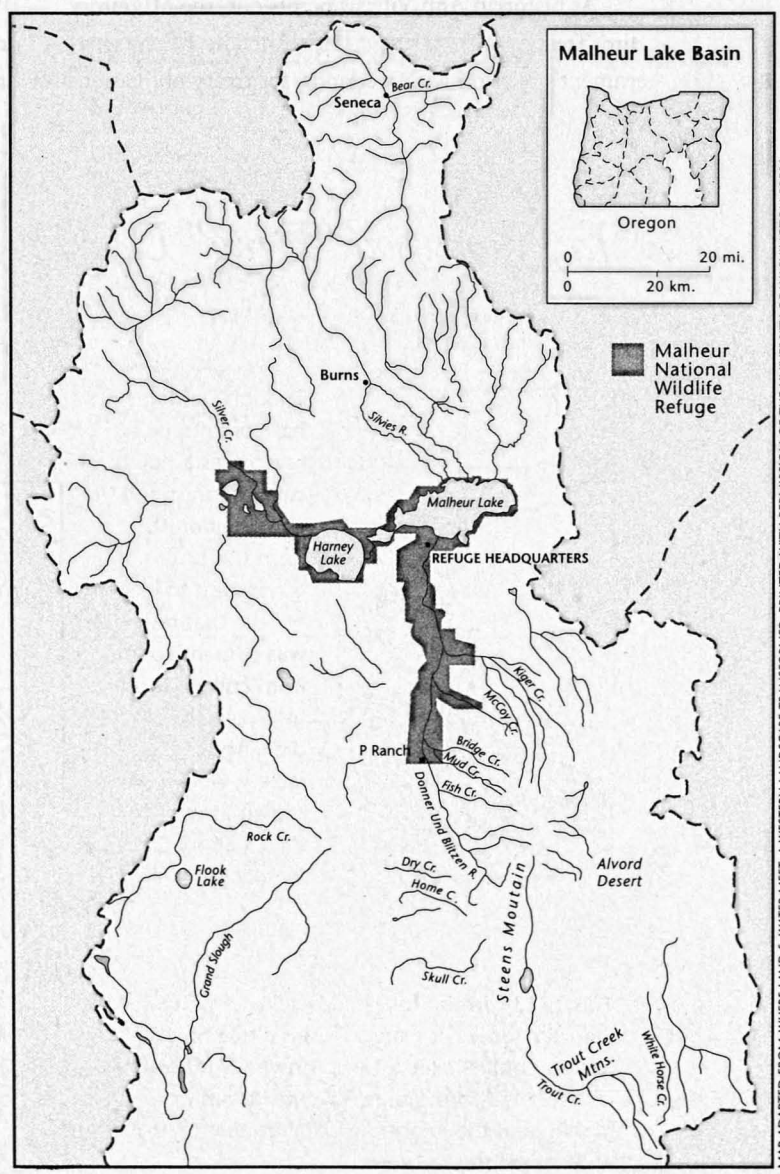
and the Silvies Rivers as important for wildlife, and so no one tried to protect them. The lake was where the ducks were most visible, so the lake was what won protection. The riparian meadows that fed into the marshes, the creeks, and the slow-moving waters along the rivers seemed hardly worth worrying about at the time, for few biologists recognized that they might be critical for perpetuating the abundance of Malheur.[10]

Protection at Malheur had its origins in a national movement for wildlife conservation that had begun a generation earlier, largely stimulated by private efforts by scientists and birdwatchers. A growing interest in birds and nature study, linked with attention to the odd fashion of dead birds' perched on ladies' hats, stimulated concern over declines in bird populations.[11] In 1886, the American Ornithologists Union estimated that in North America alone five million birds died for fashion. Whereas hunting was an obvious target for conservationists, habitat loss and its effects on wildlife began to emerge as a scientific concern soon after the turn of the century. Finley, for example, had been roused to action by the market hunting of egrets, but he soon realized that hunting alone was not the primary cause of bird declines. Other ornithologists followed Finley's lead as he turned from attacking hunters to enlisting their aid in habitat preservation.

Private efforts alone seemed inadequate to support the burgeoning conservation movement, and in 1892 President Benjamin Harrison set aside the first federal sanctuary specifically for wildlife: a national salmon-spawning reservation on Alaska's Afognak Island.[12] When Teddy Roosevelt became president in 1901, he began to create a network of federal refuges. The first was in Florida, on Pelican Island—a five-acre federally owned rookery for brown pelicans. Although President Roosevelt had the power to create refuges on federal land, the federal government had no clear power to spend money to manage them. Roosevelt's friend Frank Chapman asked him to sell Pelican Island to the Audubon Society, which had the staff and money to protect the rookery. Fearing political trouble over the sale of federal property, Roosevelt instead issued an executive order on March 14, 1903, making Pelican Island "reserved and set apart for the use of the Department of Agriculture as a preserve and breeding ground for native birds."[13]

By the time Roosevelt left office in 1909, he had established 51 federal refuges. In the words of Ira Gabrielson, an Oregon ornithologist and eventually chief of the Fish and Wildlife Service, the year 1908 was "a banner one...[because] for the first time larger areas were reserved. Largely through the efforts of William L. Finley and a small band of supporters, Lower Klamath, Oregon, and Malheur Lake, Oregon, were set aside as nesting grounds for migratory waterfowl."[14] Congress, however, refused to appropriate money to manage the refuges, so state Audubon Societies hired wardens to protect the birds.[15]

Although Congress did not allocate funds for refuge management, lawmakers had attempted several years earlier to protect birds by passing the Lacey Act of 1900, which prohibited interstate shipment of birds killed in violation of state



MAP ADAPTED FROM *WHERE LAND & WATER MEET: A WESTERN LANDSCAPE TRANSFORMED*, PRINTED WITH PERMISSION OF THE UNIVERSITY OF WASHINGTON PRESS

law. But the law was rarely enforced, and proved ineffectual. In 1913 Congress enacted two statutes: the federal Tariff Act, which forbade the import of plumes and other bird parts except for scientific purposes, and the Weeks-McLean Act, which declared the protection of migratory game birds a federal responsibility. Knowing the bill would be challenged on constitutional grounds, conservationists lobbied for a treaty with Canada to protect birds that crossed the border. President Woodrow Wilson signed the Migratory Bird Treaty in 1916, prohibiting the sale of game birds and giving the secretary of agriculture the authority to limit hunting seasons and impose bag limits. With this act, the federal government became the primary protector of waterfowl.

As historian Ann Vileisis points out, the Migratory Bird Treaty would become critical to the federal government's relation with wetlands, for treaty obligations held the federal government responsible for safeguarding wetlands as well as regulating market hunting. Concern over birds, therefore, sparked America's initial concern over wetlands protection. The result was that, for a few years, waterfowl made a comeback. Yet in spite of new refuges and new laws, waterfowl populations were not out of trouble. Within a decade, duck populations crashed as numbers of hunters increased dramatically. More important, waterfowl habitat was being destroyed at an astonishing pace, as drainage became "something of a national mania," in the words of a former chief of the Fish and Wildlife Service—the Malheur Refuge's problems with drainage were not unique.[16]

BY THE LATE 1920S, biologists realized that intensive drainage was destroying critical habitat for avian feeding, breeding, and migration throughout the continent. The

Jay Norwood "Ding" Darling

OVER 50 YEARS, Ding Darling (1876–19 drew 15,000 editorial cartoons chronicling trends and politics of the United States. A life-lon conservationist, his drawings brought public atte tion to wildlife's need for habitat protections—

Though Darling has come to be revered as a political cartoonist and conservationist, from this photo it is not hard to believe that he was suspended from college for his irreverent drawings of the faculty. Here he is shown at work for Iowa's Sioux City *Journal* in 1904.

This 1923 cartoon foreshadows Darling's work on Franklin Roosevelt's special Committee on Wildlife Restoration. As Nancy Langston writes in this issue of *Wild Earth* (page 33), the committee highlighted the enormous damage that drainage and agriculture were having on waterfowl.

CARTOONS COURTESY OF THE J.N. "DING" DARLING FOUNDATION • PHOTOS: USFWS

refuge system did not offer much help, since it was poorly funded, understaffed, and often subject to drainage. Bills that had been introduced in Congress in 1921 and 1924 to fund refuges with hunting license fees had been defeated. But in 1928 enough national concern had accumulated over waterfowl that when South Dakota senator Peter Norbeck introduced another refuge bill, he finally managed to win approval for it. Norbeck's bill established the Migratory Bird Conservation Commission to acquire wetlands. But funding for wetland acquisition was not available. Federal agencies had contradictory policies as well: whereas the Biological Survey tried to protect wetland breeding areas, policies within the Department of Agriculture and the Army Corps of Engineers promoted drainage.[17]

In 1934, motivated by warnings of drastic declines in waterfowl populations, Franklin Roosevelt created the special Committee on Wildlife Restoration to study the problem, appointing Thomas Beck (a journalist), Ding Darling (a cartoonist who had been involved in wildlife conservation in Iowa), and Aldo Leopold to the committee. The men reported back with a condemnation of drainage: "There is incontrovertible evidence of a critical and continuing decline in our wild life resources, especially migratory waterfowl, due to the destruction and neglect of vast natural breeding and nesting areas by drainage, [and] the encroachment of agriculture." The ultimate cause of the problems, the committee argued, was a misguided notion of progress or, in the report's vivid phrasing, "the random efforts of our disordered progress toward an undefined goal."[18]

The committee urged that $25 million be allocated to "restore submarginal lands as wildlife refuges," and Roosevelt promised $1 million to begin the project. Fighting a losing battle, the committee urged that restoration required, first and foremost, planning and coordination so that one government agency did not destroy wildlife (to create agricultural surpluses) that another agency was trying to halt.[19]

decades before the advent of conservation biology. Darling headed the U.S. Biological Survey for 18 months, in 1934–35, and was instrumental in the development of the National Wildlife Refuge System. An energetic and bold politician, his leadership led to massive land purchases for the Refuge System in the midst of the Great Depression.

Recently appointed chief of the Biological Survey, Darling (left) makes a visit to the Washington, D.C., post office to purchase the first sheet of "Duck Stamps," which he had designed. The Migratory Bird Hunting Stamp program would yield $600 million over the next 60 years for the purchase of waterfowl habitat. Darling also created the blue goose that became the symbol of the National Wildlife Refuge System.

"Why Call Them Sportsmen?"
Outraged by poachers and "game hogs," Darling pushed for tough enforcement of hunting laws; he has been called "the best friend a duck ever had."

1964
Choctaw
William L. Finley
Hatchie
Eufaula
Pee Dee
Cibola
Kootenai
Lee Metcalf
Cedar Island
Clarence Cannon
Toppenish
Cedar Point

1965
Seedskadee
Browns Park
Grays Lake
Baskett Slough
Sherburne
Ankeny
Conboy Lake

1966
Las Vegas
Muscatatuck
Ridgefield
Flint Hills
Maxwell
Brazoria
Rachel Carson

1967
San Luis
Target Rock
Arapaho
UL Bend

1968
Seatuck
St. Vincent
Pocasse
Bear Lake
Grulla
Amagansett
San Bernard
Oyster Bay
Hobe Sound

1969
Buck Island
Fisherman Island
Wassaw
Umatilla
Mason Neck

1970
Sachuest Point
Sequoyah
Ninigret
Nomans Land Island

Roosevelt appointed Ding Darling, a close friend of Finley's, to head the Bureau of Biological Survey, and Darling transformed the poorly funded and poorly managed bureau with an infusion of energy, fundraising skills, and scientists.[20] Most important, Darling helped gain congressional approval for the Migratory Bird Hunting Stamp Act of 1934, a law that financed refuges by authorizing the sale of Duck Stamps to hunters. Enlisting the aid of local women's groups and sport hunting clubs, Darling planned a string of refuges along the Pacific Flyway, the migratory route for much of the continent's waterfowl. President Roosevelt and Congress stalled, however, diverting Duck Stamp money to other programs.[21] Darling scrambled for money and finally found it when his ally in the Senate, Peter Norbeck, won $6 million for the refuge program in 1935.

With the hope of gaining federal funding for land purchases, Darling, as new chief of the Biological Survey, began to investigate ways to save Malheur Refuge. Irrigation and drainage projects along the Silvies and Blitzen Rivers allowed very little water to reach the lake, and the biologists feared that winning court cases over title to the lake bed would accomplish nothing if the refuge had no water rights and therefore no water. The Silvies River supplied much of the water in Malheur Lake, but Finley and Darling decided that trying to acquire those water rights would be impossible, for they were divided into many separate holdings and tied up in various court battles. Instead, Finley turned to the Blitzen River, which was still controlled largely by one corporation.

Darling and Finley pushed for federal funds to purchase the Blitzen Valley from the owners, the Swift Corporation (meatpackers). In May, 1934, Darling wrote to Finley that he and Swift had come to a "very amicable understanding regarding the Malheur Lake and the Donner and Blitzen region." Darling was certain that he could purchase the lands "if we can get the promised funds liberated from the Federal Emergency Relief Corporation."[22] Darling's hopes were soon dashed, for within the week those federal funds vanished, and the Swift interests, tired of waiting for federal action, began selling off sections of their holdings in the Blitzen to other buyers. As Darling wrote to Finley, the Swift interests were "pressed for funds....I am very much distressed that we can not act at once."[23] Finley replied to Darling ten days later in despair, certain the deal had collapsed,

> Approximately a hundred and sixty thousand acres, the cream of great breeding and resting places for water fowl on the Pacific Coast, have been completely destroyed....I realize that you feel the same as I do and that you are doing everything possible, but the thing seems hopeless—at least for the present season.[24]

After decades of frustration—squatters, legal battles, drainage efforts, drought, and vanished funds—the log jam suddenly broke. The Federal Emergency Relief Program released funds for the purchase, and on September 25, 1934, Swift agreed to accept $675,000 from the federal government for 65,000 acres of the Blitzen River valley, "with all water rights attaching to said lands estimated at about 150,000 acre feet per annum."[25] Just when Darling found money to buy the Blitzen, the Supreme Court ruled in favor of Malheur Refuge on the lake bed title question, finding that the lake was not navigable, so the State of Oregon had no claim to the lake bed or to the water. The Supreme Court based this decision on *Marshall v. French,* the case that had led to a triumph for squatters against ranchers while also establishing federal rights to the lake.

In a wonderful irony, the West's grandest cattle empire became its grandest duck and wetland empire. Whereas local papers were bitter—the *Crane American* predicted angrily that "loss of these areas from the taxable land would break the county"[26]—urban papers focused on the romance of the old cattle kingdoms. The *Oregon Daily* summed up the urban feeling: "Where once the wild yells of savages and the shots of gunfighters resounded, henceforth only the muted calls of nesting waterfowl will break the silence of the plains, and the 'P' ranch, scene of the last stand of the old West, will pass into the limbo of peaceful pursuits."[27] The *Portland Oregonian* waxed even more nostalgic in its editorial, writing:

> They're going to turn the P ranch into a game refuge and wild life laboratory....It seems to us that in the last quarter century, the P ranch has been a sort of focal point in a conflict between nature and civilization for supremacy. Now nature has won the combat....Now it goes back to nature—in a way. The biological bureau of the government has it, probably to keep for all time. Wild birds, of a hundred and fifty varieties, will nest in its tules, and game animals will roam its confines in safety....But the white-faced steers, and the yipping buckaroos have departed these old precincts of Pete French and Bill Hanley forever. Nor may the chugging motor cars of

wanderers disturb the maternal deliberations of the Canadian honker. Nature has won out.[28]

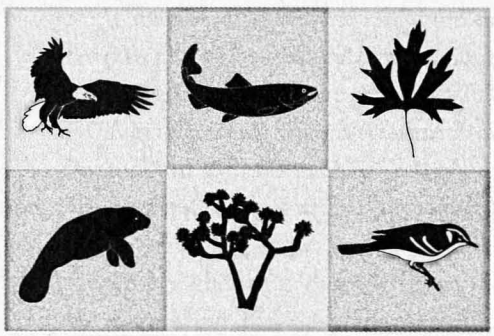
Although urban newswriters could claim that "nature has won out," the reality was far more complex. To save Malheur, Finley and Darling had turned to politics, money, and law, as well as to the rhetoric of wild nature and romantic cowboys that the newspapers favored. ☾

Nancy Langston *is associate professor of environmental studies at the University of Wisconsin, Madison.* *This essay is adapted from her book* Where Land and Water Meet: A Western Landscape Transformed *(©2003 University of Washington Press), which uses the Malheur Lake Basin in southeastern Oregon as a way to explore the complex boundary between land and water.*

NOTES

1. Gregg Mitman, 1999, *Reel Nature: America's Romance with Wildlife on Film* (Cambridge, MA: Harvard University Press), 96–97. On Finley's life and work, see Worth Mathewson, 1986, *William Finley: Pioneer Wildlife Photographer* (Corvallis: Oregon State University Press).
2. William Finley, "On the Trail of the Plume Hunters," William Finley Papers, Oregon State University Archives. See also Jennifer Price's 1999 discussion of conservation and the feather trade in "When Women Were Women, Men Were Men, and Birds Were Hats," in *Flight Maps: Adventures with Nature in Modern America* (New York: Basic Books), 57-110.
3. L. Alva Lewis, 1912, "Report on Conditions of Lake Malheur Reservation, Oregon," Report for T.S. Palmer, assistant chief of USDA Bureau of Biological Survey, refuge files, Malheur National Wildlife Refuge, Princeton, Oregon, 7.
4. Lewis, 12.
5. Dallas Lore Sharp, 1914, *Where Rolls the Oregon* (Boston: Houghton Mifflin Co.), 96.
6. Sharp, 94 (emphasis in original).
7. Sharp, 98.
8. Sharp, 92, 98.
9. John C. Scharff, 1972, "Historical Material—P-Ranch," refuge files, Malheur National Wildlife Refuge, Princeton, Oregon, 2.
10. Scharff's 1938 history of the refuge states, "The story of the Malheur is typical of the unfortunate history of waterfowl throughout the arid West, where uncontrolled shooting, over-grazing of the marsh areas, and the general abuse inflicted on this class of game, took an immense toll. The story of the wildlife abuses and the possibility of correcting these abuses was brought to the attention of...President Theodore Roosevelt with the result that on August 18, 1908 he signed a special executive order establishing Malheur, Harney, and Mud Lakes a combined area of 88,960 acres as a Federal wildlife reservation" (John C. Scharff, 1938, "A Brief History of Malheur Refuge, Malheur Lake Area—A Scene of a Thousand Interests," refuge files, Malheur National Wildlife Refuge, Princeton, Oregon.)
11. Ann Vileisis, 1997, *Discovering the Unknown Landscape: A History of America's Wetlands* (Washington, D.C.: Island Press), 151. For a much fuller examination of the role of women in bird conservation, see Price, 1999, "When Women Were Women," 57–110. On the growing national concern over bird populations, see Mark V. Barrow Jr., 1998, *A Passion for Birds: American Ornithology after Audubon* (Princeton: Princeton University Press); Ira Gabrielson, 1943, *Wildlife Refuges* (New York: MacMillan); and Thomas Dunlap, 1988, *Saving America's Wildlife* (Princeton: Princeton University Press).
12. Nathaniel P. Reed and Dennis Drabelle, 1984, *The United States Fish and Wildlife Service,* (Boulder, CO: Westview Press), 5. In 1871 the Bureau of Fisheries was established and later incorporated into the Department of Commerce. In 1886 the Division of Economic Ornithology and Mammalogy was established in the Department of Agriculture and renamed the Division of the Biological Survey in 1891. These two agencies were the ancestors of the Fish and Wildlife Service.
13. Reed and Drabelle, 7.
14. Gabrielson, *Wildlife Refuges,* 11.
15. Vileisis, 155.
16. Vileisis, 155; Reed and Drabelle, 9. For an in-depth discussion of the threat of drainage in the Malheur Lake Basin, see the section subtitled "The Attempt to Drain the Lakes" (68–83) in Nancy Langston's book (from which this article is excerpted), *Where Land and Water Meet: A Western Landscape Transformed.*
17. Vileisis, 173–75.
18. Thomas H. Beck, Jay "Ding" Darling, and Aldo Leopold, 1934, "Report of the President's Commission on Wildlife Restoration," Feb. 8, William Finley Papers, Oregon State University Archives, box 9, Klamath/Malheur Materials, 1930s, 4. The report's description of problems stemming from drainage are succinct and pithy: "The rapid depletion of the migratory waterfowl resource, now universally admitted to be a fact, is in large part a result of the unwise exploitation of sub-marginal lands. Drainage operations, intended to bring more land under cultivation, have directly destroyed millions of acres of former breeding grounds, and by lowering of water tables, have indirectly destroyed millions of acres more. Grazing of the remaining marshlands and ranges has prevented successful nesting and reproduction of breeding stocks. Mowing of hay and fires have destroyed many nests and nesting sites. This destruction of nests by grazing and mowing the shores of lakes and sloughs has reduced the annual increase from a normal expectancy of 300 percent to as low as 15 percent in areas under observation," 11.
19. Beck et al., 6.
20. In 1905 the Division of Biological Survey became the Bureau of Biological Survey, and in 1939 was transferred from the U.S. Department of Agriculture to the Department of the Interior. In 1940 the Bureau of Biological Survey and the Bureau of Fisheries merged to form the Fish and Wildlife Service.
21. Vileisis, 173–79.
22. Ding Darling, 1934, Letter to William Finley, May 15, William Finley Papers, Oregon State University Archives, box 7.
23. Darling, 1934, Letter to Finley, May 21. Darling expressed to Finley his frustration at his failure to create a national program to fund refuge acquisition: "I wish lots of things right now and one of the chief of them is at least some of the money promised by the Federal Government for the acquisition of migratory waterfowl resting areas would be forthcoming. So far we have had nothing but promises and not a cent has been allocated to this Department which we may spend even on investigations of the areas which we hope to buy. I know how mad you will be on getting this news and you are in no different emotional state than are we here in Washington, but we have hammered and pounded and tried in an effort to loosen up the guardian knot. Maybe we will finally succeed in getting a few crumbs but the original hope of a nationally planned program has almost died."
24. Finley, 1934, Letter to Darling, June 2, William Finley Papers, Oregon State University Archives.
25. Caryn Talbot, 1976, "P Ranch: History, Preservation and Interpretive Development," refuge files, Malheur National Wildlife Refuge, Princeton, Oregon, 128–29.
26. "P-Ranch Bird Refuge Sold for $610,000," 1934, *Crane American,* August 3, refuge files, Malheur National Wildlife Refuge, Princeton, Oregon.
27. *Oregon Daily,* 1935, Feb. 21, refuge files, Malheur National Wildlife Refuge, Princeton, Oregon. The article reads, "Sale of the historic P Ranch, 65,000 acre cattle barony in Harney county, famed in the romantic history of the Oregon cow country, for use as a federal game refuge was announced today by Carl C. Donaugh, United States district attorney, who turned over a check for $675,000 to the Eastern Oregon Livestock company to complete the largest real estate transfer in the state this year.

