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Suggested citation: Butler, Tom, ed., *Wild Earth* 13, no. 1 (Spring 2003).
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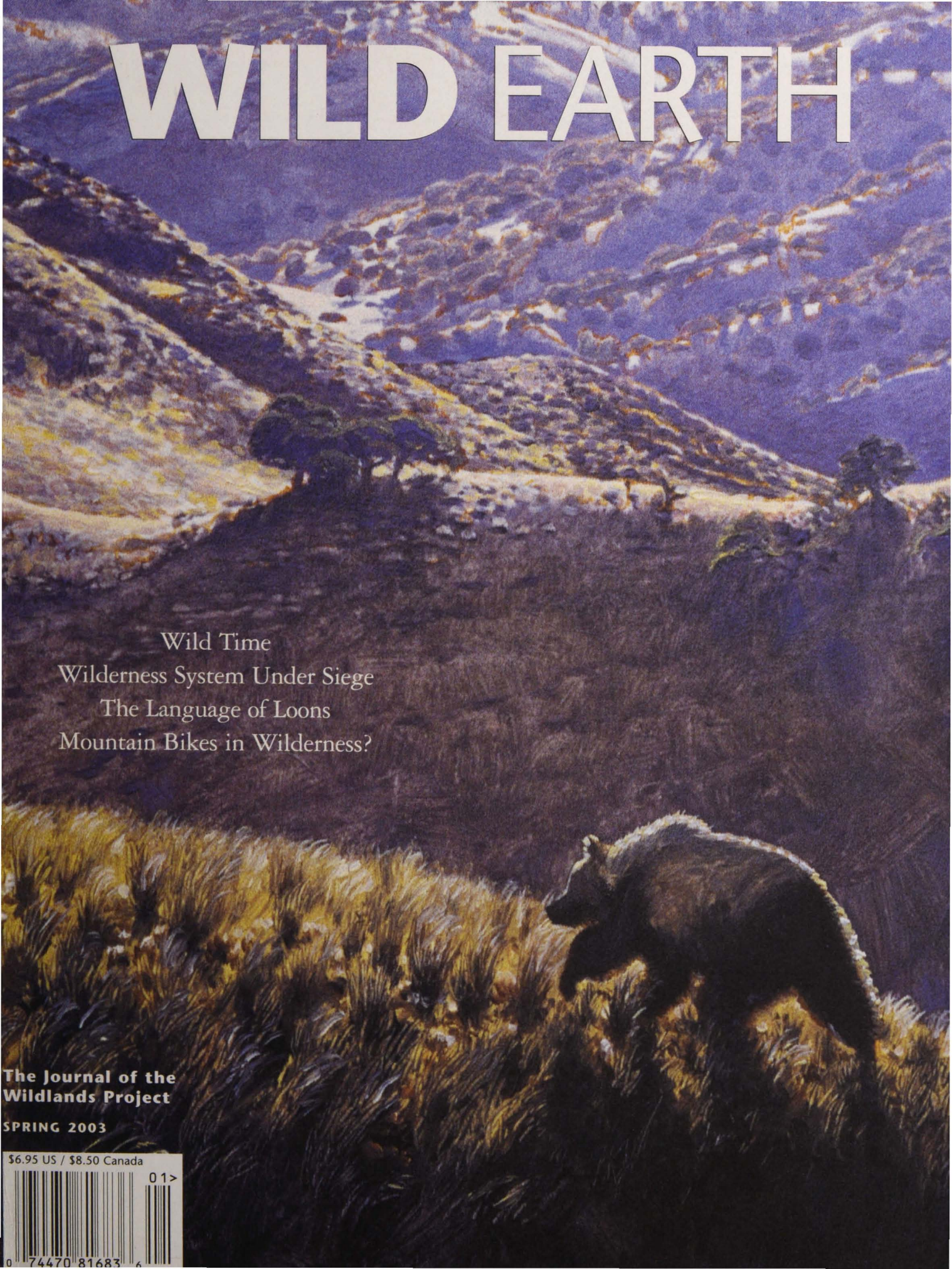
WILD EARTH



Wild Time
Wilderness System Under Siege
The Language of Loons
Mountain Bikes in Wilderness?