    "It was Peter French, pint-size sower of the seeds of empire, who fought the wilderness and Indians and battled hostile ranchers to carve out his vast holdings in Donner und Blitzen valley in the riotous, gunfighting days of 1870, who established the P Ranch, which was the headquarters of his sprawling acres....Here gathered such fabled great ones as 'Hen' Owen, John Devine, Bill Hanley, and others of the gallant crew who ran their teeming herds of bawling cow critters on the lush pasturage of Blitzen valley, Happy valley and Catlow valley."
28. *Portland Oregonian,* 1935, Feb. 23, refuge files, Malheur National Wildlife Refuge, Princeton, Oregon.



THE CRAZY-QUILT REFUGE SYSTEM

by ROBERT FISCHMAN

THE NATIONAL Wildlife Refuge System is a tangle of land units with widely varying sizes, purposes, origins, ecosystems, climates, levels of development and use, and degrees of federal ownership and Service control. This is due to the opportunistic growth of wildlife refuges, migratory bird refuges, waterfowl production areas, game ranges, wildlife management areas, and other land unit categories into the Refuge System. Units were created in response to crises, personal preferences of high-ranking officials (and legislators), funding availability, social program priorities, donations, and, of course, wildlife needs. The retrospective task of bringing coherence to this conglomeration requires historical context, flexible interpretation, and a modicum of imagination.

Despite the diverse authorities and origins of the individual wildlife refuges, all share a general purpose of animal conservation. Beginning in 1940 with a presidential proclamation renaming scores of refuges, there has been an ongoing effort to consolidate the refuge unit types into fewer categories. Beginning in the 1960s, important systemwide legislation provided central principles around which refuge management would coalesce.

The Refuge System's tortuous history has given rise to a collection of units that defy logical organization. This results in bewilderingly different categorizations for similar refuges. For instance, a prairie pothole acquired through the Farm Service Agency (FSA) may be an FSA unit refuge or a waterfowl production area, depending on its location. Similarly, a "wildlife management area" may be a national wildlife refuge or a coordination area, depending on whether it is administered through a cooperative agreement. Reorganizing the Refuge System so that unit names and categories more accurately describe their management is a perennial topic of interest for reformers.

Though it is difficult to generalize about the attributes of such a far-flung and varied system, its sheer size makes it a significant conservation network. Of all the dominant-use conservation land categories in the United States, only the overlay system of wilderness areas, consisting of 106 million acres, is larger than the Refuge System. The 84-million-acre National Park System, the 44-million-acre BLM collection of conservation lands, now called the National Landscape Conservation System, and even the 13-million-acre system of nonpublic preserves managed by the Nature Conservancy are all smaller. The Refuge System has the potential to be the preeminent ecological protection network in the nation. In some ways, the refuges serve that mission; in others, they fall short.

The Taxonomy of the Refuge System

Most land managed by the FWS is part of the Refuge System. The taxonomy of the system is illustrated in the figure on page 39. The approximately 95 million acres of the system comprise 92 million acres of national wildlife refuges, 3 million acres of waterfowl production areas, and 0.3 million acres of coordination areas.

The Refuge System contains two major categories of units: coordination areas and refuges. Coordination areas are federally owned lands managed by states under cooperative agreements with or long-term leases from the FWS. Though these 50 coordination areas are part of the system, they are excluded from key statutory requirements of the 1997 National Wildlife Refuge

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System Improvement Act, such as comprehensive planning and the substantive criterion of compatibility for all uses, which apply only to refuges. Older statutory requirements, such as the compatibility criterion for approval of recreational uses, continue to apply to coordination areas, as lands within the system. Though defined by statute and regulation to be managed by states, the FWS realty database notes that coordination areas may be managed by cities and organizations that enter into cooperative agreements with the Service. This gap between law and practice reflects the difficulty of flexibly responding to conservation opportunities within the antiquated taxonomy.

All other units of the system are refuges, regardless of whether that term is included in their names. So, Bull Mountain Game Range, Falls of the Ohio National Wildlife Conservation Area, Hart Mountain National Antelope Refuge, and National Bison Range are all national wildlife refuges, despite their formal names. Though the approximately 550 named national wildlife refuges are the best known and largest component of the refuges in the system, they form a category defined by what it is not: refuges other than waterfowl production areas.

The most important affirmatively defined category of refuges is the waterfowl production area (WPA). The WPAs are often excluded from studies of the Refuge System because of their unwieldy numbers, relatively narrow focus on increasing bird populations, and lack of intensive management. In general, WPAs have less restrictive public-use conditions than other refuges in the system. The WPA may be a fee simple interest owned outright by the federal government or an easement to conserve resources on privately owned land. Nearly 95% of the WPAs protect the northern prairie wetlands ("potholes") that are critical waterfowl habitat.

The WPA is a category so confusing that even the FWS fails to get it right. Though WPAs are supposed to be limited to "any wetland or pothole area acquired pursuant to section 4(c) of the amended Migratory Bird Hunting Stamp Act," some WPAs are acquired under other programs, such as the Emergency Wetlands Resources Act, or through Farm Service Agency transfers.

Also confusing are the numbers of WPAs reported by the FWS. Though the Service often cites the nearly 3,000 WPA units owned outright by the United States, there are approximately ten times that number of WPA areas if one counts all the conservation easements that the FWS holds over private lands. The Service groups the WPAs, which are relatively isolated, small wetlands or prairie potholes, into 37 "wetland management districts." To qualify as a WPA, the property must be within one of 193 counties with acquisition targets. Most of these counties are located in eight north-central states: Iowa, Minnesota, Michigan, Montana, Nebraska, North Dakota, South Dakota, and Wisconsin. However, other states, such as Idaho and Maine, have acquisition targets and, therefore, wetland management districts. Wetland management districts also acquire wetland and grassland easements to enhance habitat for migratory birds.

WPAs are often acquired by the Department of Agriculture. After a Department of Agriculture reorganization in 1994, the Farm Service Agency (FSA) succeeded the Farmers Home Administration as the principal federal lender to farmers. When the FSA acquires properties with waterfowl production values through foreclosure or bankruptcy, it may transfer them to the FWS. If these properties are located in a qualifying county, they generally become WPAs. If they are outside of a WPA county, then the FWS categorizes them as FSA interests. With the exception of the FSA interests, refuges that are not WPAs are the named national wildlife refuge units that constitute the core identity of the Refuge System.

What FWS property is excluded from the Refuge System? Most fish hatcheries and administrative holdings are not part of the system. However, some fish hatcheries may be part of the system because they happen to occur within a system unit. For instance, the Hagerman National Fish Hatchery is part of the Hagerman Coordination Area in Idaho, and the Ouray National Fish Hatchery is located on the Ouray National Wildlife Refuge in Utah.

On some units of the Refuge System, the Service shares management control. For instance, the National Aeronautics and Space Administration cooperatively manages Merritt Island National Wildlife Refuge (which includes the Kennedy Space Center) with the Service. Also, the Bureau of Reclamation administers the agricultural leases, subject to Service control, in the Tule Lake, Lower Klamath, Upper Klamath, and Clear Lake Refuges. Other cooperating agencies include the Tennessee Valley Authority and the Department of Defense. In 1976, the Game Range Act ended joint management with the BLM of four large refuges and placed them under the exclusive control of the Service. This 1976 law now limits the ability of the president to transfer control of any refuge from the Service.

As a general matter, the Refuge System lacks control of the airspace above and the minerals below the surface of the refuge. The Federal Aviation Administration generally controls aeronautical activity, but the Department of Defense manages overflights of military aircraft on many refuges.

1971
Conscience Point
St. Johns
Wallops Island
Julia Butler Hansen

1972
Thacher Island
Attwater Prairie Chicken
Pearl Harbor
Meredosia
Plum Tree Island
Lewis and Clark
Wapack
Hanalei
Seal Island

1973
Sevilleta
Pond Island
Humboldt Bay
Supawna Meadows
Nantucket
Occoquan Bay
Franklin Island
Nansemond
Great Dismal Swamp
Salinas River
Block Island
Swan River
Rose Atoll
Huleia

1974
San Pablo Bay
Don Edwards San Francisco Bay
Hopper Mountain
Oxbow
Seal Beach
Petit Manan
Jarvis Island
Baker Island
Howland Island
Nisqually
Egmont Key
Trustom Pond
Cabo Rojo

1975
Mississippi Sandhill Crane
Optima
Felsenthal
Big Stone
Pinckney Island
Ellicott Slough
Hillside
D'Arbonne
Karl E. Mundt

☞

These overflights have been an ongoing source of conflict arising from their adverse effects on wildlife. Conflicts also exist between petroleum-related development and refuges' mandate to achieve conservation goals. Some type of oil or gas exploration or production occurs on 77 refuges in 22 different states.

Finally, many refuges, such as the Klamath Basin refuges in Oregon and California, the Deer Flat in Idaho, and the Upper Mississippi River in Minnesota, Illinois, Iowa, and Wisconsin, are located along rivers or lakes that are managed by the Bureau of Reclamation or the U.S. Army Corps of Engineers for flood control, irrigation, or other purposes. These refuges often are subject to water level variations or water deliveries that are outside of Service control and can frustrate conservation purposes.

The Refuge System also contains special overlays of preservation zoning. The Refuge System includes over 20 million acres of wilderness areas, mostly in Alaska, on 65 refuges. This amounts to approximately 20% of both the Refuge System and the total wilderness area acreage in the United States. The wilderness areas range in size from an eight-million-acre unit in the Arctic National Wildlife Refuge in Alaska to a tiny five-acre unit in the Pelican Island National Wildlife Refuge in Florida.

The Alaskan refuges also contain most of the system's river segments protected under the Wild and Scenic Rivers Act. Some 1400 river miles of the 10,815 miles of wild and scenic rivers in the United States occur in refuges. The Refuge System's wild and scenic rivers range from the 285-mile Ivishak River in the Arctic National Wildlife Refuge to a five-mile segment of the Niobrara River flowing through Nebraska's Fort Niobrara National Wildlife Refuge.

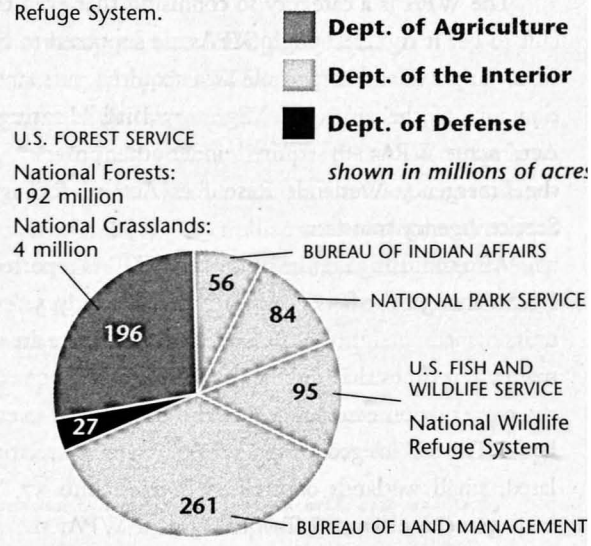
The National Park Service manages most national monuments. But recent executive orders have broadened the monument management agencies to include the BLM and the FWS. In 2000, President Clinton established the 195,000-acre Hanford Reach National Monument. The FWS manages nearly 165,000 acres of this monument, which is the only one in the Refuge System.

The Resources of the Refuge System

It is not simply the large size and numerous units that make the Refuge System extraordinary. More important to the significance of the system are its broad reach and diverse landscapes. These attributes, in turn, generate a great deal of public use of and interest in the refuges. They also make the system a key network for protecting representative ecosystems and sustaining migrating animals, such as ducks and caribou.

As with the National Park System, the bulk of the Refuge System lands and its largest units occur in Alaska. Though only 4% of refuge units are located in Alaska, they constitute 85% of the system's acreage. The Arctic National Wildlife Refuge tops the list of giant refuges with 19.3 million acres. Yukon Delta National Wildlife Refuge runs a close second with 19.2 million acres. The 3.6-million-acre Alaska Maritime National Wildlife Refuge has the largest sweep, containing a string of islands that would stretch from California to Florida if superimposed on the lower 48 states. Nonetheless, there

To the amazement of many East Coast residents, one-third of the United States is federally managed land. The bulk of these nearly 720 million acres lies west of the Mississippi with 83% of Nevada, 64% of Utah, 52% of Oregon, and 44% of California under the watch of government. Alaska tops the chart at 250 million acres of federal land, some 68% of the state. This—sometimes loved, sometimes abused, much disputed—trust for all the people is managed by a bewildering string of agencies. The two giants in the parade are the Department of Agriculture—overseer of the national forests—and the Department of the Interior—home to both the National Park Service and the largest land manager in the nation, the Bureau of Land Management. Interior's third charge is the U.S. Fish and Wildlife Service, that, in turn, manages "America's Best Kept Secret," the 95 million acres of the National Wildlife Refuge System.



are some very large refuges outside of Alaska, including Desert National Wildlife Range (1.6 million acres) in Nevada, Charles M. Russell (910,000 acres) in Montana, Cabeza Prieta (860,000 acres) in Arizona, Okefenokee (390,000 acres) in Georgia and Florida, Hart Mountain (270,000 acres) in Oregon, Alligator River (160,000 acres) in North Carolina, and Aransas (110,000 acres) in Texas. Several refuges containing important habitat are under 100 acres in size. The smallest, Mille Lacs in Minnesota, logs in at only 0.6 acre.

Waterfowl production areas tend to be small, averaging 223 acres in size. The smallest, North Dakota's Medicine Lake WPA, is less than an acre. The largest, Montana's Kingsbury Lake WPA, is 3,700 acres.

Every state and several territories have at least one unit in the Refuge System. The spread of the system is evident in the location of the top three states in numbers of refuge units. North Dakota has 64, California has 38, and Florida has 29. The system's origins in wildlife conservation are evident in its habitats, which support more than 700 bird, 220 mammal, 250 reptile and amphibian, and 200 fish species. The four major bird migration corridors (flyways) across the United States—the Atlantic, Mississippi, Central, and Pacific—contain concentrations of hundreds of refuges. These flyway refuges provide breeding, feeding, and resting habitat for millions of birds each season. The WPAs protect thousands of prairie wetlands (potholes) in an area of the northern plains otherwise dominated by private agricultural land use.

Endangered and threatened species protection has triggered the acquisition of 56 refuges, including Crystal River in Florida for manatees, Oklahoma Bat Caves for bats, Hakalau Forest in Hawaii for indigenous birds, and Ash Meadows in Nevada for a variety of imperiled plants and fish. The Refuge System contains a total of 180 animal and 78 plant species listed under the Endangered Species Act.

An indication of the quality of Refuge System habitat comes from the many units recognized by international programs designed to protect ecosystems of global significance. The United Nations Educational, Scientific and Cultural Organization's Man and the Biosphere Program designates as "biosphere reserves" protected ecosystems that are managed to reconcile the conservation of biodiversity with sustainable use. Five units of the Refuge System occur in biosphere reserves: Blackbeard Island, Wolf Island, and Cape Romain National Wildlife Refuges fall within the Carolinian-South Atlantic Biosphere Reserve; Farrallon National Wildlife Refuge occurs in the Central California Coast Biosphere Reserve; and Alaska Maritime National Wildlife Refuge includes an Aleutian Islands Unit, which is in the Aleutian Islands Biosphere Reserve.

The 1971 Ramsar Convention provides criteria for the designation of

National Wildlife Refuge System

"various categories of areas that are administered...for the conservation of fish and wildlife, including species that are threatened with extinction, all lands, waters, and interests therein administered...as wildlife refuges, areas for the protection and conservation of fish and wildlife that are threatened with extinction, wildlife ranges, game ranges, wildlife management areas, or waterfowl production areas"
16 U.S.C. § 668dd(a) as interpreted by 50 C.F.R. § 25.12

Refuges or National Wildlife Refuges
"a designated area...within the System, but does not include Coordination Areas" 16 U.S.C. § 668ee(11) ("refuge"); 50 C.F.R. § 25.12 ("national wildlife refuge")

Waterfowl Production Areas
"any wetland or pothole area acquired pursuant to section 4(c) of the amended Migratory Bird Hunting Stamp Act"
50 C.F.R. § 25.12(a)

37 wetland management districts
3 million acres
Approx. 30,000 areas, including easements

Other National Wildlife Refuges
Default category under 50 C.F.R. § 25.12

543 units
92 million acres
14 types of names, including:

National Wildlife Refuge
FSA Interest
Wildlife Management Area
Fish and Wildlife Refuge
Wildlife and Fish Refuge
Elk Refuge
Deer Range
Wildlife Range
Bison Range
Migratory Bird Refuge
Wildlife Refuge
Antelope Refuge
Game Preserve
Research Refuge

Coordination Areas
"a wildlife management area...made available to a State by cooperative agreement...or long-term leases"
16 U.S.C. § 668ee(5)

50 units
0.3 million acres
16 types of names, including:

Wildlife Management Area
Game Range
Public Fishing Area
Waterfowl Management Area
Elk Winter Pasture
Elk Refuge
Deer Winter Refuge
Game and Fish Management Unit
Migratory Bird Management Area
State Game Range
Wildlife Conservation Area

1976
James Campbell
Desecheo
Kakahaia
Minnesota Valley

1977
Green Cay
Morgan Brake

1978
Panther Swamp
Texas Point
Sheldon
Upper Ouachita
Becharof
Bear Valley
Featherstone
Sauta Cave

1979
Lower Rio Grande Valley
Lower Suwannee
Grasslands
Crocodile Lake
Moapa Valley
Fox River
Bon Secour

1980
Kanuti
Kodiak
Arctic
Antioch Dunes
Alaska Peninsula
Koyukuk
Nowitna
McFaddin
Alaska Maritime
Kirtland's Warbler
Banks Lake
Cross Island
Mathews Brake
Butte Sink
Lower Hatchie
Togiak
Selawik
Yukon Flats
Castle Rock

1980
Tijuana Slough
Overflow
Tetlin
Innoko
Watercress Darter
Yukon Delta

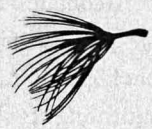
1981
Fern Cave
Bogue Chitto

☞

A Refuge Sampler

What metaphor for the Refuge System? It has been called the middle child of the federal land estate, lost between the beloved national parks and the gargantuan Bureau of Land Management. It can be seen as a fragile green necklace, each refuge held together by migrating birds. In this issue of *Wild Earth* it is compared to a crazy quilt, a patchwork of disjointed acquisitions driven by crisis and whim. The Refuge System calls itself America's best kept secret, a label both poignant and self-congratulatory—but maybe true. Here are eleven refuges, none typical, since diversity may be the most shared feature of the system. For the creatures that live in these wetlands and tundras, deserts and prairie potholes, mountains and river bottoms, coral reefs and estuaries, the National Wildlife Refuge System is simply home.

On March 14, 1903, President Theodore Roosevelt created the first national wildlife refuge, protecting a five-acre brown pelican rookery in Florida's Indian River. "Is there any law," he asked, "that will prevent me from declaring **Pelican Island** a federal bird reservation?" Assured that, as it was government land, there was none, he added: "Very well, then I so declare it."



The most recent addition to the Refuge System, **Mountain Longleaf National Wildlife Refuge**, Alabama, was established in May 2003; its 9,000 acres of former military land contain the only remaining stands of old-growth mountain longleaf pine forest.

Lake Erie's 77-acre **West Sister Island National Wildlife Refuge** is the only designated wilderness in Ohio. This island is strictly for the birds: home to more than 1,000 great blue heron, black-crowned night heron, and egret nests, West Sister is one of nine federal wilderness areas closed to the public.

Driftless Area National Wildlife Refuge, Iowa, takes its name from the most recent ice age: 12,000 years ago glaciers surrounded this "driftless area" but did not pass over it. The 775-acre refuge was established in 1989 to protect the endangered Iowa Pleistocene snail and threatened northern monkshood plant, glacial relicts that require a unique moist microclimate.

Yukon Delta National Wildlife Refuge, Alaska—19.5 million acres—is the most important shorebird nesting area in the United States. Millions of birds, traveling six major flyways from the Atlantic Ocean to the east coast of Asia, nest, rest, and feed here.

Johnston Island National Wildlife Refuge is located on one the most isolated pieces of emergent land in the world, an atoll in the central Pacific Ocean between the Hawaiian Islands and the Marshall Islands. Established as a wildlife refuge in 1926, the atoll has also been used by the military since 1934. Seabirds, such as the great frigatebird and wedge-tailed shearwater, breed on the refuge, while the reef lagoon supports the threatened green sea turtle and endangered Hawaiian monk seal. Dioxin and plutonium contamination are among the toxic legacies of nuclear and missile testing here in the 1950s and 1960s.

The four refuges within Desert National Wildlife Refuge Complex include the largest one in the lower 48 states:

the 1.6-million-acre **Desert National Wildlife Range** in the Mojave Desert of southern Nevada. The refuge was established in 1936 for the protection of desert bighorn sheep and now forms one of the largest intact blocks of desert bighorn habitat remaining in the Southwest.

Nearby, **Ash Meadows National Wildlife Refuge** protects 24 plants and animals found nowhere else in the world—including several species of endangered pupfish. This unique desert oasis has a greater concentration of endemic life than any other local area in the United States, but its warm springs are threatened by roads, cattle grazing, and potential aquifer depletion.

Extending 125 miles along the Missouri River in north-central Montana, the **Charles M. Russell National Wildlife Refuge**'s 1.1 million acres are home to elk, pronghorn, and sage and sharp-tailed grouse. Large prairie dog towns here are the site of an ongoing effort to rescue one of North America's most endangered predators, the black-footed ferret. A reintroduction program for the endangered pallid sturgeon is also underway in the refuge's section of the river.

Twenty-six miles west of New York City, **Great Swamp National Wildlife Refuge** speaks to the history and challenges of the Refuge System. Formed in 1960 from a grassroots effort to protect the area from development as an airport, it is 7500 acres of mixed hardwood freshwater swamp. The eastern half of the refuge was designated as the first wilderness in the National Wildlife Refuge System in 1968. Large breeding populations of wood ducks and bluebirds occur at Great Swamp, but it also is being damaged by invasive purple loosestrife and other exotic plants. More than 350,000 people visit the refuge each year, which is home to the threatened bog turtle and blue-spotted salamander.

Delta National Wildlife Refuge is formed from 48,000 acres of emergent wetlands at the mouth of the Mississippi River south of Venice, Louisiana. Purchased in 1935 with a mandate to provide sanctuary and habitat for wintering waterfowl, the refuge today is dotted with oil and gas operations on 455 permitted wells.

digital cartography by Kurt Menke/Bird's Eye View

1982
San Bernardino
Blue Ridge
Protection Island

1983
Crystal River
Harbor Island
Bandon Marsh
Massasoit
Big Boggy
Pierce

1984
Sandy Point
Alligator River
Currituck
Eastern Shore of Virginia
Kilauea Point
Ash Meadows

1985
Hakalau Forest
Chickasaw
Stewart B. McKinney
Willow Creek–Lurline
Tensas River
Buenos Aires
Ozark Plateau
Bitter Creek
Coachella Valley

1986
Little Sandy
Atchafalaya
Steigerwald Lake
Cache River

1987
Little River
San Joaquin River
John Hay
Pilot Knob

1988
Sunkhaze Meadows
Cameron Prairie
Sweetwater Marsh
Lake Ophelia
Midway Atoll

1989
Cape May
John H. Chafee
Hamden Slough
Sacramento River
Grand Bay
Driftless Area
Bond Swamp
Florida Panther
Logan Cave
Laguna Cartagena

"wetlands of international importance." Units of these extraordinary wetlands sites occur in 19 national wildlife refuges, including Izembek in Alaska, Edwin B. Forsythe in New Jersey, Okefenokee in Georgia and Florida, Ash Meadows in Nevada, Pelican Island in Florida, and Sand Lake in South Dakota. Similarly, the Western Hemisphere Shorebird Reserve Network designates areas providing essential habitat for migratory shorebirds. The Refuge System contains 20 of these designated areas.

Though the Refuge System is best known for its natural resources, it also contains significant cultural resources. Hundreds of sites within refuges are eligible for protection under the National Historic Preservation Act, and seven are National Historic Landmarks. Landmark sites include a shipwreck and its cargo in Iowa's DeSoto National Wildlife Refuge, archaeological remains of Paleo-Indians in North Dakota's Lake Ilo National Wildlife Refuge, and petroglyphs in New Mexico's Sevilleta National Wildlife Refuge.

The Refuge System attracts 37 million visits annually, which is modest compared to 214 million visits for the National Forest System and 280 million visits for the National Park System. The visitation statistics reflect the relatively low public recognition of the refuges compared to the national forests and parks. Nonetheless, all but two percent of the system is open to the public for some form of recreation. The Refuge System's chief priority use, after conservation (the primary use), is wildlife-dependent recreation.

Wildlife-dependent recreation includes hunting, fishing, wildlife observation and photography, and environmental education and interpretation. Hunting occurs on 290 refuges and attracts 2 million visitors annually. Though most hunters target waterfowl, refuges also offer big game (especially in Alaska), upland bird, and small mammal hunting. Fishing occurs on 260 refuges and attracts 6 million visitors annually. This includes both fresh- and saltwater fishing. Wildlife observation and photography bring in 16 million visitors annually to the Refuge System. The Refuge System contains 230 field stations offering environmental education programs. Because wildlife refuges are better distributed around the country than other public land systems, they can educate a great many people close to home. A refuge is within an hour's drive of every major U.S. city.

Non-wildlife-dependent recreation also occurs on refuges. The most prevalent of these activities are boating, picnicking, horseback riding, swimming, and camping. Also common are waterskiing, recreational trapping, and off-road vehicle use, which (along with motorboating) give rise to widespread conflicts with the ecological protection mission of the system.

Additional conflicts arise from military and economic uses of refuges. The military uses of refuges, especially air exercises, generally fall outside the jurisdiction of the Service. The principal economic uses are rights-of-way for roads, pipelines and other utilities, and agriculture. However, logging, commercial fishing, commercial trapping, and mining also occur on some refuges.

Conflicts among users, or between users and the conservation mission of the Refuge System, fuel the development of new law. Certainly, the path-breaking 1997 Improvement Act emerged from an outbreak of concern about the ability of the Service to manage the refuges under existing authority in a manner that would achieve the Refuge System's comprehensive conservation potential. The challenge for the law is to coordinate the crazy quilt of far-flung refuges as an orchestrated system that functions to achieve large-scale ecological harmony. Organic legislation, like the 1997 Act, views each land unit as a kind of organ with its own role to play in the functioning of the larger body of the Refuge System.

Robert Fischman *is professor of law and Louis F. Niezer Faculty Fellow at Indiana University School of Law–Bloomington. He has published widely on issues related to public land management, endangered species recovery, environmental impact analysis, and sustainable forestry.*

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For in-text citations, including statute references, please see The National Wildlife Refuges: Coordinating a Conservation System Through Law.

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Lynn Greenwalt

Lynn A. Greenwalt, *former director of the U.S. Fish and Wildlife Service, headed the agency from 1973–1981, serving in that capacity under Presidents Nixon, Ford, and Carter. It is sometimes said that Greenwalt was born into the Fish and Wildlife Service; while tales of his birth on a wildlife refuge are apocryphal, he did grow up on refuges in Nevada and Oklahoma, the son of a refuge manager. Following schooling and military service, he spent his entire government career with the agency. After retiring from the Service, Greenwalt served in a variety of executive positions with the National Wildlife Federation. In 2002, he was appointed by the Secretary of the Interior to serve on the National Wildlife Refuge Centennial Commission, which helped broaden public understanding and appreciation of the Refuge System during its centennial year, 2003.*

Wild Earth *asked* **Brock Evans,** *another legendary figure in the conservation movement, and currently the executive director of the Endangered Species Coalition, to interview Lynn Greenwalt. They spoke on August 25, 2003.*

BROCK EVANS: How did you decide to make your career with the Fish and Wildlife Service?

LYNN GREENWALT: My father, Ernest J. Greenwalt, inspired me. He was a successful newspaperman in Reno, Nevada, and in 1928 was asked to do some writing designed to encourage the establishment of a pronghorn antelope refuge in northwestern Nevada. He and my mother went there—for the summer—and he never returned to the newspaper office. He became the first field manager of what is now the Sheldon National Wildlife Refuge, and I was born in Reno (not on the refuge, as some myth-makers would have it) in 1931.

sandhill cranes, Bosque del Apache Refuge, New Mexico, acrylic by Todd Telander

That was then, and is now, a remote part of the country and when it came time for me to go to school, we were moved to the Wichita Mountains National Wildlife Refuge in Oklahoma, where I grew up. I watched my father dig into his work with enthusiasm and obvious pleasure, in spite of the problems he often faced. In my high school years it dawned on me that what my father did seemed to be great fun and obviously challenged him. Somehow a spark of insight was kindled in me: any job that was as rewarding as his seemed to be, so rich in opportunities to accomplish important things, should not be ignored. I wanted that kind of job.

So, how did it begin for you?

I spent my summers in late high school and college working as a laborer and then as a maintenance man—there was a distinction, however slight—on the Wichita Refuge. I cleaned campgrounds, repaired things, mowed lawns. I started at the bottom, I suppose, though at the time I thought I was an occupant of the best of possible worlds.

I attended the University of Oklahoma, majoring in zoology, then went on to the University of Arizona in Tucson for a master's in wildlife management. Extraordinary good fortune had come my way a few years before, when a "girl next door" appeared on the Wichita Refuge. She was the daughter of a refuge manager sent to Oklahoma to train under my father. I had a moment of good judgment, in which I persuaded Miss Cunningham to marry me. This was an important event in my life, and in retrospect I see it as pivotal to whatever success I have enjoyed since then. There is nothing like a supportive, understanding, patient spouse to help one succeed. It is also useful when she is self-reliant, courageous, good-humored, knows about pickup trucks and electric generators, and can type.

Judy and I were assigned to Salt Plains Refuge in Oklahoma and the Bosque del Apache Refuge in New Mexico. In 1959, we were given a chance to start a new national wildlife refuge in western Utah, at a wild and remote place called Fish Springs. This is the site of a large spring-fed marsh within a 10,000-acre tract immediately south of the Great Salt Lake Desert. It was 30 miles to a neighbor, 66 miles to civilization in the form of the super-secret Dugway Proving Grounds, and 104 miles to a paved highway. We loved it.

By the time my older son had to go to school, the place was on the cusp of being really comfortable—full-time electricity, a real house to live in, and miles of dikes and lots of control structures to enable a small staff to manage the water to greatest advantage for a remarkable number and variety of birds.

I served in regional refuge offices in Albuquerque and Minneapolis, then accepted a job as the Fish and Wildlife Service's regional law enforcement supervisor in Portland, Oregon. I had done a lot of law enforcement on refuges, but never on a full-time basis. I was pleased to be accepted by the 25 or 30 veteran officers who worked with me, the first "alien" to have gone from refuge work to supervising law enforcement.

That was my first exposure to the earlier versions of the Endangered Species Act; we also focused on import violations, enforcement of the Lacey Act (which makes it a federal crime to move wildlife taken illegally in one state into another), and worked closely with state wildlife officers. This rewarding job reinforced my conviction that the Fish and Wildlife Service is an organization of many important parts, each focused on the well-being of the nation's wildlife and habitat resources.

Tell us what the Refuge System was like thirty years ago.

That was about the time I moved to Washington to become Chief of the Division of Refuges, in 1971. I can't recall the exact number of refuges in place then, but it was roughly 320, containing about 35 million acres, as I remember. (This was before the Alaska National Interest Lands Act in 1980 more than doubled the size of the system.) The system has more than 540 refuges in it now, and embraces over 93 million acres.

There had been a land acquisition program for the Refuge System since 1935, when the first Duck Stamp went on sale and revenue began to accumulate, to be used for the purchase of lands valuable to wildlife. Before that, land purchase was made possible by direct appropriations from Congress; in those days of economic hard times, money was not easy to come by.

Many refuges, though, particularly those in the western U.S. where federal public lands dominate, were withdrawn from the public domain for wildlife purposes. This was the way places such as Charles M. Russell NWR in Montana, Kofa and Cabeza Prieta in Arizona,

and much of the Sheldon and Hart Mountain Refuges in Nevada and Oregon were acquired. Some, like relatively tiny Fish Springs, were partly public land and private holdings, which were purchased. Over the years, lands have been donated, made available by agencies such as the Corps of Engineers or Bureau of Reclamation to compensate for wildlife and habitat losses caused by water development projects, and others created when military bases have been declared excess to the military's needs.

Did all the acquisition money come from the sale of Duck Stamps?

Not all. After passage of the Land and Water Conservation Fund Act, those funds could be mingled with Duck Stamp funds under certain conditions. As you can imagine, after 100 years the basis for funding the acquisition of lands for wildlife refuges has become very complex and provides great flexibility in the process. Public and private funds now support refuge creation and expansion. Over the years, Congress has increased the price of the Duck Stamp to keep pace with increasing land values. All this has helped assure that funds were available to keep the acquisition program going, though there has never been enough to meet the often critical needs of wildlife. There will probably never be "enough," which simply highlights the real challenge of accommodating wildlife needs (including fish) and the desires and expectations of a steadily growing human population. It was a tough challenge 30 years ago and it's an even more difficult one now. When I think about it, I'm glad I was director then, and not now—it's a really tough job these days.

You became director of the U.S. Fish and Wildlife Service in 1973. What were your relations like with Congress?

I was young, just 42, and inexperienced, but I had a good staff and at that time there was not much interaction between the Service and Congress. This was just before the full impact of the Endangered Species Act and the Marine Mammal Protection Act was felt around the country, along with the earlier National Environmental Policy Act. In those times, the organization was often regarded as just another bureaucracy from downtown. I didn't ask for too much, and relations were good.

I remember once telling a House committee chairman that I would prefer he not seek a significant increase in land acquisition funding, as he proposed. This was a plea that ran counter to his usual experience, I'm quite sure, so I hastened to explain that we had as much money at the moment as we had staff to spend properly and I did not want to risk seeing him embarrassed if we couldn't do a good job with so much money at one time. He pondered a moment and said something like, "That's the first time I ever had that kind of advice and I appreciate it. I will not forget this." He had always been a friend of the Service, but I think my candor impressed him. We did get the money—and more—later on.

The Endangered Species Act gave the Fish and Wildlife Service a great deal of responsibility, and the agency was becoming a major player in the processes prescribed by the National Environmental Policy Act, as well as the beneficiary of the Alaska lands legislation. All this put the organization squarely in the spotlight, from which it has not moved since. The Service began to touch people's lives in a wide variety of ways, some of them not all that popular. It was a time when people discovered that the ESA had teeth in it and a little fish could complicate plans to build a dam, or if the FWS pointed out that deepening Mississippi River barge channels would seriously affect wildlife habitat along that remarkable river, it could stop plans to dig the channel deeper. The Service was no longer just another outfit from "downtown," and I got a lot more attention than ever before. Times—and the U.S. Fish and Wildlife Service—had changed.

I have always been struck by the political fact that most, if not all, additions to the National Wildlife Refuge System have seemed to be so much less controversial than additions to, say, the National Park System or National Wilderness Preservation System. Why is that?

First of all, many additions to the Refuge System have come out of the public domain, as we discussed earlier. That means there is no change in the local tax base, and no purchase of private land. This usually staved off political concern. In addition, the Service has a lot of flexibility in providing for continued reasonable use of the land, such as letting a farmer live out his life on his homestead, or assuring that prior hunting or fishing opportunities will continue. Local farmers are often permitted to share-crop, leaving the refuge a share in the fields for migrating birds, and the like. This kind of flexibility, plus the fact that most refuges are far smaller than national parks, tends to blunt the sharp point of controversy. Not always, of course, but often. Taking care to keep everyone informed and to be up front with details of proposed refuge management also helps. A very wise young lady who works for the Service described it to me in simple terms not long ago. "First we make them like us, and then they like the project." Splendid advice.

1995
Mashpee

1996
Mandalay
Ten Thousand Islands
San Diego
Rappahannock River Valley

1997
Key Cave
Waccamaw
Boyer Chute
Blackfoot Valley
Silvio O. Conte
Black Bayou Lake

1998
Aroostook
Colorado River
Clarks River

1999
Navassa Island
Shawangunk Grasslands
Lost Trail
Whittlesey Creek

2000
Guadalupe-Nipomo Dunes
John W. and Louise Seier
Northern Tallgrass Prairie
Dakota Tallgrass Prairie
North Dakota
Big Oaks
Caddo Lake
Cat Island

2001
Kingman Reef
Palmyra Atoll
Coldwater River
Assabet River
Oahu Forest
Vieques

2002
Detroit River International
Bayou Teche
Cahaba River
Red River

2003
Baca
Mountain Longleaf

Many people are concerned about refuge management policies that seem to promote activities—commercial or otherwise—that appear to conflict with the generally pristine appearance of a particular refuge. What's your take on that?

Many refuge visitors are surprised to learn that what they thought was natural and pristine was actually created or restored by the FWS. The Bear River Refuge in Utah is a good example. Once there was a great natural marsh in the north end of the Great Salt Lake. Over time, however, the waters of the Bear River had been so exploited that most of the marsh no longer existed. When the refuge was established in 1929 the FWS literally recreated it, and built a system of dikes, canals, and water control structures to manage the available water. The refuge is a remarkable example of marshland re-creation, and is a place where hundreds of species of birds can be seen. It is not pristine, but it is highly productive, and it can be managed to make the most of its potential.

Bosque del Apache Refuge is another example. When acquired, in 1936, it was a wet savanna, full of springs and natural ponds, and trees on the higher ground. This gave it its name, which means "Forest of the Apaches." In the early 1940s the Rio Grande, which passes through the refuge, changed its course in a major flood and left up to 30 feet of silt on the wetlands. There went the natural habitat. The Fish and Wildlife Service began to build dikes and canals to recreate wetland habitat, installed wells and pumps in critical areas, and now it is a fine managed marsh. The thousands of sandhill cranes and snow geese that come there and the coyotes and marsh birds that live there don't know it's largely artificial and carefully managed, and most visitors are not put off by the dike roads and boardwalks. These are the kinds of activities undertaken across the Refuge System, except for those parts that are now in the wilderness system.

The St. Marks Refuge on the Florida Gulf Coast is another interesting example of this. I was never happier—in a perverse way—than when I got unshirted hell because some of the forestland was being managed, which included harvesting trees. Some folks thought this was "primeval forest" and should be left alone. In fact, the forest habitat was all the result of careful management. When the refuge was set up, in 1931, it was badly eroded and depleted, scrub-covered, abandoned farmland, hardly attractive or productive habitat. The Service restored forestland, flooded drained marshland, and turned an abandoned embarrassment into what it is today. I did not like the criticism, but for some people to be concerned that we were ruthlessly plundering a forest resource at least made me confident that management over the preceding 40 or so years had done the right job.

What challenges did you face when you were director?

Perhaps the most daunting was the task of setting up the regulations for making the Endangered Species Act work. The 1973 act, which is the one that brought strength to the idea of keeping imperiled species from sliding into oblivion, had been passed just a while before I became director. My life from that time onward was full of rich experiences as we strived to create regulations that would make sense out of the act and provide a realistic opportunity to identify and protect creatures in jeopardy.

That's far easier to talk about than to do, and everyone involved learned that fact the hard way. But we made it fly, with a lot of help and tons of advice, and began a new era in wildlife and habitat conservation in this country—and abroad as well, thanks to CITES (Convention on International Trade in Endangered Species), which helps govern the way member nations deal with their own plant and animal resources. That was pretty heady stuff for the agency and especially for its new director.

Sometimes I found myself having to remind politicians, developers, builders, and all kinds of government officials that protecting a species—fish or fowl, plant or animal—is a full-time obligation, especially if the species is not abundant. Saving the whooping crane, for example, is not a one-act play. It goes on and on and on. The FWS took action in the early 1940s when there were only about 14 whooping cranes anywhere, and now, more than 60 years later, there are only about 200 wild cranes, I think. The Service, state agencies, and private organizations still struggle to make sure the gains are not lost. The birds still make the magnificent transit from north to south and back again each year, and they depend on human intervention to make sure they

are watched and protected along the way. It's not easy, and it's expensive—and if we fail they will be gone forever.

People sometimes suggest that extinction is part of evolution, and not a big deal. The big deal is that the lifetime of hazards faced by wildlife are so frequently traceable to human action—pollution in the air and water, loss of breeding or resting or wintering habitat, and so on. Evolutionary extinction usually takes a long time, but humans can hasten a species' slide into oblivion in a generation or two, even when they number in the millions, or even billions. Seen any passenger pigeons lately? Neither have I.

As you know, there's a movement now that calls for splitting the Refuge System out of the Fish and Wildlife Service and making it an entirely separate entity, like the National Park System. Its proponents feel that such a move would add great stature to the system in the eyes of the public and Congress, and increase its ability to get acquisition and management money. What's your position?

I oppose it. The Fish and Wildlife Service is the principal federal agency created to pay attention to the well-being of wildlife in this country, and in doing so it employs a variety of organizational elements. For example, one of the key concerns of the FWS is migratory birds, a responsibility embodied in a half-dozen international treaties. The Service works through refuges, which provide habitats needed by these birds. The Migratory Bird Office handles the development of migratory bird hunting rules each year, and is involved in the special programs for certain classes of migratory birds, such as shorebirds and songbirds. The states are involved in migratory bird management, and much funding for this work comes through the FWS. The law enforcement arm is involved with migratory bird law enforcement, among other things. In short, there is a powerful interaction among all parts of the agency, and all these are, like the Refuge System, focused on the fundamental business of making sure there will always be wild creatures in wild places for the enjoyment of future generations—on refuges, private lands, other public lands, and even in your own backyard. Dismembering the Service seems to me to fly in the face of logic, and doing so will not guarantee any magical change in the stature of the Refuge System.

Looking ahead into the next 100 years, what do you see for the National Wildlife Refuge System?

That's a provocative question and it's been put to me many times over the years. I see the Refuge System continuing to grow and flourish, largely because of new and more innovative ways to get the job done.

In recent years the Fish and Wildlife Service has engaged in an activity with a thoroughly bureaucratic name, but with powerful implications. That is "outreach," a turning outward in many directions to work with others. For refuges, this has encouraged service folks to work with private landowners, corporate landowners (such as timber companies), and other public lands managers to create new kinds of refuges. These are combinations of ownerships, bound together by long-term (even permanent) agreements to manage the aggregation of lands to improve the well-being of wildlife and wild habitat.

The relatively new ACE Basin National Wildlife Refuge in South Carolina is such a place. Various landowners, including the Service, have joined together to protect and manage more than 136,000 acres (so far) of coastal wetland habitat. I see much more of this happening, along with a steady acquisition of lands that can be permanently conserved as wildlife habitat. With innovation and imagination and courage, the Fish and Wildlife Service and all its parts—especially the national wildlife refuges—can provide some guarantees for the future.

In the 30 years since I became director, more than 220 units have been added to the Refuge System. That pace probably can't be sustained for the next century, but there will be an unremitting effort to make sure that human population growth does not come at the price of loss of species and the wild places that once provided for them.

Earlier this year, I was at Pelican Island, on the east coast of Florida, to mark the centennial of the first refuge in the system. To commemorate the event, a boardwalk was built into the Indian River so visitors can see the tiny island where it all began. Each board in that long promenade is incised with the name of a refuge, set out in the order of its establishment. Someone asked me about what the system might be like in a hundred years, just as you have. I suggested that if the nation is lucky, the boardwalk in place 2103 would have to extend out into the Atlantic surf to accommodate the roster of refuges then in existence. That was probably an old man's imagination at work, but who knows? All I know for sure is that there are more and more people who are coming to know the National Wildlife Refuge System and they like what they see. And I know that, like those who came before, refuge people and their supporters and friends in the future will do their utmost to build that boardwalk into the sea. ☾

When the Fences Come Down

Wildlands on the Great Plains

by KATHLEEN DEAN MOORE

IN THE HEADLIGHTS OF A PICKUP TRUCK on a dark night, a rabbit's eyes glow red. Reflections from an elk's eyes are yellow. Coyotes' eyes reflect orange. But we're searching the darkness for eyes that glow bright green, as lucid a green as wet prairie grass under a spring storm. It's midnight, and I am bumping across a dark Montana prairie in the Charles M. Russell National Wildlife Refuge with Randy Matchette, a wildlife biologist for the U.S. Fish and Wildlife Service. Overhead is the black bowl of the sky, brimming with stars. To the west, lightning slashes at the horizon, where the moon appears and disappears behind blowing clouds.

At a bend in the ruts, Randy brakes and kills his lights. The darkness is sudden and complete. Then Randy flicks a switch and sweeps a narrow spotlight over a prairie dog town. The spotlight searches the stubble, the earthen mounds, the western wheat-grass. It swings around again and there they are: the emerald eyes of a black-footed ferret.

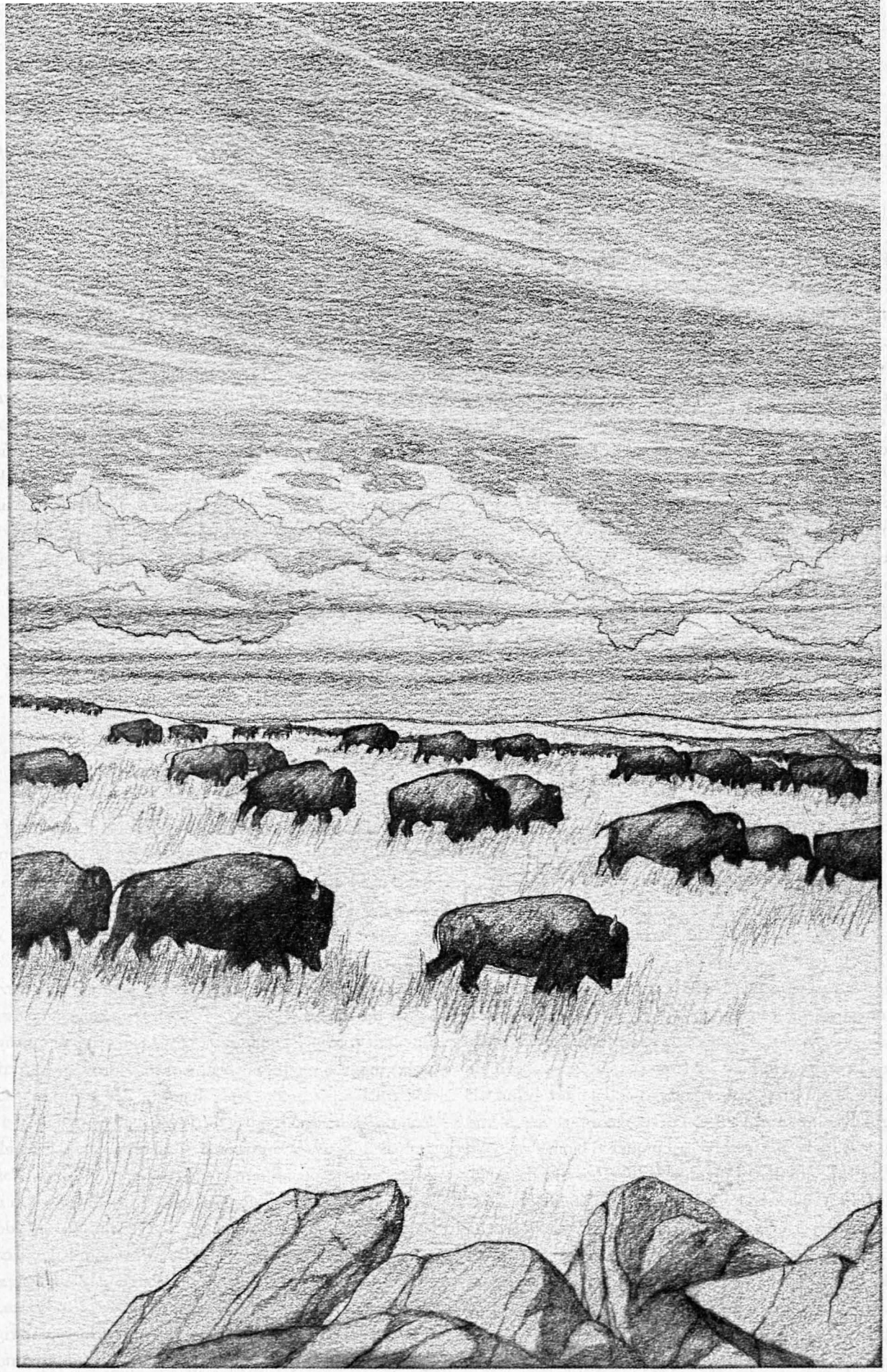
Thirty years ago, the ferrets seemed to be lost forever, killed by disease and starvation, their prairie habitat reduced, degraded, and fragmented, their prairie dog prey harried almost to extinction. With only 18 black-footed ferrets left, the species was listed under the Endangered Species Act. But now, after a painstaking captive-breeding program, ferrets are being returned to the land. The U.S. Fish and Wildlife Service and partners have reintroduced roughly 1600 black-footed ferrets to grassland habitat in Montana, South Dakota, Wyoming, Arizona, and Chihuahua, Mexico, and along the Colorado-Utah border.[1]

The story of the ferrets echoes the story of the American wild prairies. Like the ferrets, the prairies themselves have been dramatically, almost irredeemably, degraded and reduced. But prairie wildlands are coming back, nurtured by a growing awareness of their value and a myriad of hopeful determined projects to preserve and restore free-running ecosystems. As people work to re-create the prairie wildlands, they are creating something equally important: imaginative new visions and working models for how all members of the land community—human and wild—can live together.

THE AMERICAN GRASSLANDS once stretched a thousand miles from the Eastern deciduous forests to the foothills of the Rocky Mountains. The big bluestem grasslands of the tall-grass prairie flowed into the slender wheat-grass, blue grama, and sagebrush steppes of the mixed and shortgrass prairie.[2] Herds of bison grazed across prairie dog villages that vanished over the horizon. Blizzards and fires ran wild. Willa Cather saw the prairie as possibility, perfect and absolute: "...nothing but land: not a country at all, but the material out of which countries are made."[3]

Onrushing Europeans didn't know what to make of it, even though native people had lived in the country since the ice age. Zebulon Pike called it "a desert—a barrier"[4] and the Great American Desert it became for many years. Charles Dickens took one look and yawned. "Its very flatness and extent, which left nothing to the imagination, tamed it down and cramped its interest....It was lonely and wild, but oppressive in its barren monotony."[5] Europeans recognized in the expansive grasslands something that looked deceptively like their pastures and barley fields at home. In 1673, Louis Joliet wrote from the Mississippi bluffs, "No better soil can be

graphite by Todd Cummings



found, either for corn, or for vines, or for any other fruit whatever....A settler would not there spend ten years in cutting down and burning the trees; on the very day of his arrival, he could put his plough into the ground."[6]

True to prediction, settlers lost no time in putting their plows into the ground. Soon the tallgrass prairie was replaced by corn, the shortgrass prairie by wheat, and the bison ranges by cattle ranches.[7] The Great Plains or "buffalo" wolf, the subspecies of gray wolf once so abundant that Lewis and Clark didn't record their numbers for fear no one would believe them, were eliminated entirely.[8] Roughly 30 million bison were reduced to scattered bands and replaced by 45.5 million cattle. More than a billion prairie dogs once lived in colonies that spread across ten to twenty percent of the Great Plains;[9] today, less than two percent remain, and they now live on a fraction of one percent of the Great Plains. To this litany of loss, add damage to the elements that sustain the prairie: water and the very soil itself. Nearly one-third of prime topsoil is gone, blown away on the wind or washed into streams. Farmers and encroaching cities are pumping groundwater at a rate that will, in the next few decades, empty the Ogalalla Aquifer, the reservoir of fresh water that lies under the Great Plains.

Overall, only four percent of the native tallgrass prairie survives.[10] The remnants are fragmented and fenced, often saved only by neglect in cemeteries and railroad rights-of-way. "Within one human lifetime," wrote Adrian Forsyth, "the prairies have passed from wilderness to become the most altered habitat in this country, and one of the most disturbed, ecologically simplified and over-exploited regions in the world."[11] It is also the world's least protected biome.

As the health of the prairies declined, so did the well-being of the people who lived there.[12] Cycles of drought, desperately unsustainable agricultural practices, and high debt loads continue to undermine ranchers' and farmers' struggles to hold on to their land, and people—especially young people—are leaving the rural counties.[13]

Aldo Leopold raised the alarm in *A Sand County Almanac,* a beautiful, grief-ridden elegy for the prairies:[14]

> I hear the heart-stirring whistle of an upland plover; time was when his forebears followed the buffalo as they trudged shoulder-deep through an illimitable garden of forgotten blooms....
>
> No living man will see again the long-grass prairie, where a sea of prairie flowers lapped at the stirrups of the pioneer....
>
> Wilderness is a resource that can shrink but not grow.[15]

Leopold was right about most things, but he was wrong about this. The past decade has seen a resurrection of some grassland ecosystems, and a rebirth of hope that significant sections of prairie wilderness can be preserved and restored. It's true that when people think of wilderness, they're more likely to think of mountains or river canyons than open plains. No John Muir[16] or Ansel Adams sang the praises of the prairie. But the ecological consciousness now recognizes the biological and economic values of wilderness, as well as the spiritual and aesthetic. So the idea of what deserves protection as wilderness has expanded too—from the mountains, to the deserts, to the oceans, now to the prairies.

Like the ocean, the prairie dwarfs human pride and plans. Thus, the paradox of prairie wilderness preservation: If a prairie wilderness is vast by definition, then small, scattered reserves cannot preserve it.

WE SIT IN THE PICKUP and watch the green eyes. Randy is waiting for more eyes to join the first, hoping for a litter. He passes the time by "kissing in" coyotes, sucking air across his lips in a convincing imitation of a mouse. A young coyote walks into the spotlight, then trots toward the pickup truck where it stops in confusion. Randy pours a cup of coffee. Eventually, he decides that the ferret is alone tonight. So we grab flashlights, hop out, and stumble across the hundred yards that separate us from one of the rarest animals on Earth.

There are prairie dog holes and cactuses to avoid in this black night and clumps of silver sage casting long shadows where prairie rattlers may hide. But off we go, loping across the prairie. The green eyes hold their ground, then disappear. We peer into the hole where the eyes vanished, and there, in the flashlight beam, is a little face peering back at us—bright eyes in a black mask, rounded ears, and a black button nose.

Randy records the animal's number with a machine that works on the principle of a grocery-store scanner. He plants a small pink flag to mark the location, and hurries back to the truck. There are other ferrets waiting to be counted, in sites scattered across the refuge.

How do you reassemble all the scattered pieces of a prairie and make them into something whole and free? Nobody I talked to thought it would be easy, but everyone acknowledged you've got to save the pieces of prairie habitat that are left, and begin to restore, step by step, the pieces that are missing—not just plants and animals and the natural processes that shape the land, but biocultural communities as well. The question is how to help wilderness recover in an inhabited land.

black-footed ferret, watercolor by Todd Telander

It starts with the prairie dogs, a keystone species in the prairie, the creature central to holding together the entire structure of the natural community. Biologists identify between 140 and 163 vertebrate species that find shelter in the burrows, eat the prairie dogs, or feed on the diverse flora and fauna in the prairie dog village.[17]

The first step in prairie dog restoration is to stop the killing—state-sponsored varmint eradication programs, so-called "recreational" killing, and the deaths incidental to habitat destruction. There is progress. In Montana, landowners have joined tribal scientists and conservationists to lobby Congress to pay private landowners to preserve prairie dogs and other imperiled wildlife on their property. The Colorado Division of Wildlife has banned all recreational black-tailed prairie dog shooting on public land in Colorado; similar seasonal restrictions on recreational shooting on public lands in Montana and South Dakota have also been enacted. Since 2000, legal poisoning of prairie dogs on federal land has been dramatically reduced, and recently completed management plans for northern Great Plains units of the National Grasslands System identify four areas where prairie dog conservation is the top management priority. In these areas, there is an explicit goal of recovering prairie dog populations to a level capable of supporting ferret reintroduction.[18]

That's an attitudinal sea change, notes Jonathan Proctor, coordinator of the Northern Plains Conservation Network. "These incremental conservation actions are welcome and hopeful, but only a tiny first step toward comprehensive protection for prairie dogs and their habitats."[19] Proctor wryly describes the challenge of generating widespread public support for small burrowing rodents long viewed as pests, despite their imperiled status, and despite new awareness that prairie dogs are as vital to the prairie as sun and wind and sky.

Next to prairie dog restoration, bison restoration is the big story on the Great Plains. A growing number of Western ranchers have traded their cattle for bison, among them media mogul and philanthropist Ted Turner, who recently converted over 120,000 acres of his Montana lands to bison range and runs bison on his 120,000-acre ranch in South Dakota and others in Nebraska and New Mexico. Still, a major economic impediment to widespread bison ranching remains in the form of government subsidies that favor cattle, and lack of market demand for bison meat. Managers are reintroducing bison to some federal and Nature Conservancy lands, but native tribes are the leaders in bison restoration. The Intertribal Bison Cooperative (ITBC) provides technical and financial assistance to 31 tribes who are restoring bison to tribal lands in 13 states. In his book *Bring Back the Buffalo!* Ernest Callenbach points out that together the ITBC tribes have 12 million available acres, room for more than 120,000 bison.[20]

For many plains tribes, buffalo are a source of wisdom and the center of a way of life. It follows, says Edward Valandra, a

Sicangu Lakota, that "buffalo restoration is a cultural and spiritual restoration too." In the beginning, people and buffalo emerged together from a dark, round hole, "out on the shining, grassy place that was the Earth."[21] The buffalo reminds us that we are all on this Earth together, related in closely woven systems of mutual need and sustenance. If the buffalo can teach us this, then maybe they can provide another piece essential to the rebirth of the prairie: a worldview that sets humans among, but not over, the other creatures of the Earth. The Lakota say, *Mitakuye oyasin.* We are all related.[22]

FLICKING OFF MY FLASHLIGHT, I stand on a prairie dog mound in the midnight wind. I can smell sage and warm dirt, and the green scent of grass at night. I hear a small *peet* from a hidden bird, disturbed on its roost. There almost certainly are prairie dogs and black-footed ferrets, prairie rattlesnakes, white-tailed jackrabbits, and Great Plains toads in tunnels under my feet. But all I can see is the darkness of the night—not a ranch light, not a town, not a car, not a plane. All I can feel is warm wind on my face in this star-filled wilderness of space and sky.

The oceanic sky defines the prairie. It is wild, the way the ocean is unpredictable and uncontrolled. Like the ocean, the prairie dwarfs human pride and plans. Thus, the paradox of prairie wilderness preservation: If a prairie wilderness is vast by definition, then small, scattered reserves cannot preserve it. Every agency effort, every cattleman's bison, every backyard prairie garden and wilderness area and wild river is necessary if the prairies are to be preserved and restored. These are the repository of genetic possibility. Their biological richness is a standard to measure a poor, degraded world. They are beautiful, a source of spiritual renewal. But the sum of them is not sufficient. A prairie is not bison, but thundering herds of bison. It's not grassland, but grassland spilling over the horizon. It's not just prairie dogs, but millions of dogs in colonies across the land. It's not just a wildlife refuge, but a whole landscape that offers refuge.

IT'S A SILVERY MORNING just before dawn. We're sitting at the edge of a prairie dog village with our hands wrapped around mugs of coffee—Randy and I, and Craig Miller, a fisheries and wildlife biologist at the Bowdoin National Wildlife Refuge in Malta, Montana. Our perch overlooks a wilderness of bearpaw-shale ridges and shortgrass prairie that has never been turned—blue gramma and western wheat-grass, scarlet globe-mallow in lush sweeps, silver sage, purple vetch. The prairie dogs are already up and about, stuffing blades of grass into their mouths or tussling with their brothers and sisters. A jackrabbit zigzags through the sage. Burrowing owls stand on their tall legs, peering over the mounds of dirt. We see a deer in a distant draw. And now here come two young coyotes, more curious than afraid, with their overgrown ears on full alert. They trot past the pink flag that marks the place where we saw a female black-footed ferret last night. As I breathe steam from my coffee, a golden eagle drops from a fence post and sweeps over the dog town. Prairie dog pandemonium—they streak for their holes and dive in head-first.

The beauty of the place speaks eloquently of its value, but I ask the question anyway: "Why are you going to so much trouble to bring back the black-footed ferrets?" I ask. "Why are people going to so much trouble to bring back the prairie?"

"A cog in a complicated machine," Randy says flatly. "You take one piece out, and things start falling apart." I understand what he means: Americans are growing accustomed to living in the Time of Things Falling Apart. We have grown accustomed to the impoverished landscape, the precarious existence of the remaining plants and animals, the thump of oil pumps, the slick of roadkill rabbits, the cascading effects of things going wrong, lives large and small skidding from a balance scale thrown off kilter. We know that given enough time and space, a complicated system can freely sustain itself, and thus can sustain human life. But a stripped and simplified system, the monoculture wheat in the sterile field, the cow-calf unit, requires more and more intervention, ongoing artificial life support. If we're to have any chance of a biocultural system that will work until the next ice age comes, we need all the parts we can get.

Craig has a different answer. "Human beings destroyed the ferret," he says. "Human beings should bring them back." Same thing for the prairie dogs. Same thing for the prairies. There is a quiet intensity in his response: It's about being a responsible member of a community. "You don't just go in there and destroy things and not try to set them right."

Out in the prairie dog village, a male pops up and gives the all-clear signal, "jump-yip." For the moment at least, I too can make myself believe that all is well. I believe that "hope is a wild country,"[23] and this morning my hope is bolstered by the wild country around us. To be sure, there are tremendous challenges to the growing effort to increase wildness on the Great Plains, but each national wildlife refuge created or expanded, each national park or grassland designated, each acre of prairie protected and restored by a wildlands philan-

thropist moves us closer to the scale of conservation necessary to reconnect this giant place.

Wildlands preservation and restoration projects on the Great Plains are beginning to show that this is possible—that we can take down the fences that divide people who are desperately at odds, but united in their love for the land. We can take down the fences that fragment the landscape, and we can re-create vast, untrammeled wildlands. We can find ways for people to live in a mutually sustaining relationship with free-running prairies. If there is any place where humans can meet the "deep planetary challenge"[24] of long-term human and ecosystem survival, perhaps we can do it here. ☾

Kathleen Dean Moore *is a professor of philosophy at Oregon State University in Corvallis. She is author of* Riverwalking: Reflections on Moving Water *(1995) and* Holdfast: At Home in the Natural World *(1999). Her new book,* The Pine Island Paradox, *is forthcoming from Milkweed Editions.*

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21. Mari Sandoz, Buffalo Hunters, quoted in Madson, 66.
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Winter Solstice

—Nisqually Wildlife Refuge—

Somewhere in the closing fog
I hear the purposeful whistle

of wings, ducks and the hidden
arc of their muted chat and gabble.

Without horizon, gulls perch
and blur near flat water, where

starting at my feet, I read
the cuneiform of flooded stubble.

It spells out *cold* and *calm*
in water-doubled rows.

From the duff, amanita embers
bulge and glow. Crabapples still

hang in the black reticulated branches
of winter trees—nearly burning.

All these spare embellishments on
the ritual contraction of winter light.

Bill Yake

This poem first appeared in Appalachia, *vol. 54, no. 2* ©2002 *Bill Yake.*

Trapping on Nationa

Cull of the Wild

by Camilla H. Fox

MOST AMERICANS THINK OF national wildlife refuges as sanctuaries for wildlife, and they once were. In 1903, when President Theodore Roosevelt established the first national wildlife refuge on Pelican Island off the coast of Florida, the recreational killing of wildlife was prohibited. Although an avid hunter himself, Roosevelt recognized the need to set aside lands to protect wildlife from exploitation, and continued to create sanctuaries for the protection of various species of colonial nesting birds that were being killed for their plumage. By the end of his term in 1909, Roosevelt had issued 51 Executive Orders establishing wildlife reservations in 17 states and 3 territories.

Much has changed in the 100 years since the creation of the first national wildlife refuge. Today, more than 60% of all refuges allow activities that are harmful to wildlife, including mining, oil and gas drilling, cattle grazing, and logging, according to a 1990 General Accounting Report. Perhaps most egregious of all is that the U.S. Fish and Wildlife Service (FWS) allows—and even promotes—the trapping of wildlife on more than half of the nation's 543 national wildlife refuges. While the exact number of animals trapped and killed on refuges is unknown due to jurisdictional complications and a lack of adequate monitoring and reporting, the total count is likely in the tens of thousands of animals, including bobcat, fox, coyote, badger, and river otter as well as numerous "non-target" animals.

Bald eagle caught in a leghold trap

MARK MARTELL/THE RAPTOR CENTER

To many people, the concept of trapping on lands specifically set aside to *protect* wildlife contradicts the very definition of the word refuge as a "safe haven," or a "shelter or protection from danger and distress."

How is it that a public land system established to provide sanctuary to wild animals from commercial profiteering now allows and even encourages the killing of wildlife for profit and "sport"? This drastic change in management of the

CONTINUES PAGE 56


The endangered California clapper rail

USFWS

An Important Tool for Conservation

by Steve Williams

THE ENDANGERED CALIFORNIA CLAPPER RAIL lives only in the San Francisco Bay area. In the 1980s its numbers were in serious decline, with only about 300 birds left. One of the bird's few sanctuaries was—and remains—the Don Edwards San Francisco Bay National Wildlife Refuge. There, the U.S. Fish and Wildlife Service is actively working to improve clapper rail habitat in the tidal bay marshlands—an ecosystem severely fragmented by the construction of salt pond levees a century ago and the inevitable urban development that followed.

One day, former refuge manager Rick Coleman and biologist Jean Takekawa were floating along the area's shallow tidal marshes, conducting a seasonal clapper rail survey. To their surprise, they encountered several non-native red foxes out hunting in these same tiny remnant marshes. "They were doing the same thing we were—looking for rails," Coleman recalled.

CONTINUES PAGE 59

bobcat and red fox, acrylics by Steve Oliver

National Wildlife Refuge System (NWRS) can be traced to 1934, when Congress passed the Migratory Bird Hunting and Conservation Stamp Act, more popularly known as the "Duck Stamp Act."[1] This act required that waterfowl hunters purchase a Duck Stamp in order to hunt migratory birds. The funds collected from the sale of Duck Stamps were placed in the Migratory Bird Conservation Fund, which was used for the acquisition of additional refuge lands. This gave consumptive wildlife users political clout to push for the expansion of hunting and trapping on refuge lands since they could argue that they were the chief financiers of refuge land purchases.

With the acquisition of refuge land deeply dependent on migratory bird hunting through the sale of Duck Stamps, management of refuges now focuses largely on ensuring an adequate supply of waterfowl for hunters. The "wildlife as commodity" viewpoint is reflected in the name used to classify many units of the Refuge System, Waterfowl Production Areas (WPAs), and in one of the stated goals of the National Wildlife Refuge System: "to perpetuate the migratory bird resource." Since avian predators, including foxes, raccoons, badgers, coyotes, and bobcats, threaten the "production" of waterfowl, state and federal agencies encourage trapping on refuges to meet national migratory bird population objectives. Trappers who trap on WPAs do not even have to obtain the permit that is normally required to trap on refuge lands.

In its publication *Fulfilling the Promise,* the FWS makes no secret about its alliance with and dependence upon consumptive wildlife user groups, stating that "migratory birds are often considered the 'bread and butter' of the System."[2] An example of this is in the memoranda of agreement between the FWS, the National Rifle Association, and the National Wild Turkey Federation, which call for the creation of a national "Predation Avian Recruitment Team" to increase bird populations (i.e., hunting targets) on refuges by encouraging the trapping and killing of avian predators. Such politically motivated agreements provide these special interest groups with a unique position and heightened influence over refuge management decisions.

The Fish and Wildlife Service also wants to convince the public that trapping on refuge lands is justified because it is used to protect imperiled species. Even if one puts aside the significant scientific controversy over the effectiveness of trapping for recovering endangered wildlife, only about one in fifteen refuge trapping programs are implemented for this purpose, far fewer than the agency would like the public to believe. Further, the traps commonly used on refuges—including leghold traps, neck snares, and vise-like kill-traps—are inherently nonselective and can injure or kill the very species that refuges are intended to safeguard. Records obtained through the Freedom of Information Act show that body-gripping traps have maimed and killed numerous threatened and endangered species, including lynx, bald eagles, and wolves. One study conducted by the U.S. Department of Agriculture showed as many as 10 nontarget animals are captured for each "target" animal caught in a body-gripping trap.[3] While such evidence makes clear the danger these traps pose to threatened and endangered species, the FWS continues to widely sanction and promote their use on the National Wildlife Refuge System.

Leghold traps remain one of the most commonly used traps in the U.S. on both public and private lands. With spring-loaded jaws that forcefully clamp an animal's foot or leg when triggered, leghold traps can cause cause swelling, lacerations, joint dislocations, fractures, damage to teeth and gums, limb amputation, and death.[4] Trapped animals may endure serious trauma, dehydration, exposure to harsh weather, and predation by other animals. Many die or are so severely injured that they cannot survive in the wild. A six-year study conducted at Alabama's Wheeler National Wildlife Refuge in the 1950s reported that one-quarter of mink, raccoons, and foxes caught in steel traps were "crippled," which researchers defined as "animals that pulled out of the traps, escaped by wringing-off or gnawing feet, or escaped with the traps" attached to their limbs.[5] The steel-jaw leghold trap has been declared inhumane by the American Veterinary Medical Association, the American Animal Hospital Association, and the National Animal Control Association,[6] and has been banned or severely restricted by more than eighty countries and eight U.S. states.[7]

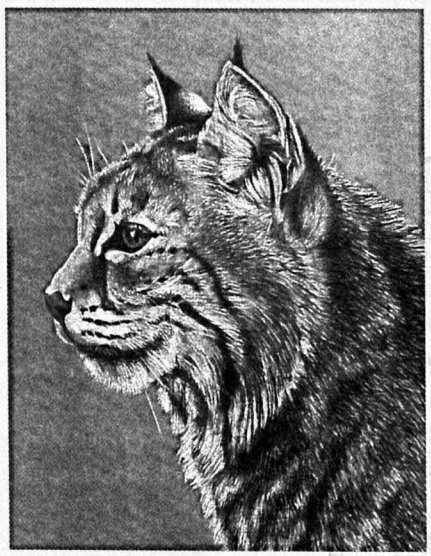
In 1997, the FWS actually thwarted international efforts to prohibit the use of leghold traps and used refuge managers as puppets to support their use. An internal memo delivered to refuge managers from former acting Refuge Division Chief Stan Thompson strongly encouraged managers to emphasize and promote the use of leghold traps in refuge management.[8] The memo was in response to a resolution passed by the European Union that called for a ban on the importation of furs from countries still using leghold traps or not complying with international humane trapping standards. Thompson's memo included attachments, one of which stated that if the U.S. were

to oppose this international ban on leghold traps, the U.S. could become "isolated as the 'only country' still continuing to use the conventional steel-jawed leghold restraining trap."

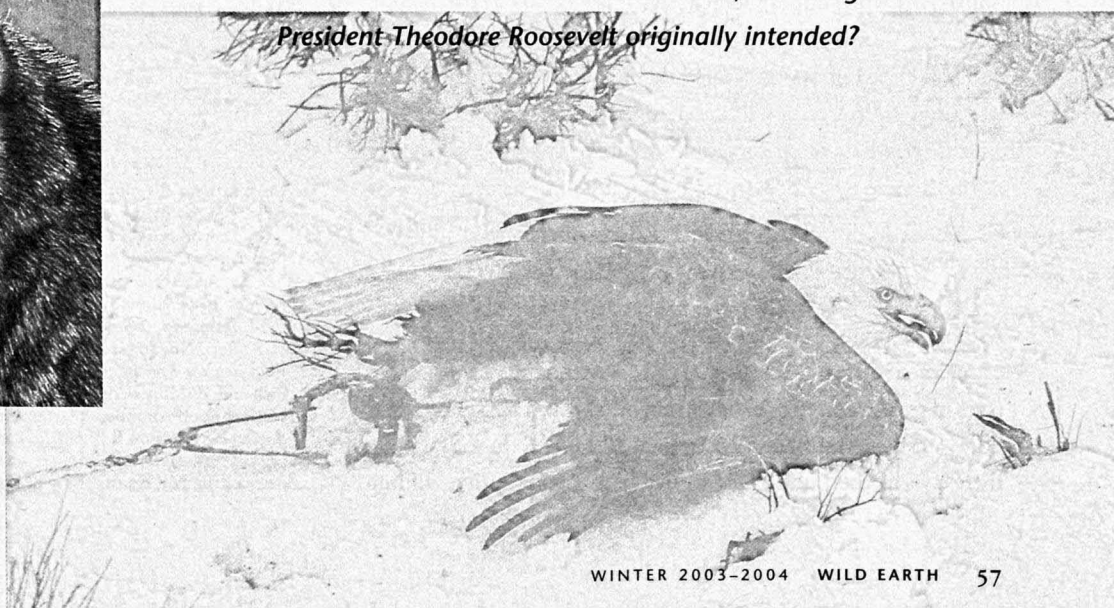
While the Fish and Wildlife Service has done its best to keep the American public in the dark about trapping on national wildlife refuges, wildlife advocates have had some success in exposing the truth through the Freedom of Information Act. In 1997, as a result of publicity and political pressure, Congress directed the Service to convene a task force to "study the use of animal traps in the National Wildlife Refuge System [and to] consider the humaneness of various trapping methods...and other relevant issues."[9] The FWS, however, argued that such a task force could not be convened in the allotted time and convinced Congress to replace it with a survey of refuge managers about trapping in the Refuge System. The agency also posted a notice in the *Federal Register* allowing the public a scant 60 days to submit comments on the issue of "the use of animal traps within the National Wildlife Refuge System." Despite the brief comment period, the agency received nearly 1,000 public comments, the vast majority of which expressed opposition to the continued allowance of trapping on refuges.

The FWS eventually forwarded a summary of the survey and four volumes of unedited public comments to Congress. In its final report, the Service offered a glowing account of trapping on national wildlife refuges and diverted attention from the large number of trappers who trap primarily for profit and recreation. The report claimed that trapping on refuges is conducted chiefly for the protection of facilities, migratory birds, and threatened and endangered species. Trapping for "recreation / commerce / subsistence" was listed as the *last* of eleven reasons for trapping on refuges. The Animal Protection Institute, however, obtained a copy of the raw survey data and found that the agency's official conclusions did not accurately reflect the information submitted by the refuge managers. "Recreation / commerce / subsistence" was in fact the refuge managers' *single most frequently cited* reason for trapping; one out of every six refuge trapping programs was conducted for this purpose. While "facilities protection," "habitat management," and "predator control for migratory bird protection" were listed, these were frequently considered to be indirect by-products of commercial and recreational trapping, and not primary purposes. Not surprisingly, the summary failed to report the number of nontarget animals caught as well as information about the types of traps used for different species.

The Fish and Wildlife Service's deliberate attempts to misinform the public and legislators, coupled with poor oversight and a dearth of information about trapping on refuges, have only increased the controversy and fueled ensuing legislative efforts to restrict trapping on the Refuge System. In an historic vote, the House of Representatives widely approved an amendment to the 1999 Interior Appropriations bill that would have severely restricted commercial and recreational trapping on the Refuge System. The amendment was later



Is it unreasonable to ask that the National Wildlife Refuge System, a mere 5% of the public land available to consumptive wildlife users, be maintained as "inviolate wildlife sanctuaries," as Congress and President Theodore Roosevelt originally intended?



defeated in the Senate after trapping proponents organized an aggressive lobbying campaign.

Prior to the opening of a refuge to hunting or fishing, the National Environmental Policy Act requires that the FWS administer an environmental and public review process. No such process, however, has been implemented for refuge trapping programs. The decision to allow trapping on a refuge has been left to the sole discretion of the refuge manager, who must determine whether trapping is compatible with the specific purpose of the refuge. The 1997 National Wildlife Refuge System Improvement Act, however, does require the Service to provide some degree of oversight and justification for allowing trapping on an individual refuge.[10] The new act "directs that wildlife comes first in the National Wildlife Refuge System" by establishing that "wildlife conservation is the principal mission of the Refuge system; by requiring that we maintain the biological integrity, diversity, and environmental health of each refuge and the Refuge System; and by mandating that we monitor the status and trends of fish, wildlife, and plants on each refuge."[11] If the FWS fails to meet basic requirements while assessing compatibility and potential impacts of refuge activities, the agency may become vulnerable to legal challenges from conservation and wildlife advocates.

THE FISH AND WILDLIFE SERVICE has continued to promote and facilitate the trapping of animals on refuges, even though trappers represent a minority interest in every state, and nonconsumptive users of wildlife contribute substantially more money to the local and national economy than do trappers and other consumptive wildlife users. Further, in recent years the FWS has increased its efforts to open refuges to consumptive wildlife use for the benefit of organizations and politicians who support such activities.

An Animal Protection Institute–commissioned opinion poll conducted in 1999 revealed that 79% of Americans oppose trapping on national wildlife refuges and 88% believe that wildlife and habitat preservation should be the highest priority of the Refuge System.[12] Patterns of public use reflect this view even more strongly. According to the FWS, of the 30 million people who visited refuges in 1995, fewer than 5% went there to trap or hunt animals. Most refuge visitors expect to view wildlife without stepping into a trap or witnessing the pain and suffering of maimed animals. Trappers already have access to millions of acres of public and private lands outside the Refuge System. Is it unreasonable to ask that the National Wildlife Refuge System, a mere 5% of the public land available to consumptive wildlife users, be maintained as "inviolate wildlife sanctuaries," as Congress and President Theodore Roosevelt originally intended?

As the U.S. Fish and Wildlife Service's celebration of the centennial anniversary of the National Wildlife Refuge System winds down, Congress and the FWS should take a hard look at the mission of this public land system. It's time to restore the true meaning and spirit of the term "refuge" to the National Wildlife Refuge System by prohibiting trapping and other activities inimical to wildlife protection. ☾

Camilla Fox *is the national campaign director of the Animal Protection Institute, a national nonprofit animal advocacy organization with headquarters in Sacramento, California. For more information about trapping on the National Wildlife Refuge System, visit API's websites: www.api4animals.org and www.BanCruelTraps.com.*

NOTES

1. Migratory Bird Hunting Stamp Act of 1934, 16 U.S.C. § 718, *et seq.*, commonly referred to as the Duck Stamp Act.
2. *Fulfilling the Promise*, 1998 (The National Wildlife Refuge System, U.S. Fish and Wildlife Service), September 18.
3. Thomas N. Tomsa and James E. Forbes, 1990, *Coyote Depredation Control in New York—An Integrated Approach* (USDA-APHIS-ADC, New York State Department of Agriculture), 75–82.
4. G. Proulx, 1999, Review of current mammal trap technology in North America, in *Mammal Trapping*, ed. G. Proulx (Sherwood Park: Alpha Wildlife Research & Management Ltd.), 1–46.
5. Thomas Z. Atkenson, 1956, Incidence of Crippling Loss in Steel Trapping, *Journal of Wildlife Management* 20 (July): 3.
6. The National Animal Control Association states in its policy on trap use: "NACA strongly opposes the use of leghold or snare traps....NACA also recommends that agencies work to eliminate laws that allow the use of inhumane legholds or snares."
7. *Countries banning the leghold trap*: Austria, Bahrain, Bangladesh, Belgium, Belize, Benin, Botswana, Brazil, British West Indies, Bulgaria, Burkina Faso, Burundi, Cameroon, Cayman Islands, Chile, Colombia, Costa Rica, Cuba, Cyprus, Czech Republic, Denmark, Dominican Republic, El Salvador, England, Equatorial Guinea, Finland, France, Gabon, Gambia, Germany, Ghana, Greece, Greenland, Guinea, Guyana, Hong Kong, Hungary, India, Israel, Ireland, Italy, Ivory Coast, Jamaica, Jordan, Kenya, Korea (Republic of), Lebanon, Liberia, Liechtenstein, Luxembourg, Mali, Malawi, Malaysia, Maldives, Mauritania, Mexico, Moldavia, Monaco, Morocco, Mozambique, Netherlands, Nicaragua, Niger, Nigeria, Norway, Pakistan, Panama, Philippines, Poland, Portugal, Russia, Scotland, Senegal, Seychelles, Singapore, Spain, Sri Lanka, Swaziland, Sweden, Switzerland, Tanzania, Thailand, Togo, Trinidad & Tobago, Tunisia, Uganda, United Arab Emirates, United Kingdom, Wales, Zaire, Zambia, Zimbabwe. *States banning or severely restricting the leghold trap:* Arizona, California, Colorado, Florida, Massachusetts, New Jersey, Rhode Island, Washington.
8. Thompson also tried to quell debate about the trapping of coyotes to protect the endangered Columbian white-tailed deer on the Julia Butler Hansen Refuge in southern Washington. It was discovered later that the FWS scapegoated coyotes to draw attention away from the real long-term threat to the deer: competition with livestock allowed to graze on the refuge.
9. The language directing the USFWS to convene a task force to study trapping on national wildlife refuges was included in the 1997 Department of the Interior Appropriations bill.
10. H.R. Rep. No. 105-106, 105th Cong., 1st Sess. 1798-6 (1997).
11. *Fulfilling the Promise*, 1998 (The National Wildlife Refuge System, U.S. Fish and Wildlife Service), September 18.
12. National poll commissioned by the Animal Protection Institute and conducted by Decision Research in April 1999 regarding trapping and hunting on national wildlife refuges and other public land systems. For a summary of the poll results, contact the Animal Protection Institute.

➤ An Important Tool for Conservation

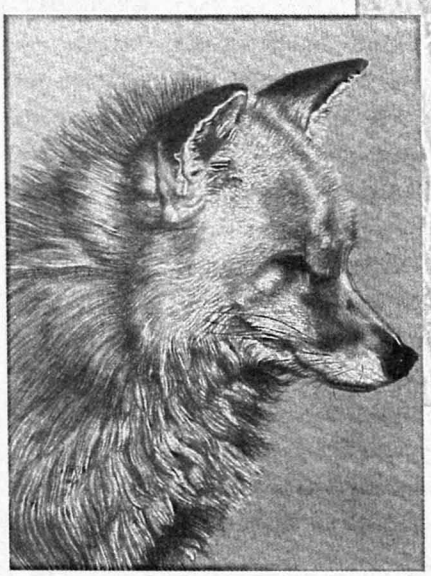
It was not a pleasant sight. A brand new predator on the scene, whose presence stemmed from conditions created by human activity, spelled imminent extinction for the rail. An ideal solution to eliminate the red fox would have been to reintroduce native coyotes to the area; but given the proximity of the refuge to residential areas and domestic pets, that was unworkable. In 1991, none too soon for the endangered rail, the refuge decided to establish a trapping program. It wasn't a popular decision, at first.

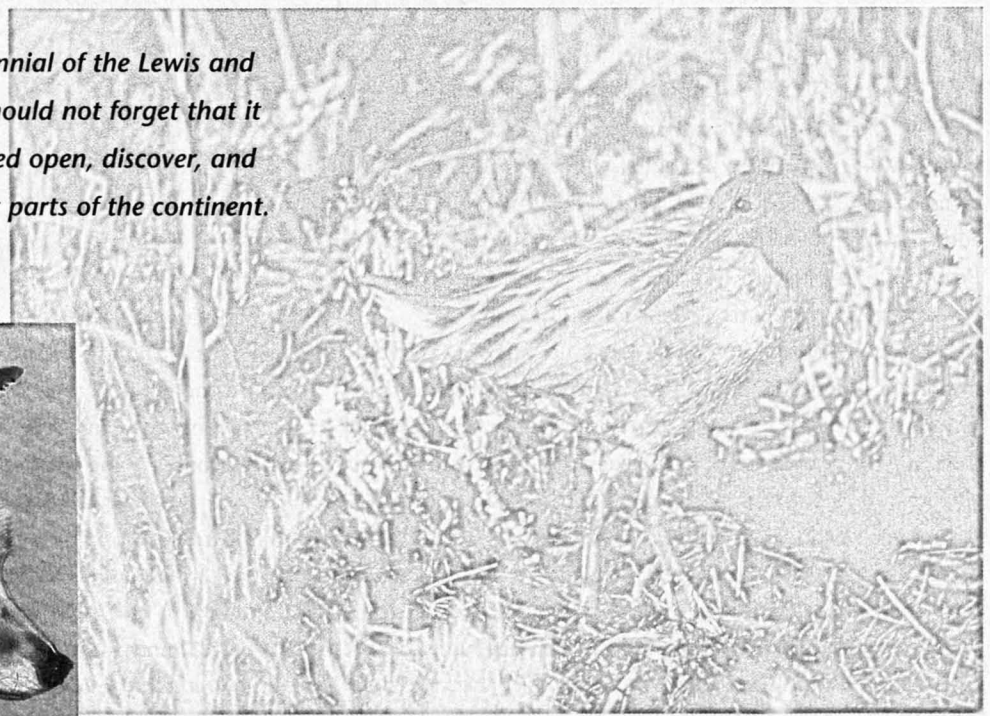
During the environmental review and public comment period when trapping was proposed for the Don Edwards San Francisco Bay National Wildlife Refuge, initial opposition soon became support with the help of our refuge friends group, the Citizens to Complete the Refuge, as well as local Audubon chapters, the Save San Francisco Bay Association, and other local environmental and conservation groups. These groups were key in explaining why trapping was crucial if we were to preserve the California clapper rail, and why active wildlife management is sometimes a conservation requisite.

The situations faced by refuge managers today are much different from those that existed in 1903, when President Theodore Roosevelt established the first national wildlife refuge at tiny Pelican Island, Florida. But even then, Paul Kroegel, the first refuge manager, practiced his own form of management. Whenever poachers came to the island, which happened often, he grabbed his gun, jumped in his boat, and sailed out to scare them off. Today's refuge managers are coping with even more complex and pressing challenges: urbanization, habitat fragmentation, invasive species, and the loss of critical components in a variety of ecosystems. Meeting these challenges requires a host of tools and techniques. Trapping is an important tool we need to retain if we are to sustain wildlife diversity in these stressed ecosystems.

DURING MY CAREER in wildlife management, I have worked for three state wildlife agencies. I have seen a vari-

As we mark the bicentennial of the Lewis and Clark exploration, we should not forget that it was trapping that helped open, discover, and map many of the wildest parts of the continent.





ety of perspectives, running the gamut from animal rights groups to trappers. While the control of animal populations through any means is likely to cause a stir, I have learned that it is crucial to stay focused on the big picture.

The big picture is not always easy to see. In Massachusetts (one of the states in which I worked), a ballot initiative was passed that banned trapping. Subsequently, beavers ran rampant, building their dams, as beavers do. As a consequence, serious flooding of roads, culverts, and septic tanks created a burden to the state and to taxpayers, and the state had more challenges to contend with in achieving its long-term wildlife management goals. In July 2000, an exception in the Massachusetts law eventually allowed for trapping in emergency situations; there are currently two bills that have been proposed to re-allow permits during a trapping season.

While I worked for state agencies, I helped promote Best Management Practices for trapping. I still encourage trappers to employ them. A practical tool for trappers, Best Management Practices are carefully researched recommendations that address the welfare of captured animals and identify the safest, most efficient, humane, and practical techniques and equipment.

The predator control program at the Don Edwards San Francisco Bay National Wildlife Refuge involves two types of traps: padded leghold traps and cage traps. Both are considered "live traps" because nontarget species inadvertently captured can be released unharmed. The trapping is conducted by USDA Wildlife Services personnel who are expert at reading signs of target predators and trained in humane methods of euthanasia approved by the American Veterinary Association. Problem predators are humanely euthanized and are made available to interested researchers for study.

Altogether, this program—and others like it—serve an important function in our conservation efforts. We are responsible for protecting endangered wildlife. Today, as a result of the trapping program established back in 1991, the California clapper rail population—so perilously close to extinction—has more than doubled and remains stable. Additionally, the refuge has documented larger population sizes and better reproductive success for three other endangered species: the western snowy plover, the California least tern, and the salt marsh harvest mouse.

Of course, these achievements are symptomatic of a larger and more complex goal: to restore habitat and the balance of Nature in a stressed ecosystem. The National Wildlife Refuge System has been working towards this goal for a full century now.

WHILE 2003 marks the centennial anniversary of the National Wildlife Refuge System, it also marks another historic landmark. In 1803, a full century before the Refuge System was established, Meriwether Lewis and William Clark set off on their celebrated exploration of the American West. As we mark the bicentennial of the Lewis and Clark exploration, we should not forget that it was trapping that helped open, discover, and map many of the wildest parts of the continent.

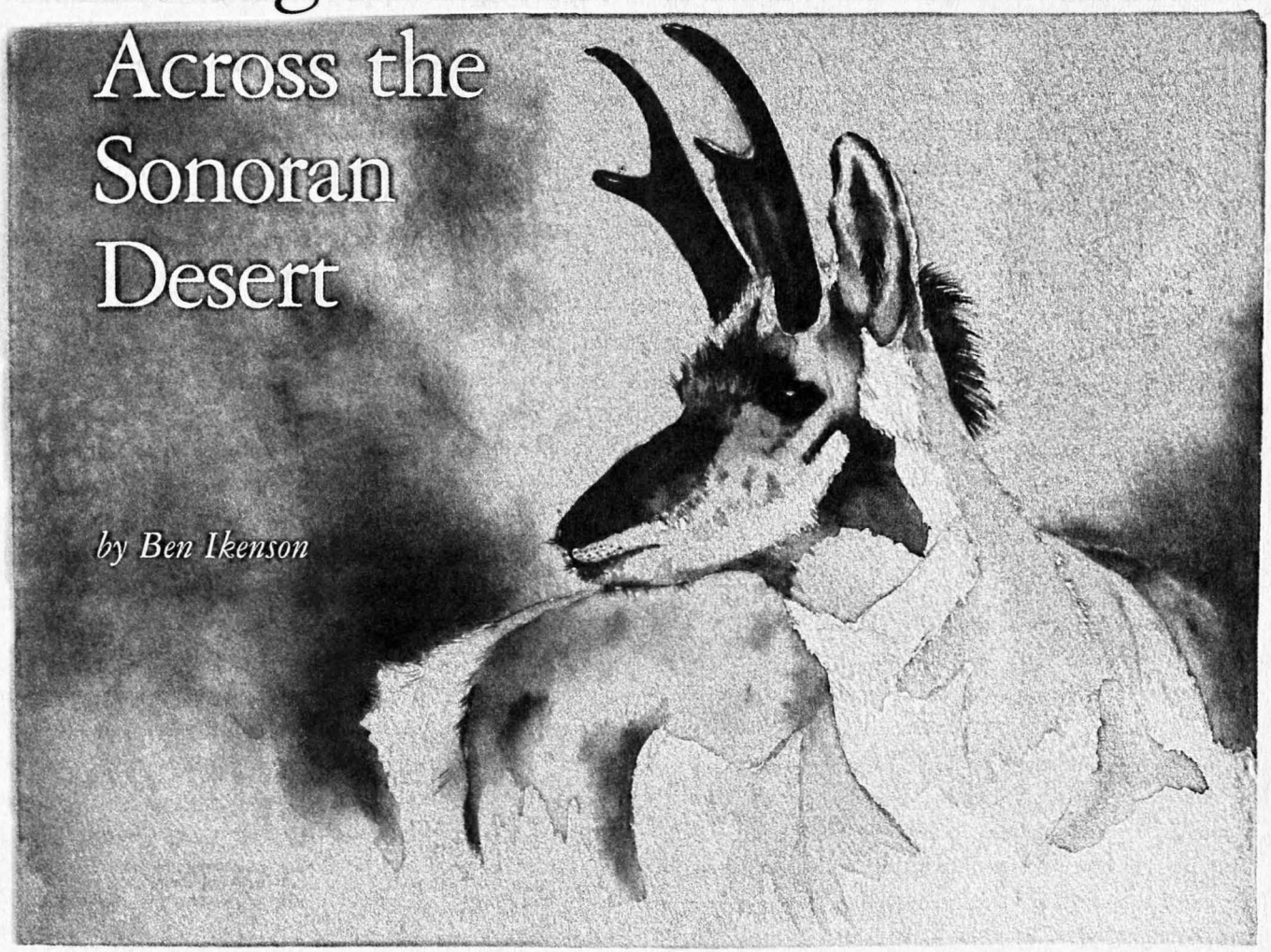
Today, as our conservation challenges have grown increasingly complex, I believe it is equally important to encourage people in the outdoor traditions, including trapping. We should not abandon this important part of our cultural heritage, nor the skill it imparts. Trappers are among the most astute observers of Nature; they are up before dawn and they are keen to the subtlest cues in wildlife behavior. They represent a tradition that really has helped balance Nature in urban, suburban, and rural areas, and in doing so, they pass on a uniquely refined ability to perceive the workings of the natural world. This is an important offset to the multitudes of urban dwellers who don't have time or access to the outdoors, and whose children are raised on video games and television.

The anniversaries of the National Wildlife Refuge System and the Lewis and Clark exploration have more in common than mere coincidence. Both speak of the importance in discovering and documenting America's wild heritage; both speak of the traditions that continue to this day to be valuable components in the conservation of wild America; both tell us now that if history is a lesson, then our perpetual homework assignment is the responsible stewardship of our natural heritage.

This is the big picture, and as I look at this picture, I see it is not an easy task; it is an endless task. But it is a necessary one that involves difficult trade-offs. Among the many conservation challenges that lie ahead, we should keep in mind the California clapper rails, and remain open to the role of trapping in maintaining the richness and diversity of America's wildlife populations. ☾

Steve Williams, *who holds a doctorate in forest resources from Pennsylvania State University, has been director of the U.S. Fish and Wildlife Service since 2002. A career wildlife professional, he previously served as secretary of the Kansas Department of Wildlife and Parks, executive director of the Pennsylvania Game Commission, and assistant director for Wildlife in the Massachusetts Division of Fisheries and Wildlife.*

Pronghorn Race Extinction Across the Sonoran Desert



by Ben Ikenson

AT THE MEXICO BORDER in southwestern Arizona, the old Peligroso/Danger signs dangling from the barbed wire do little to stop a furtive flood of foot traffic through the desert, despite its unforgiving conditions. In May 2001, 14 undocumented Mexican immigrants tragically perished in this grim location; more than 400 since have died in the searing heat along the entire Arizona-Mexico border.

While humans are ill-equipped to survive the harsh conditions of the Sonoran Desert, endangered Sonoran pronghorn (*Antilocapra americana sonoriensis*) may be even less equipped to handle the widespread consequences of human activity in a region where moisture is already a rare commodity. In conjunction with recent extended periods of low rainfall during hot summer months, range fragmentation and habitat degradation are presenting serious problems for the Sonoran pronghorn, which was listed as endangered in 1967.

watercolor by Lezle Williams

About the size of small deer, Sonoran pronghorn bucks weigh between 100 and 130 pounds; does generally weigh 75 to 100 pounds. They have long legs, are mostly beige in color, and have distinctive white stripes on their necks. Males display black cheek patches across their bony faces and boast the signature pronged horn. (Females sometimes have shorter horns which are rarely as long as their ears.)

Seeing Sonoran pronghorn in the wild has become increasingly rare. Of the small number remaining, there are three isolated populations: two in Mexico and one confined to federal lands in the United States, including Cabeza Prieta National Wildlife Refuge in Arizona.

The third largest national wildlife refuge in the lower 48, Cabeza Prieta occupies a sizable chunk of the Sonoran Desert—some 860,000 acres—and plays a central role in recovery efforts for the Sonoran pronghorn. Here, biologist John Morgart tracks and monitors the herd.

"It's life versus death out here," Morgart says. A glimpse through his high-powered binoculars upholds the ominous statement. The only perceivable movement in the wide desert valley is that of two rival vultures poking for morsels at the underside of a coyote's sun-bleached skeleton. The sound of wings slices the silence like erratic drumbeats.

Those who claim this vast desert arena as home—turkey vultures, desert bighorn sheep, coyotes, desert tortoises, saguaros, and Sonoran pronghorn—have evolved to survive under austere conditions. To travel long distances in response to rainfall, across a landscape populated with hungry predators, the pronghorn employs two distinctive survival techniques: great speed and a pair of enormous eyes positioned for a wide-ranging view. Its vision is said to rival a pair of 8x binoculars. However, these evolutionary attributes may not be enough; the dwindling pronghorn who gaze with curiously large eyes upon the landscape are blind to an onslaught of threats that may be impossible to outrun.

All three populations of Sonoran pronghorn contend with roads, fencing, and railroad tracks. Although the U.S. population and Mexico's northernmost population on the El Pinacate Biosphere Reserve can roam within a few miles of each other, border fencing and Mexico's Highway 2, which parallels the border, have divided them as effectively as if they inhabited separate continents. Further south, the largest population of some 255 individuals, comprising more than 80% of the remaining Sonoran pronghorn in the world, is isolated by the Gulf of California on one side and Mexico's Highway 8 on the other.

Border-dwelling pronghorn are challenged by the ongoing legacy of human and drug trafficking. Foot traffic often means not only the unsettling effect of temporary human presence on pronghorn stomping grounds but also hazardous disturbances, including abandoned vehicles whose corrosive batteries and leaking fluids are known to contaminate the soil. Also, undocumented immigrants sometimes compete for water stored in holding tanks for dehydrated pronghorn.

Still more menacing than the foot traffic, though, are the makeshift roads that litter both sides of the border. John Hervert, a wildlife program manager for the Arizona Game and Fish Department, has observed some of the more subtle and long-lasting deterioration caused by the network of illegal roads. "On more heavily used roads, the hydrology is being altered to the detriment of plants," he said. "At first glance, you can see how a road crushes plants or cuts through the natural flow of vegetation. But even worse is what you cannot see right away. The movement of water in slightly sloping desert valleys is very slow, and heavily used roads will effectively divert moisture away from lower level vegetation." In short, pronghorn forage dies where roads make incisions across the land.

Additionally, historical overgrazing has taken a toll on native vegetation throughout the pronghorn's range. It continues in Mexico, where hungry livestock deplete the greenery, leaving the soil especially vulnerable to erosion. Much of the native vegetation that pronghorn graze, such as dune bursage, ratany, and mesquite leaves and beans, is vanishing, giving way to parched earth and shrub.

"We suspect that livestock grazing can significantly alter the equilibrium of the plant community, evidence of which exists on both sides of the border," said Hervert. For example, an overabundance of creosote is a reliable indicator that a desert ecosystem is in disrepair. A hearty, native desert shrub that provides forage neither for cattle nor pronghorn, creosote out-competes neighboring palatable vegetation. By degrees, patches of the shrub will fan out, grow taller, and dominate an area. Ultimately, a landscape of thick, inedible vegetation is unattractive to an animal like the pronghorn, which prefers open vistas where it can use its extraordinary vision to watch for danger.

Wherever native habitat has been altered in its current fragmented range, the Sonoran pronghorn suffers. And each factor that militates against the subspecies is made worse by the recent spate of dry seasons. Droughts this severe are not outside the natural range of variation in the Sonoran Desert. However, the severing of connections across the landscape—

which might have allowed many pronghorn to escape the dry conditions through migration—and the overall decline of the metapopulation—such that local "catastrophes" cannot be reversed through recolonizations from populations that fared better—have proven disastrous. Worse still, the harsh natural pattern of droughtlike conditions in the Sonoran Desert is possibly exacerbated by global warming; water will likely be scarcer than it has been historically in this region.

Even hearty desert critters need a minimum of moisture for survival, which adult pronghorn typically obtain through their preferred forage. These plants spring up after the rainfall the animals would instinctively follow, were it not for the barrage of obstacles throughout their range. But hemmed in by barriers and struggling through seven dry years in the last decade—including the worst drought on record for the Desert Southwest in 2002—pronghorn are challenged to procure

A goatlike animal often mistaken for a relative of the African antelope, the Sonoran pronghorn is one of five subspecies within the unique *Antilocapridae* family. The species descended from prehistoric Antilocaprids, which roamed North America during the Eocene Epoch some 30 million years ago. By the end of the Pleistocene, all were extinct but one: the pronghorn *(Antilocapra americana)*.

The fastest land mammal in North America, and possibly the second fastest in the world after the African cheetah, a pronghorn can reach speeds of up to 60 miles per hour. Unlike the cheetah, who tires after a quarter-mile burst of energy, pronghorn can maintain its top speed for about four minutes and run 30 mph for up to five miles. Scientists believe the animal developed its extraordinary speed and stamina millions of years ago, when the continent was populated with swift, large carnivores, including saber-toothed cats, lions, and two species of American cheetah. These have since gone extinct, leaving healthy adult pronghorn free from all but the craftiest coyotes.

In more recent times, pronghorn became a regular component of the human diet for nomadic Native Americans such as the Shoshoni, Bannock, Ute, Paiute, and Gostiute. These tribes came together annually for three weeks to partake in a great pronghorn drive, forming a large circle and closing it inward until the prey could be harvested. Beyond mere sustenance, the hunt furnished a cultural celebration whereby cross-tribal marriages were arranged and spiritual rites were conducted.

A Blackfeet legend tells how the pronghorn came to inhabit the prairie. When the Creator turned the animal loose on the slopes of the Rockies, its great speed was not suited to the tricky terrain, where it stumbled and fell. The pragmatic Creator hastily relocated the pronghorn to the prairie where it flourished—at least for a while.

By the turn of the twentieth century, the entire pronghorn species, which had numbered as high as 40 million, was reduced to 20,000. Evidently, nothing in Nature could prepare the pronghorn for the rifle and the plow. Hunting in the nineteenth and twentieth centuries greatly contributed to the rapid decline of the entire species. Market hunters slaughtered millions of pronghorn and continued to do so even after the value of the meat diminished because it was so plentiful. Often, carcasses were simply left to rot wherever bullets brought them down.

As settlers cleared land and staked fences, pronghorn, which unlike deer will not jump fences, were finding less forage and less room to roam. Also, many ranchers shot pronghorn, who were perceived as competing with livestock for forage, even though pronghorn typically don't eat the grasses favored by livestock. Human settlement was gradually accompanied by livestock overgrazing of grasses, which inhibited growth of the symbiotic pronghorn forage, as well as by diseases such as bluetongue and epizootic hemmorrhagic outbreaks introduced through cattle and ever-increasing habitat fragmentation.

Although all five subspecies—especially the peninsular pronghorn (*A. a. peninsularis*) of Baja California and the Mexican pronghorn (*A. a. mexicana*) of northern Mexico and most of Arizona, New Mexico, and Texas—suffered under the myriad pressures, the Sonoran pronghorn (*A. a. sonoriensis*) were reduced to perhaps the smallest number. Traveling in small bands of 25 or so, Sonoran pronghorn roamed like caravans across vast expanses of the North American desert, throughout what is now southwestern Arizona, southeastern California, northeastern Baja California Norte, and northwestern Sonora, Mexico. As much an icon of the Sonoran Desert as the buffalo were of the prairie grasslands, thousands of Sonoran pronghorn once graced the landscape—and, in a restored desert, might again. **—Ben Ikenson**

meaningful nutrition and hydration through low-quality forage that is scarce in moisture.

The drought is also significantly diminishing the animal's success at nurturing young. The better forage a mother can eat, the more nutrients she can divert to her fetus. After birth, a healthy mother is better equipped to provide nutritious milk during the critical nursing stage. If malnourished, a fawn is likely to die. Because the pronghorn's life span is generally short, between 10 and 12 years, the number of times it has to reproduce is limited. For an animal so close to extinction, this adds to its peril.

Morgart heads a collaborative recovery team that includes scientists from both sides of the border. "It's a cooperative effort," he said. "We're collaring animals to track them. We're sharing our research and discussing ideas." In the United States, the Fish and Wildlife Service, the Arizona Game and Fish Department, Organ Pipe Cactus National Monument, the U.S. Bureau of Land Management, the U.S. Air Force, the U.S. Marine Corps, the Arizona Army National Guard, and the University of Arizona are working for the pronghorn. Recovery team members from Mexico include the El Pinacate y Gran Desierto de Altar Biosphere Reserve (PINA) (El Pinacate Biosphere Reserve), and the Instituto del Medio Ambiente y el Desarrollo Sustentable de Estatio de Sonora (IMADES) (Institute of Environment and Sustainable Development of the State of Sonora, Mexico). The team's goals are to increase Sonoran pronghorn numbers and to improve and expand their current range.

One of the more important achievements in Mexico was the declaration of the El Pinacate Biosphere Reserve as a national protected treasure on June 10, 1993. "This is a good tool for Sonoran pronghorn recovery," said Carlos Castillo, who directs activities for PINA. He believes that the biosphere reserve fits into an overall approach to saving the pronghorn: binational cooperation, the search for common goals, and transmitting the importance of pronghorn conservation to the various stakeholders.

As managers of protected natural areas, PINA and IMADES staff members are trying to learn more about the use of habitat and behavioral ecology of the Sonoran pronghorn. Specifically, they are assessing wildlife crossings along Highway 2, between Sonoyta and San Luis Río Colorado, and Highway 8, between Sonoyta and Puerto Peñasco, since both highways may be widened to the detriment of conservation efforts. "We are trying to propose more restrictive regulations for the highway widening process," said Castillo, "and also to develop some broad education programs for local communities to help them gain an appreciation for the importance of conservation. In addition to border fencing, the highways pose further barriers, reducing potential for free movement and genetic exchange between Sonoran pronghorn in southwest Arizona and northwest Sonora."

Certainly, the past few years have been the most dramatic for the recovery team. The winter months of 2000 and 2001 provided more precipitation than in preceding years, and surveys conducted by Arizona Game and Fish documented that, as a consequence, about 50 fawns were born into the U.S. population. The estimated ratio of fawns to does revealed the highest productivity ever recorded for Sonoran pronghorn.

Unfortunately, a record year in terms of fawn production and survival and recruitment was followed by arguably the worst drought year on record. From mid-August 2001 to early September 2002, the National Weather Service gauge in Ajo, Arizona recorded less than an inch of rain—in an area that averages nine inches. The effects on desert vegetation were catastrophic, and many perennial plant species that Sonoran pronghorn depend on in their diet died. Furthermore, without winter rains, no annual forbs were produced in the spring of 2002. Most adult females produced twins, but none survived. So severe was the impact of drought that a December 2002 survey indicated only 21 animals likely remained in the U.S. subpopulation.

Recovery team biologists are working to alleviate the problems associated with the extreme dry conditions. These efforts include the construction of water access sites; creation of forage enhancement plots on the Barry M. Goldwater Range, a military training ground used by the Air Force, and on the Cabeza Prieta National Wildlife Refuge; seasonal area closures; and the building and stocking of a semi-captive breeding enclosure.

Experimental techniques are part of the effort. For example, John Hervert and his colleagues from the Arizona Game and Fish Department have been hauling water tubs to remote areas on the Cabeza Prieta Refuge where they have tracked pronghorn activity. The four-mile hikes with five-gallon jugs of water in 105-degree temperatures are proof of their dedication; the fact that the animals have responded is proof of their desperation, since they typically don't drink water when the moisture in their preferred forage is adequate.

The biologists have affixed cameras to snap pictures of activity at water tubs in an attempt to gather information on how to make them more effective. They are currently investigating the survival rate of fawns that have access to the water

tubs as compared to those that do not. Also, the Goldwater Range has funded two forage-enhancement projects on its land. One is already in place. By clearing creosote and watering areas during below-average rainfall, biologists hope to increase the quantity and quality of forage. Likewise, the Marines have funded the drilling of a new well and a forage-enhancement plot on the Cabeza Prieta Refuge. Cameras have revealed that pronghorn are already using the enhancement plots. These efforts may stimulate other partners, including those in Mexico, to initiate similar projects throughout pronghorn range. "It may be a long, hard road to recovery ahead," said Morgart, "but the shorter road leads only to extinction."

To stave off extinction, the team established a semi-captive breeding program. "We were hoping it wouldn't come to this," said Morgart. "We were hoping that conditions would have improved enough for pronghorn to reestablish their numbers on their own. But when you review weather patterns over the last few years, you can see how unpredictable things have been. The pronghorn in the U.S. were almost entirely wiped out in 2002; and unfortunately at this point, we can no longer afford the luxury of hoping conditions will improve next year."

A one-square-mile enclosure in an irrigated and well-vegetated area on the Cabeza Prieta National Wildlife Refuge will likely be used at first to hold one male and four females, which will be captured from Mexico in December, 2003, or January, 2004. Biologists are hopeful that captive breeding will produce up to two fawns per female the first year—fawns that will help replenish the U.S. population.

Today, there are approximately 350 Sonoran pronghorn struggling in a severe and fragmented environment. In the U.S., about 30 animals remain. Biologists are determined, though, to keep this unique subspecies from going extinct. "Such an ancient animal should not be allowed to disappear as a result of human settlement and activity," said Morgart.

The Sonoran Desert presents an archetypal drama: who gets water, lives. But modern circumstances threaten to destroy some of the players completely. Over a short period, human actions have disturbed the evolutionary symbiosis honed over eons to afford the natural inhabitants of this harsh land a fighting chance. Pronghorn recovery efforts are a small step toward restoring balance to this ancient stage. ☾

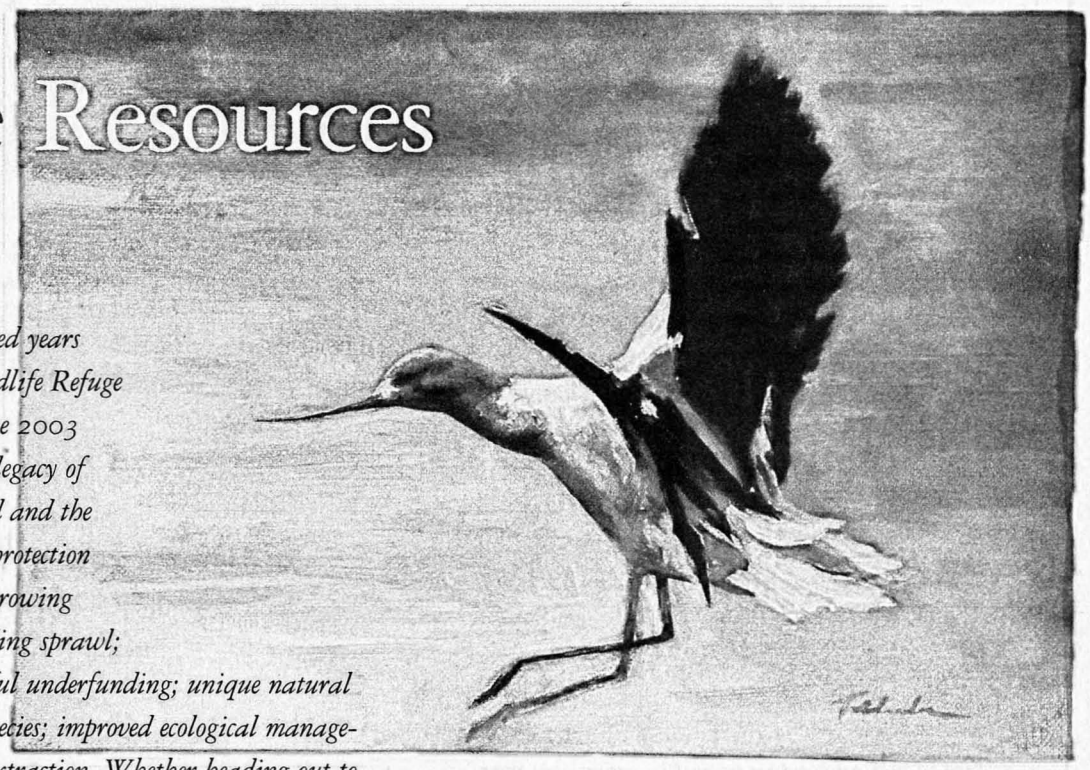
Ben Ikenson *is a writer and editor for the U.S. Fish and Wildlife Service. His work has appeared in magazines such as* Earth Island Journal, North American Sportsman Magazine, *and* American Indian Report.

Winter Temperatures

Tonight in New England it is only zero,
again. Cold enough to dream of death
in the blue-black hours when nothing stirs,
when even the snowy owl hides in a tree
and wraps a wing around its eyes,
so that a rabbit can enter the white field
where a few stalks of half-seeded rye bow
from out the snow to the moon, whose slim
light hangs in air against gravity to play
with hungers, to tease the blood into
happiness, even if only for the time it takes
a small tongue to savor a small seed,
because the little rustling noise of those
few rye stems fattens across the frozen
nothingness and awakens the owl.
Later, snow will dilute the deep, deep red
spilled on its icy crust and a softened stain
will match the sky's aurora of light just
before the sun lifts over the yet dark forest.

Gary Metras

Refuge Resources



What will the next hundred years bring to the National Wildlife Refuge System? Moving beyond the 2003 centennial celebration, the legacy of the refuges must be weighed and the future imagined: wildlife protection vs. habitat deterioration; growing refuge acreage vs. surrounding sprawl; increasing budgets vs. woeful underfunding; unique natural places vs. invasive exotic species; improved ecological management vs. ongoing resource extraction. Whether heading out to the bookstore or onto the Web, here are a few leads to help those working to tip the scale toward improved refuge conservation.

On the World Wide Web

U.S. Fish and Wildlife Service

➤ www.fws.gov

Click on "Refuges" at the Fish and Wildlife Service website. Here is a trove of information, such as locator maps, species accounts, educational programs, and upcoming events. Numerous links and reports make this a good starting point for exploring the 543 national wildlife refuges. The National Conservation Training Center pages—at http://training.fws.gov—have excellent information on the historical development of the Refuge System.

National Wildlife Refuge Association

➤ www.refugenet.org

Over the past eight years, the National Wildlife Refuge Association has galvanized a network of 220 refuge friends groups—with 45,000 members who provide volunteer support for their local refuges. Since 1975, the NWRA has been dedicated exclusively to protecting and expanding the National Wildlife Refuge System. They sponsor a National Refuge Friends Conference and a mini-grant program—while also working in Washington, D.C., on federal refuge policy ranging from endangered species protection to Refuge System budget increases.

CARE

➤ www.refugenet.org/New-issues/about%20care.html

When the National Rifle Association and the National Audubon Society sit together, Congress takes note. Starting on September 11, 1996, the Cooperative Alliance for Refuge Enhancement (CARE) presented its vision for the future of the National Wildlife Refuge System to the House Resources Subcommittee of Fisheries, Wildlife and

American avocet, oil by Todd Telander

Oceans. Since then, the alliance's diverse coalition of 20 nongovernment conservation and recreation organizations has successfully worked to secure increased federal funding for refuges. CARE's report, *Restoring America's Wildlife Legacy,* is a good introduction to the NWRS funding crisis, noting that the Refuge System has $3.18 for operations and maintenance per acre—compared to the National Park Service's $15.80.

Rachel Carson

➤ www.rachelcarson.org

The most famous U.S. Fish and Wildlife Service employee, Rachel Carson (1907–1964) began 15 years in federal service as a scientist and editor in 1936; she quickly rose to editor-in-chief of all publications for the FWS. It is well known that her *Silent Spring* ignited the environmental movement of the 60s and 70s—which in turn sparked expansion and reform in the National Wildlife Refuge System.

Blue Goose Alliance

➤ www.bluegoosealliance.org

The Blue Goose Alliance has a singular mission: to promote the establishment of the National Wildlife Refuge System as a separate agency within the U.S. Department of the Interior. An internet-based organization founded by several retired FWS employees, the alliance believes that "the Fish and Wildlife Service cannot install the type of organizational structure, provide the leadership, or obtain the level of funding needed by the refuge system to achieve its full potential" for protecting wildlife.

Ding Darling Foundation

➤ www.ding-darling.org

With a giant steam-shovel digging a hole literally to the center of the Earth, one of Ding Darling's 1938 cartoons asks, "How rich will we be when we have converted all our forests, all our soil, all our water resources and our minerals into cash?" As an editorial cartoonist, chief of the Biological Survey, and creator of the Duck Stamp program, Darling was a creative force in the development of the Refuge System. The Ding Darling Foundation supports the national wildlife refuge named in his honor, provides teaching materials for conservation education, and has published a CD containing 6,800 of Darling's cartoons.

Refuge Reading

Smithsonian Book of National Wildlife Refuges

by Eric Jay Dolin, 2003, Smithsonian Institution Press, 258 pages, $39.95 • Shelf fungus, tundra swan hatchlings, Yaqui chub, beavertail prickly pear, red-footed booby, desert bighorn—these are among the dozens of species captured on film through the cameras of John and Karen Hollingsworth in this glossy, glorious book. Eric Dolin's accompanying text pours out the story of the Refuge System's formation and shifting fortunes as presidential administrations have swung from neglect to abuse to reform.

The National Wildlife Refuges: Coordinating a Conservation System through Law

by Robert L. Fischman, 2003, Island Press, 277 pages, $25

The 1997 National Wildlife Refuge System Improvement Act made the first major revision to federal public land law since the 1970s. Looking in detail at the implications of this law, this book analyzes the Refuge System's ecological management criteria, conflicts between primary and secondary uses, and the potential for the current hodge-podge of refuges to re-form as a coherent national conservation system.

America's National Wildlife Refuges: A Complete Guide

by Russell D. Butcher et al., 2003, Roberts Rinehart, 720 pages, $29.95 • Tuck this into your pack. Describing some 530 refuges nationwide—habitats, birds, mammals, accessibility, facilities, etc.—this could be your outdoor travel guide for the next several decades.

Arctic National Wildlife Refuge: Seasons of Life and Land

by Subhankar Banerjee, 2003, Mountaineers Books, 176 pages, $35

Few coffee-table books shape public policy, but this stunning volume was held aloft during Congressional debate over proposed oil drilling in the 19-million-acre Arctic National Wildlife Refuge. As the *Los Angeles Times* noted, the photographs "defy the administration's argument...that drilling would not disrupt the refuge because for most of the year it is an area of 'flat, white nothingness.'" Photographer Subhankar Banerjee—in collaboration with essays by Jimmy Carter, George Schaller, Bill Meadows, Fran Mauer, Debbie Miller, David Allen Sibley, and Peter Matthiessen—has seen deeply into what some call America's Serengeti.

Ice Age Mammals of North America

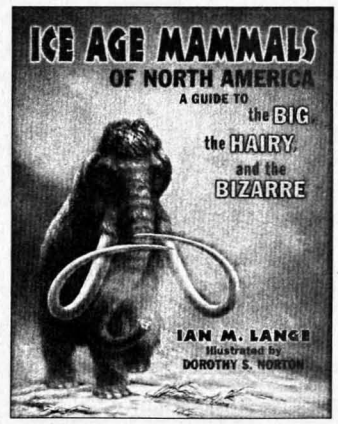
A Guide to the Big, the Hairy, and the Bizarre

by Ian M. Lange; illustrated by Dorothy S. Norton
Mountain Press Publishing Co., 2002
226 pages, $20

WHAT IS KNOWN of the Pleistocene mammalian megafauna of North America, big game that overshadow everything reported by Lewis and Clark? The extinct beasts more than match in diversity and size the largest mammals to be found now in Africa and Asia. Radiocarbon dates indicate that this continent's megafauna disappeared around 13,000 years ago. Now, in *Ice Age Mammals of North America,* Ian Lange superbly interprets the dozens of large animals that evolved here over tens of millions of years, or immigrated from Asia or South America before or during the Pleistocene, the last ice age beginning around 1.8 million years ago. Lange all but brings the magnificent creatures back to life.

But wait! Is Lange, an economic geologist, truly qualified to author this book? To turn the table, how many vertebrate paleontologists or paleoecologists would be qualified to do a credible popular book on economic geology? Lange does stumble on occasion. Surely the Palouse loess is derived from deflation of mud flats left behind by sediments of the Missoula Floods, not dust off the glaciers themselves; the Komodo dragon lives on the island of Komodo, other small islands, and on Flores, not on the island of Timor; in the reference works Lange consulted, yak are listed as part of the Alaskan, and thus become part of his New World megafauna, but paleoecologist Dale Guthrie at the University of Alaska has reported that the alleged yak bones are actually cow bones from miners' garbage, intruded into the fossil bones washed out of the fossil rich placers, mistaken for fossils, and misidentified.

Finally, purists will growl that we don't have much to justify pattern or paint in color illustrations of the extinct beasts. This is not a field guide in which body color is known. Nevertheless, I say that if illustrator Dorothy Norton wants to color the extinct giant predatory bird *Titanis* an inky purple, more power to her.



The first third of Lange's book covers the geological and geographic features beginning with Wegener's continental drift. Maps and illustrations show when and where one finds glacial moraines, the pluvial lakes, the ice-polished boulder fields with residual boulders left in place, and the distribution and recurrent discharges of the incredible Missoula Floods. After the floods, a group of Clovis people left rich treasure, a cache of oversize Clovis spear points, and beveled rods of ivory, entombed with red ochre, in what is now an apple orchard in East Wenatchee, Washington. Whether or not they were the first Americans, they were America's first mammoth hunters.

The balance of the book treats the various orders of large mammals affected by Pleistocene extinctions. Of the Order Xenarthra (living tree sloths, armadillos, and ant eaters; extinct ground sloths, glyptodonts, and giant armadillos), the ground sloths managed to gain a foothold in North America as the Panamanian land bridge began to provide direct access beginning roughly 2.5 million years ago. Extinction did not strike the larger Xenarthra until the end of the Pleistocene.

Of the carnivores (Order Carnivora), many survive, but we lost the saber-tooth and scimitar-tooth cats, the American cheetah, and the short-faced bear (much larger, leaner, and, who knows, maybe even meaner than a grizzly guarding a bison carcass).

Of the rodents (Order Rodentia), the fossil record shows virtually no extinctions in continental mice or rats at the end of the Pleistocene (including the last 13,000 years), which proved fatal to so many large mammals. The exceptions are the 170-pound giant beaver and the extinct capybara of a genus different from the living one; both living and extinct capybaras once inhabited Florida.

Among the odd-toed ungulates (Order Perissodactyla), including horses, rhinos, and tapirs, horses evolved in North America, spread into South America and Asia and only survived in Asia. It is hard for me to view our free-ranging wild horses and burros as other than highly worthy replacements for those equids once native to this continent.

Of the even-toed ungulates in North America, the Order Artio-

dactyla once included camels, llamas, extinct species of bison, woodland muskoxen, diminutive species of pronghorn, and stag-moose. Living artiodactyls include the cervids (such as moose, wapiti, and deer) and the bovids (including bison, mountain goats, and mountain sheep), plus the family Antilocapridae, represented by living and extinct species of pronghorn.

Finally, the biggest losers of all are in the Order Proboscidea, the elephants and their relatives such as mastodonts, gomphotheres, and mammoths, including dwarf mammoths that once occupied the Channel Islands along with vampire bats. Yes, lest we forget, until not long ago as geologists measure such things, America was a land of elephants, the largest tipping the scales at ten metric tons. On occasion Columbian mammoths are found in intimate association with Clovis points and other artifacts.

In Lange's last chapter we come to the bottom line: "Why are the big guys gone?" There is an unquenchable argument about just why. An academic rear guard is increasingly strident in its objections to the majority view that most, if not all, late Pleistocene large mammals—over 30 genera and roughly 45 large species—disappeared on the heels of *and because of* human arrival in America. As Lange notes, paleontologist John Alroy has recently shown that the extinction of so many large animals at the end of America's ice age, with so few small mammals involved, is not seen at any time in the tens of millions of years and thousands of generic extinctions since North America began to support a rich mammalian fauna. If people were not involved, what was?

Lange ends with an obvious mega-thought, often buried by all the other efforts to save species. Whatever it was that took out the proboscidea and other large animals of America so late in the fossil record, their absence is a red flag. The loss of any more large species in various corners of the planet cannot be allowed.

Meanwhile, anyone planning an expedition, traveling back to wildest Wild America in the Pleistocene over 10,000 years ago, or simply day dreaming about the past, will want this fascinating field guide and time machine. ☾

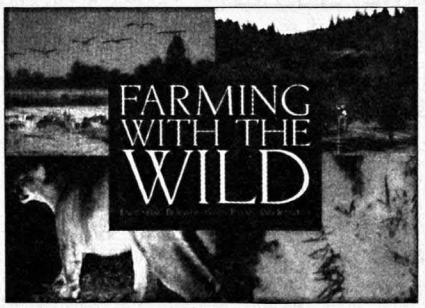
Reviewed by **Paul S. Martin,** *emeritus professor of geosciences at the University of Arizona, who has written extensively on prehistoric extinctions and co-edited* Gentry's Rio Mayo Plants, Quaternary Extinctions, *and other works.*

Farming with the Wild

Enhancing Biodiversity on Farms and Ranches

by Daniel Imhoff
Sierra Club Books, 2003
176 pages, $29.95

AMIDST A BLOSSOMING of recent books that depict the disastrous effects of industrial agriculture on biodiversity, human health, and rural communities around the world (e.g., *Fatal Harvest, Welfare Ranching, Fast Food Nation*), Daniel Imhoff's *Farming with the Wild* is a phoenix rising from the ashes of industrial "success" and excess. Imhoff focuses on resolution of the conflicts between agricultural practices and conservation of native ecosystems by presenting compelling examples of farmers and ranchers, primarily in the United States, who have become citizens of their local ecosystems. The book represents for Imhoff and photographer/designer Roberto Carra "a vision of what interconnected, fully functional ecosystems and healthy farming communities might look like."



The expression "farming with the wild" refers to a set of agricultural practices that express a land ethic in the way that Aldo Leopold conceived it, a striving toward harmony between people and other members of the biotic community. Ecological principles and processes are the foundation of this approach, which seeks to understand, utilize, and maintain the ecological actors and processes of its bioregion. Included under the umbrella of wild farming are the perennial polycultures of the Land Institute in Kansas, grass-fed and rotationally grazed cattle ranches in many parts of the U.S., the seasonally flooded rice farms of the Sacramento Valley, the shaded coffee farms of Latin America, and a host of other examples. In addition to farming with an agroecological outlook, these farmers and ranchers recognize that biodiversity conservation cannot succeed within reserves alone and that agricultural landscapes have an essential role in maintaining native species and ecosystems.

The book is skillfully designed. The introductory chapter, "The case for farming with the wild," lays out the conflict between industrial agriculture and biodiversity and describes the motivation for the book. Seven sections follow, two based on regions (the Sky Islands of southern New Mexico and Arizona, and the Sacramento Valley) and five based on practices, such as "building a matrix of farmland habitat" and "ecolabels and marketing initiatives." Each of the sections includes several examples, mostly vignettes about a particular place in which farming or ranching practices have maintained or restored native biodiversity and strengthened their economic viability. The final section, "Getting started," presents guidelines and information resources for the interested reader. About one-third of the book is color photo collages that illustrate the places, people, and creatures benefiting from wild-farming practices. Text and photos feature not only the charismatic megafauna—jaguar, wolf, bison, and cranes—but also the less conspicuous but vastly more numerous insect pollinators, bats, plants, and aquatic life. Together the text and excellent photographs demonstrate that "farming with the wild" is not just a laudable vision but is already being practiced by pragmatic visionaries across the United States.

The book highlights important changes underway in the approaches of both farmers and conservationists. Fred Kirschenmann, in the Foreword, sets the cultural context in which the wild-farming movement is emerging: "Like the generations of farmers and ranchers before me, I have lived, in part, by [a] wilderness eradication ethic and caused devastating harm to natural ecosystems." That Kirschenmann now grows organic grains in North Dakota and directs the Leopold Center for Sustainable Agriculture in Iowa is a testimony to his change in outlook as well as in agricultural methods. From the conservation side, the California Nature Conservancy bought a 9200-acre ranch where the owners practiced seasonal flooding of its rice fields as habitat for waterfowl and native fishes of the Cosumnes River watershed. Some conservationists criticized the Nature Conservancy for using scarce funds on a managed landscape rather than more natural habitat. "We bought an economically sustainable operation that had already been maximized for wildlife habitat," responded a fish ecologist for the Nature Conservancy.

Other examples go beyond our customary ideas about farming or conservation. Tubac Farm in southern Arizona manages the farm fields and their edges for native pollinators. Gary Nabhan's research there documents 230 species of insect pollinators and over 25 vertebrate pollinators. Wild-garden farms are large gardens that fit into and enhance the natural landscape. In some instances, these gardens are the focus of educational programs about farming, biodiversity, and holistic living. The Occidental Arts and Ecology Center in northern California has added art—in the garden, on canvas, and in photographs—to its mission. The Native Seed SEARCH Conservation Farm gathers and tests traditional varieties of crops from Native Americans in the Southwest. The Anishinaabeg people of the White Earth Reservation in Minnesota harvest and sell native wild rice and struggle for economic viability against wild rice grown in paddy fields in California.

It is clear that adoption of ecologically progressive farming and ranching methods requires new economic opportunities and incentives from many quarters. In addition to organic certification, predator-friendly meat and fiber, songbird (shade-grown) coffee, and salmon-safe are among the newer marketing labels for farming practices that also enhance native biodiversity. Federal programs, such as the Wetlands Reserve Program; private initiatives, such as the Florida Farm Stewardship Program; and groups with both governmental and private members, such as the High Plains Partnership, offer a range of incentives for wild farms and ranches.

The audience for *Farming with the Wild* is broad. Since the examples include organic and conventional, large and small, long-established and new efforts, many farmers and ranchers should be drawn to the compelling portraits of wild farms and ranches. The book would be even more influential with the agricultural community if the economic viability of the examples received more emphasis. With such narrow profit margins today, most farmers and ranchers will not entertain departures from their established methods unless there is an economic draw. Conservationists will find much to appreciate here, especially with a little imagination about how such efforts could be multiplied across North America. The public will find more reasons to support conscientious local farmers and ranchers. All of us can appreciate the book for pointing a way out of the industrial food system from within the belly of the beast. ☾

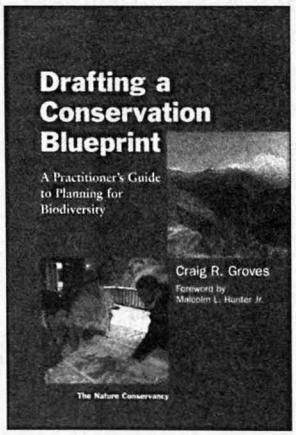
Reviewed by **Catherine Badgley,** *a paleoecologist and organic farmer who teaches at the University of Michigan.*

Drafting a Conservation Blueprint

A Practitioner's Guide to Planning for Biodiversity

by Craig R. Groves
Island Press, 2003
404 pages, $70 hardcover, $35 paper

ON THE FIRST DAY of my graduate class in conservation biology at Duke University in 1996, our professor reviewed the syllabus, which began with the topic of island biogeography and the techniques of conservation planning. She prefaced this section by remarking, "It is highly unlikely that any of you will ever be involved in large-scale conservation planning or actually designing reserves, but these lectures and readings will contain basic principles of conservation biology which you can apply in other ways." What a surprise when quite a few of us from that class ended up working as conservation biologists involved in reserve design for the Nature Conservancy, the Wildlands Project, Conservation International, World Wildlife Fund, and other organizations and agencies involved in regional or landscape-scale conservation planning.



The science of conservation planning has grown considerably more sophisticated over the past 30 years, in step with the large increase in the number of conservation organizations and public agencies attempting reserve design. Yet, until now, different approaches and techniques have not been gathered in one place, which is why *Drafting a Conservation Blueprint* will be such a useful guide for conservation practitioners around the world. While *Continental Conservation* (1999) focused on the *why* of large-scale conservation planning, *Drafting a Conservation Blueprint* focuses on the detailed steps of *how* to create a scientifically credible and effective conservation plan.

Craig Groves draws on years of experience as Director of Conservation Planning for the Nature Conservancy (TNC), but also includes different techniques used by other conservation organizations, biologists, and agencies around the world, assembling an excellent overview of reserve design and conservation planning principles. Highlighting some of the successes in the past 20 years of conservation planning, Groves also discusses common pitfalls (like not involving necessary stakeholders from the beginning) and identifies areas for research that will make conservation planning stronger in the future. The bibliography alone is a valuable tool to conservation planners.

The book begins with the problems that conservation planning is attempting to address and why it is necessary to effectively guide land protection efforts. This is followed by six comprehensive chapters that take readers through conservation planning from beginning to end—the expertise needed on a planning team, tips on project management, stakeholders to involve, where to find data, choosing targets, evaluating existing protected areas, setting goals, assessing viability, and setting priorities. Terrestrial conservation planning has consistently overshadowed freshwater and marine planning; however, these overlooked systems recently have been gaining more attention. Groves covers these bases by drawing on the expertise of Jonathan Higgins for freshwater ecosystem planning, Michael Beck for marine ecosystem planning, and Earl Saxon for conservation planning in the face of climate change. The book concludes with the most difficult, and the most important, part of conservation planning—following through and implementing the plan on the ground.

The book's chief shortcoming is that it gives relatively little attention to methods for incorporating connectivity into reserve design, which may speak to the fact that, until recently, TNC hasn't delved deep into that aspect of conservation planning. Landscape connectivity is an afterthought in many conservation planning efforts, or is completely ignored, yet the effectiveness of habitat linkages between protected areas is likely to be one of the primary factors that influence the long-term persistence of many populations and species, especially with the looming threat of climate change.

I would also have liked to see a discussion of the different challenges of designing reserve networks in relatively undeveloped areas like the boreal forest or remote areas of Siberia. Many conservationists are concerned that proposed reserve designs for such areas will be interpreted by policymakers to mean that

all areas not identified as high priority for protection should be open to clearcut logging, mining, oil and gas drilling, and other resource extraction. Many conservation planning efforts could also benefit from a greater discussion of how to incorporate economic and social aspects into planning.

These minor criticisms notwithstanding, *Drafting a Conservation Blueprint* is highly recommended for any conservation practitioner involved in landscape-scale or regional conservation planning, as well as agency staff, students, and those looking for efficient ways to focus scant conservation dollars in a region. The book is already being used as a text in conservation biology and conservation planning courses, and will likely become the "bible" of conservation planners for years to come. ☾

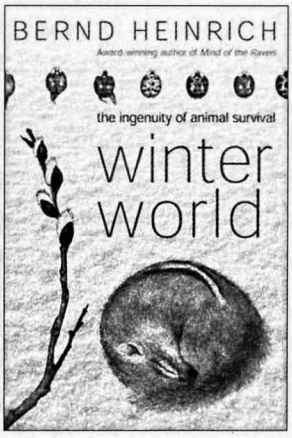
Reviewed by **Kathy Daly,** *conservation biologist for the Wildlands Project.*

Winter World

The Ingenuity of Animal Survival

by Bernd Heinrich
HarperCollins, 2003
368 pages, $24.95

ANYONE WHO enjoyed feasting on the luscious visuals of the movie *Winged Migration* this summer should curl up by a fire with ecologist Bernd Heinrich's book *Winter World*. Beautiful and dangerous though it may be, migration is just one slim strategy for staying alive in a seasonal world. In northern New England, Heinrich's neck of the woods, one in three bird species and almost every insect, amphibian, reptile, and mammal are residents in winter. In a world where liquid instantly becomes razor-sharp crystal—with lethal consequences—the golden-crowned kinglet (a bird with a body the size of a walnut) plays out its life "on the anvil of ice under the hammer of deprivation." Together with bears, tadpoles, and flying squirrels, these tiny birds have evolved physiological and behavioral adaptations to withstand the rigorous subzero temperatures of the Northwoods, as well as survive the scarcity of food available in winter.



A migrant from Germany as a young boy, Heinrich turns a unique lens on the animals who are permanent residents in the woods near his adopted home in Vermont and his cabin in Maine. During the decades he has spent on the land there, he has developed a keen intuition about where to go to find animals and their sign from knowing where he's seen them before.

The chapter "A Late Winter Walk" is an elegant ramble that begins with a search for crossbill nests. It includes one detour to investigate whether the red spruce cones still had enough seeds to feed crossbills, and another to discover a freshly killed deer with lynx or bobcat hair in the snow. It ends in a circle back to the cabin where a bright strawberry-pink male white-winged crossbill appears. "He fluttered within a foot of my ear and then landed at the edge of the firepit. The crossbill hopped close to the glowing embers and picked at ash. Within another minute it departed as quickly as it had come, leaving us in surprise and wonder." Such luck seems magical, almost unbelievable, but Heinrich increases his luck with hard-earned book knowledge and hour upon hour in the woods.

Not satisfied with the speculative theory that golden-crowned kinglets eat snow fleas ("I have never seen a kinglet pay any attention to the snow fleas that are so conspicuous to us on the ground"), Heinrich begins his own sleuthing. He shoots a kinglet to examine the contents of its gizzard. He finds many small geometrid caterpillars. By hammering trees with a club, he shakes down the same variety, and tries three times before successfully rearing them into moths, which he sends off to be identified. What moths do they become? I'll let you discover that and other kinglet secrets. Okay, one more small secret: despite being extremely poorly adapted to it, each year some golden-crowned kinglets do migrate.

Although kinglets weave the book together, Heinrich broadly investigates many animals and their winter adaptations. His beautiful descriptions and illustrations of birds' nests and their construction materials (thin grass stems, dried stems of sugar maple flowers, fine strips of ash bark, the rachis from decaying fern fronds, and sedge-like fibers) leads to a discussion of their modification and use by deer mice. Active all winter, deer mice convert birds' nests into winter

grain bins for seeds by adding a dome of plant down. Bears slow their bodily functions, drop their temperature to about 35 degrees Celsius, convert their urea to a nontoxic substance called creatine, and hibernate. Frogs freeze solid. Along with some insects, wood frogs, gray tree frogs, spring peepers, and chorus frogs (which are all tolerant of being frozen) reach a state of suspended animation so deep that there is no movement, heart beat, circulation, respiration, nor neurological activity. Heinrich argues that they have the potential for life, but are really dead. Because, he writes, "It is not matter that defines life. Process, such as energy flow, does."

Heinrich has a gift for parlaying disparate facts into a good story and he quotes liberally from other sources to do so. (*Winter World* has 30 pages of references!) The chapter "Berries Preserved" explains the continuum along which berries are either adapted for quick consumption (raspberries, blueberries) or hang around to be eaten as a last resort (sumac, buckthorn). The fruit's nutritional content depends on the season for which its dispersal is tailored. Thus, although the highest-quality (highest-energy content) fruits contain fat and sugars, these (especially fat) cause rapid fruit spoilage due to microbes. Low fat and sugar contents, as well as high acidity and low water content, all help to prolong branch life, with staghorn sumac being the extreme manifestation of the strategy. With its tightly packed, small, dry fruit, sumac is the tomato aspic of the bird world, the can you'd still have in your pantry after being snowed in for two weeks. "My pursuit of hard facts is not for the sake of facts. It's to 'capture' the story behind them," Heinrich writes.

Bernd Heinrich retired from the University of Vermont last spring, perhaps closing a chapter on his legendary winter ecology course, whose students appear throughout the pages of *Winter World*. It's hard to imagine a January without Bernd striding along through the Maine woods, like Konrad Lorenz, with a gaggle of fledgling naturalists struggling in his wake. If you have ever dreamed of spending time in the winter woods with a natural scientist of Heinrich's caliber, pick up *Winter World*. It is the next best thing to being there. ☾

Reviewed by **Alicia Daniel,** *a field naturalist living and working in Vermont.*

Bringing the Biosphere Home

Learning to Perceive Global Environmental Change

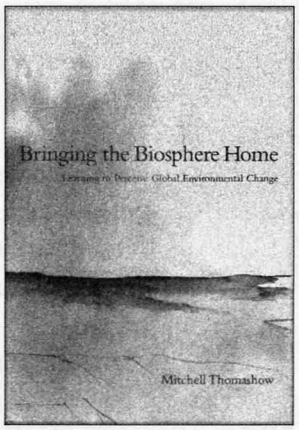
by Mitchell Thomashow
MIT Press, 2002
244 pages, $32.95 hardcover, $15.95 paper

FOLLOWING THE ASPHALT around a shoulder of the green Taconics, I am startled by a flash of orange fringing the crown of a roadside sugar maple. It's barely September, but soon enough these rumpled hills will be blushing in earnest, drawing bedazzled parades of tourists onto our lonely roads. Slowing as I pass the shaggy trunk, I realize how much these majestic maples shape the popular idea of Vermont, whether blazing in the fall or hung with buckets come March. Yet the trees I pass today may be among the last generations of maples to spring from New England's rocky soil. By the end of this century, according to some reports on global warming, the dominant trees of the northern hardwood forest will no longer thrive anywhere south of Canada. Beyond the obvious aesthetic costs, the economic consequences of a changing climate—the loss of maple syrup and fall tourism industries, as well as a shortened ski season—would be devastating to human communities of northern New England. The effects on our wilder neighbors are sure to be even more profound.

It can be sobering to imagine the local effects of global climate change, especially the loss of biodiversity, but encouraging such a perspective is precisely the goal of Mitchell Thomashow's latest book, *Bringing the Biosphere Home: Learning to Perceive Global Environmental Change*. As a long-time educator and Director of the Doctoral Program in Environmental Studies at Antioch New England Graduate School, Thomashow is keenly aware of what a challenge it is for people, even those working in environmental fields, to perceive global changes at a personal level. Problems large enough to affect the entire world seem beyond the capacity of individual attention, beyond the remedies of individual action. But the key to "understanding global environmental change," Thomashow writes, is in "learning how to perceive the biosphere" and our participation in it. Of course, environmental educators have long understood that personal identification with local habitats can lead to investment, activism, and empowerment. But is it possible for people to

identify in a similar way with the entire planetary biosphere? Thomashow believes it is, so long as such identification begins with the mindful practice of "place-based perceptual ecology."

This is not the first time that Thomashow has explored the question of how humans identify with their surrounding landscapes. In 1995, he published one of the classic texts of environmental education, *Ecological Identity: Becoming a Reflective Environmentalist*. The book contains a wealth of teaching strategies designed to help conservationists reconstruct their sense of personal identity in the context of natural systems. As Thomashow explained at the time, such identity work highlights "the direct experience of nature as a framework for personal decisions, professional choices, political action, and spiritual inquiry." *Bringing the Biosphere Home* is an ambitious extension of this project, urging readers to continue widening their frames of identification—from narrowly defined selves out into local ecosystems, and outward from there toward the larger planetary processes that enable and shape our existence.



There are, of course, clear philosophical and epistemological challenges to identifying oneself with the planet's biosphere, and thus Thomashow insists that such a project must begin at the local level: "The more familiar you become with the place where you live," he explains, "the more you'll come to recognize the importance of the relationship between other places and your own." Developing such an ecological intimacy can encourage citizens of all ages to participate in observing and recording local evidence of large-scale environmental change—what Thomashow playfully calls "barefoot global change science."

Throughout the book, he models ways of "juxtaposing scale and perspective [in order to] learn how to explore the spatial and temporal dimensions of environmental change and therefore cultivate the ability to perceive the biosphere." Exercises on tracking thresholds, weather systems, and natural cycles are helpful, as is his chapter on "The Internet, the Interstate, and the Biosphere," which weighs the costs and benefits of our various "technologies of speed." Thomashow closes by considering how one might go about developing a biospheric curriculum, which likely assures this volume a place beside *Ecological Identity* on the bookshelves of environmental educators far and near. The author has demonstrated a knack for writing books that ground apparently abstract issues in the practice of applied learning.

But nearly as compelling as Thomashow's project of biospheric identification is the self-portrait taking shape between discussions of theory and pedagogy. For all of the memorable examples that illustrate his points, in the end what stands out is the striking image of a transplanted New Yorker weaving Buddhist mindfulness and Jewish mysticism into a deliberate act of inhabitation in the shadow of Mount Monadnock. It may be that the author's own practice of perceptual ecology has led to a more vivid and inviting narrative voice, or it may simply be that Thomashow has become more comfortable in the role of storyteller. Regardless, those glimpses of the author that enliven *Bringing the Biosphere Home*—seeing his first television as a child in Queens, wading the flooded road to his New Hampshire home, or searching his Jewish roots in order to fashion an ecological mitzvah—reveal a writer who is simultaneously more complex and approachable than the more reserved educator we met in *Ecological Identity*.

In the spirit of Abraham Heschel, Thomashow is on a daily quest to discover the radiant and abiding wonder in the world around him, taking as gospel Heschel's claim that "indifference to the sublime wonder of living is the root of sin." This is not to suggest that Thomashow ignores the calamities, past or present, that our species has inflicted on the biosphere. But he wishes to emphasize that wonder can lead to a sense of indebtedness, and ultimately to hope, and so finally his tone is celebratory: "Biospheric perception is the song of the soul learning to sing the earth's music, improvisational melodies and rhythms that you learn to sing in unison with your family, your people, your ecosystem and your planet," he writes. "Our task is to practice its music." ☾

Reviewed by **Laird Christensen,** *chair of the Department of English and Communications at Green Mountain College, an environmental liberal arts college in Poultney, Vermont.*

➤ LETTERS, FROM PAGE 7

movement has largely rejected our calls for diversification. Is there fear that alternatives would end designation of additional wilderness? The history suggests otherwise. The larger, looser designations have often facilitated the political process—allowing the designation of additional wilderness.

We agree that some alternatives have been too loose. None of the national conservation areas designated to date have banned road-building. But that could change, if we work together.

Twenty years ago, wilderness advocates told us bikes don't belong, but go ahead and enjoy the other public lands —and we did. Today, many wilderness advocates want to make those places into designated wilderness. This puts us on a collision course regarding 60 to 100 million acres of land that might become wilderness, or something else.

Bicyclists and the trails movement, with our person-power and our money, could be a big part of the effort to rewild North America. Or, we can devote our energies to defense against attacks on bicycling and trails.

Ever since John Muir, recreation has been a foundation of preservation. Mountain biking is non-polluting, health-inducing, spirit-enhancing, nature-based, and muscle-powered. If the conservation movement really wants to expand its base of support, we are the natural place to look.

Gary Sprung

Boulder, Colorado

Gary Sprung is Senior National Policy Advisor for the International Mountain Biking Association (IMBA).

AS AN AVID mountain biker and longtime wilderness advocate, I found your mountain biking and wilderness debate [Wild Earth Forum, spring 2003] insightful and thorough. Unfortunately it left me with more questions than answers. In the end I couldn't reason whether mountain bikers would make powerful allies in preserving wilderness. So this summer I conducted a brief, and admittedly unscientific, survey of my mountain biking friends and acquaintances. When riding on local trails in the Taconics and Berkshires I would bring up the issue of mountain biking and wilderness while regrouping at trail junctions and at the trailheads after rides.

My findings were inconclusive, but interesting. All of the trail riders I know are in favor of wilderness generally, and most seem to support wilderness expansion. Free riders and downhillers, however, care little about wilderness. Specifically mention the topic of creating new wilderness areas on public lands where riding is now legal, and the number of those in favor quickly dropped off to precious few. These are all good people mind you. They are courteous on the trail to all users, and most do volunteer trail work locally to fix problems and avoid erosion where possible. But most want to be able to ride on any public land. They don't see a problem with mountain bikes even in designated wilderness areas.

It seems that bikers, like other trail users, just want what we want. The most telling point of my brief survey was the issue of how we became mountain bikers. Those of us who came to mountain biking through hiking and backpacking were more receptive to the idea of wilderness preservation at the expense of riding on those trails. Those mountain bikers who were or still are road riders seemed less than supportive of new wilderness designation.

To answer the question, Would mountain bikers make good allies in preserving wilderness? I must say—probably not. The next question then is, How can the conservation community best utilize people like me, the wilderness allies it *does* have in the mountain biking community?

Jason Kahn

Spencertown, New York

TOM BUTLER is very eloquent on the difference bikers will make in restricted wilderness areas [A Wilderness View: "What Bears Want," spring 2003], but when he's done trying to explain the difference he is getting a bit petty. The fact that I can travel through a landscape quicker than a hiker is a moot point; I'm there because I can move at a safe but continuous pace.

I'm an old biker, over 50 years old, and I love wilderness biking. I also respect my surroundings when I'm in wild country. Those trails that hug the cliffs where moss clings delicately, areas off trail, or where the ferns and bracken block access to streams, require a little respect so I walk through. This can be achieved by placing deadfall or other natural barriers to limit or redirect riders.

As a member of the International Mountain Biking Association, I hope my participation will encourage other bikers to get out there and enjoy the outdoors. It only takes one slob to ruin the reputation of any pursuit whether it's hiking, canoeing, camping, or biking.

Let's look at the big picture: we need to stick together, and I know we can work out the details later.

David Michael Lee

Sussex, New Brunswick, Canada

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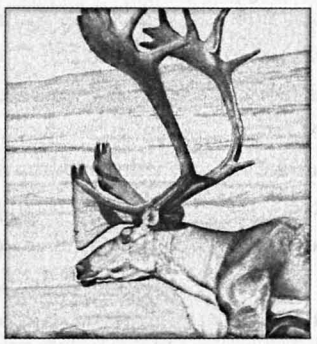

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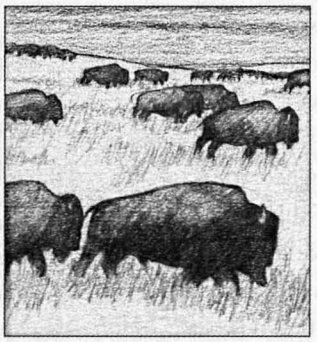

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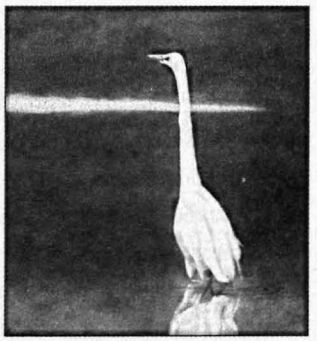

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BACK ISSUES

Thirty-two back issues are available, beginning with our spring 1991 edition. For a more complete listing, visit www.wildlandsproject.org. Order online or use the reply form insert in this issue. See form for additional publications.

Summer/Fall 2003 • ***Facing the Serpent*** Dave Foreman on the Dark Side of American Populism, Are Rednecks the Unsung Heroes of Ecosystem Management? asks Francis Putz, Serpents as the Ultimate Other by Eileen Crist, Harry Greene on Appreciating Rattlesnakes, Another Dead Diamondback by Reed Noss, Snaketime by Charles Bowden, Ted Levin on mosquitoes in Florida, Paul Ehrlich interview, Curt Meine on Conservation and the Progressive Movement, Highlands Nature Sanctuary in Ohio

Spring 2003 • Dave Foreman on the Agencies' Refusal to Control Wheels, Forum on Mountain Biking in Wilderness, viewpoints on Wild Time and Human Cultural Agency in Extinction, Howie Wolke on our Wilderness System Under Siege, Borderland by Janisse Ray, a Conversation with Jeff Fair on Loons and Language, Shark-Eating Men by Richard Ellis, Florida Scrub, John Elder on George Perkins Marsh and the Headwaters of Conservation, Limits-to-Growth and the Biodiversity Crisis, Stephanie Mills reviews Ray Dasmann's autobiography

Winter 2002–2003 • ***Freedom of the Seas*** Carl Safina on Launching a Sea Ethic, viewpoints on declining world fisheries, interview with Sylvia Earle, From Killer Whales to Kelp by James Estes, Restoring Southern California's Kelp Forests, Bottom Trawls Bulldoze Seafloor Habitat, Life in the Darkness of Monterey Canyon, Field Talk on endangered right whales, Conserving the Sea Using Lessons from the Land, Using the ESA to Protect Imperiled Marine Wildlife, marine protected areas in Oregon, Marine Protected Areas Strategies for Nova Scotia

Fall 2002 • Dave Foreman on overpopulation, Paul Hawken on Commerce and Wilderness, Jay Kardan on literary conservationists, John Elder descends into Darkness and Memory, interview with Mike Fay, John Terborgh asks whether the "working" forest works for biodiversity, Steve Stringham pleas for real science in grizzly recovery efforts, Lyanda Haupt encounters a One-Eyed Dunlin, Conserving Wildlands in Mexico, Benton MacKaye's Progressive Vision, Gary Nabhan's satire on bioregional infidels

Summer 2002 • ***Deep Time*** Foreman on Paul Shepard, John McPhee helps us find our bearings, Evolution's Second Chance by David Burney et al., Connie Barlow says goodbye to the eternal frontier, Reuniting Pangaea by Yvonne Baskin, Jeff Bickart on Reclamation, Paul Shepard essay; Theodore Roszak on ecopsychology, Terrence Frest on native snails, Kathleen Dean Moore essay, Dean Bennett tells the story of Maine's Allagash Wilderness Waterway, a proposal for Pennsylvania's Allegheny National Forest, forum on federal recreation fees

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PUBLICATIONS

ATVs in the Adirondacks Noting a dramatic jump in all-terrain vehicle sales and activity in the Adirondacks, the Wildlife Conservation Society has released a 73-page working paper assessing ecological issues and management options for ATVs—both in the park and nationally. *All-Terrain Vehicles in the Adirondacks* was prepared by Leslie Karasin, and is available from WCS, 718-220-1442, www.wcs.org/science.

Nitrogen Report New studies, led by the Hubbard Brook Research Foundation, pinpoint the major causes of nitrogen pollution in forests and coastal waters of the Northeast. An excellent 24-page report, *Nitrogen Pollution: From the Sources to the Sea,* summarizes these findings with a range of maps and recommendations. The report can be ordered at www.hubbardbrook.org, and the scientific study that it is based on can be viewed at www.aibs.org/bioscienceonline.

Old Growth Survey A revised edition of *Old Growth in the East: A Survey* by Mary Byrd Davis identifies old growth—defined as "forest, woodland, or savanna that looks largely as it would appear had not Europeans settled North America and that has experienced little or no direct disruption by EuroAmericans"—from the Atlantic coast of the United States to western Minnesota and south through eastern Texas. The revised edition updates descriptions and includes old growth identified since the 1993 edition. More information is available at www.old-growth.org/book.html.

GATHERINGS

Environment and Community Conference Topics at the 14th North American Interdisciplinary Conference on Environment and Community, February 19–21, 2004, in Saratoga Springs, New York, will range from wilderness to urban environmental issues, endangered species to ecofeminism. Speakers include Bill McKibben, Amy Vedder, and Holmes Rolston III. The conference is being held in the northeastern United States for the first time. Contact Wayne Ouderkirk or Elaine Handley at Empire State College, 518-255-5320 or 518-587-2100 x386.

Prairie Conference The seventh Prairie Conservation and Endangered Species Conference in Calgary, Alberta, February 26–29, 2004, takes the theme "Keeping the Wild in the West." Held every three years, the conference draws participants from the conservation community, First Nations, energy industry, government agencies, municipalities, and agricultural interests. Visit http://pcesc.albertawilderness.ca/ for more information.

Bird Conference Every four years, BirdLife International organizes its World Conservation Conference and Global Partnership Meeting; this round will take place March 7–13, 2004, in Durban, South Africa. The goal is to unite their international bird conservation network and focus on high-priority international conservation needs. For more information, visit www.turners.co.za/bird2004.

Desert Conference "Connecting Mountain Islands and Desert Seas" is the theme for the Biodiversity and Management of the Madrean Archipelago II meeting, May 11–15, 2004, in Tucson, Arizona. (This meeting is also the Fifth Conference on Research and Management in the Southwestern Deserts.) Sponsors include the Arizona-Sonora Desert Museum, Sky Island Alliance, USDA Forest Service, and the Nature Conservancy among others. Contact Gerald Gottfried, ggottfried@fs.fed.us, 602-225-5357, or David Hodges, dhodges@skyislandalliance.org, 520-624-7080.

SCB Meeting The 18th Society for Conservation Biology Annual Meeting, July 30–August 2, will be hosted by the Center for Environmental Research and Conservation (CERC) at Columbia University in New York City. Noting that this year, for the first time in history, more of the world's population lives in urban rather than non-urban settings, the conference theme is "Conservation in an Urbanizing World." For more information, contact 2004@conservationbiology.org or visit www.conbio.org/2004.

THERE IS ONLY one place in eastern North America where the predatory tensions of a large solitary cat affect populations of deer and other large mammals: the subtropical landscape of south Florida. Decimated by habitat loss and persecution, less than 100 Florida panthers (*Puma concolor coryi*) remain in the wild, the last population of eastern cougars (a.k.a. puma, mountain lion, painter, screamer, and catamount) that once ranged from Florida to Labrador. They have the size (70–150 lbs.) and general appearance of a cougar from the desert southwest.

As in other parts of its range, the panther is a deer specialist. Unlike white-tailed deer in the suburbs of New Jersey or cornfields of Ohio, their cousins in the Big Cypress Swamp must be on constant guard against a tawny flash of claws and teeth. Deer in the steamy swamps and flatwoods of this region select habitats in ways that minimize the risk of ambush—many choose open marshes where less stalking cover can conceal a panther (of course, this choice increases the risk of death by alligator). Adult panthers survive by killing about one deer each week.

Unfortunately, the ecological and evolutionary complexities of predator-prey relations seem simple next to the political realities of recovering an endangered carnivore in one of the country's fastest growing regions. Surrounded by development and saltwater, panther range has been dangerously constrained; cougars from Texas were introduced in 1995 to combat inevitable genetic erosion caused by this profound isolation. Individual panther home ranges can exceed 400 square miles, and they live at naturally low densities. Lately, some individuals have even made their way as far north as Orlando.

Species Spotlight

Swamp Cat illustration by Jim Wilson

Florida Panther

KINGDOM	Animalia
PHYLUM	Chordata
CLASS	Mammalia
ORDER	Carnivora
FAMILY	Felidae
GENUS	Puma
SPECIES	concolor
SUBSPECIES	coryi

CONSERVATION STATUS
federally listed as endangered in 1967

Long-term recovery of such a small population must address genetic needs and the challenge of dwindling space. Land conservation is key. Small steps forward were creation of the 26,000-acre Florida Panther National Wildlife Refuge in 1989, and more recently the 70,000-acre Picayune Strand State Forest; 5–11 cats use these areas in a given month. At least for now, the imperiled panther remains a powerful force in Nature and politics. ☾

Text by **David S. Maehr,** *associate professor of conservation biology at the University of Kentucky and author of* The Florida Panther: Life and Death of a Vanishing Carnivore *(1997). He has been involved in Florida panther research and recovery since 1985. A professional wildlife artist for over 30 years, Floridian* **Jim Wilson** *spends much of his time researching his subjects; he gathers reference material from field work, museums, zoos, veterinary hospitals, and rehabilitation facilities. This detailed drawing was created in pen-and-ink with colored pencil.*

ROOM *to* ROAM

Saving Wildlife Linkages Along the Spine of the Continent

Together with partners up and down the Rocky Mountains, the Wildlands Project has identified five areas important for wildlife movement—and at risk of being lost.

We're now working on the ground with local communities, conservation organizations, private landowners, and government agencies to protect these "endangered linkages." Keeping connections across the landscape not only makes space for beetles and birds—it gives wolves a fighting chance.

Wildlife needs room to roam. To learn more about the campaign and what you can do to help, visit **www.wildlandsproject.org/roomtoroam**

WILDLANDS PROJECT

PHOTOS top: George Wuerthner; wolf: Dave Parsons; sage grouse: WY Fish & Game

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