The Journal of the Wildlands Project

SPRING 2003

$6.95 US / $8.50 Canada

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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.

WILD EARTH

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Wild Earth (ISSN 1055-1166) is published quarterly by the Wildlands Project, a nonprofit educational, scientific, and charitable corporation. • Periodicals postage paid at Richmond, VT and additional offices. Postmaster: Send address changes to *Wild Earth*, P.O. Box 455, Richmond, VT 05477.

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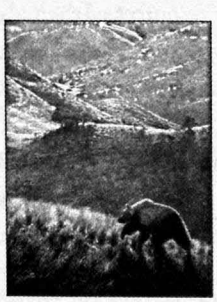
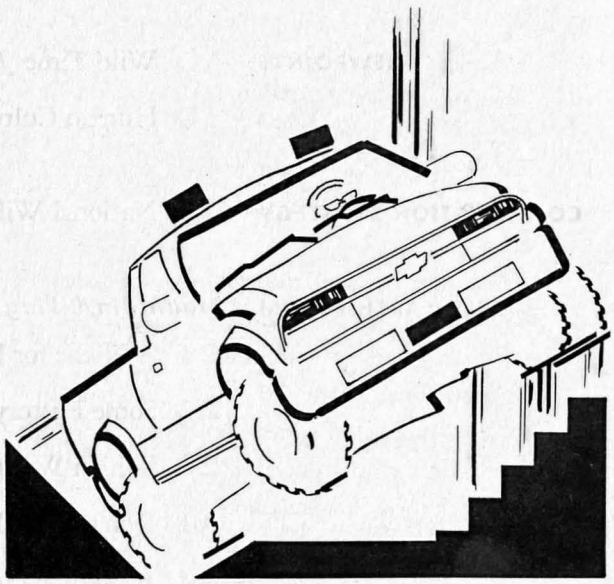


ON THE COVER
"California Grizzly on Hills" (detail), oil on paper by Laura Cunningham, ©1997



pen-and-ink by Valerie Cohen

A Brief History of the Federal Land Managing Agencies' Refusal to Control Wheels

IN THIS ISSUE OF *Wild Earth,* we offer contrasting views on mountain bikes in wilderness areas. It would be worth our while to backtrack the historical trail to look at the larger issue of wheels in wilderness—in particular at the federal land managing agencies' historic failure to control off-road vehicles.

Paul Sutter clearly shows in *Driven Wild* that the wilderness area movement after World War I came about because of the invasion of the national forests by automobiles.[1] Back in 1979, historian Susan Flader made the same point. From 1919 to 1923, Aldo Leopold was Chief of Operations for the Forest Service in the Southwest. Part of that job was overseeing roads. Based on his on-the-ground knowledge of how roads and automobiles were invading the backcountry, he developed his proposal for a Gila Wilderness Area. He asked:

> Who wants to stalk his buck to the music of a motor? Or track his turkey on the trail of the knobby tread? Who that is called to the high hills for a real *pasear* wants to wrangle his packs along a gravelled highway? Yet that is what we are headed for, at least in the Southwest. Car sign in every canyon, car dust on every bush, a parking ground at every waterhole, and Fords on a thousand hills![2]

In the 1970s, the Forest Service and Bureau of Land Management worked hard to limit wilderness designation to as few areas as possible. Closely tied to the agencies' opposition to wilderness areas was their refusal to restrict damaging motorized recreation, which was then beginning to boom with the wider availability of four-wheel-drive vehicles and the invention of dirt bikes. In 1971, President Richard Nixon ordered the federal land managing agencies to survey their lands and formally close or open them for off-road vehicle (ORV) use. Off-road vehicle areas and routes were to be "located to minimize damage to soil, watershed, vegetation, or other resources of the public lands...to minimize harassment of wildlife or significant disruption of wildlife habitats...[and] to minimize conflicts [with] other...recreational uses...."[3] The agencies did their level best to ignore Nixon's ORV executive order.

For example, the Forest Service's ORV issue paper in 1974 stated that "The question should not be, should we close an area to ORV use? but—can ORV use, in some form, be permitted on the area?"[4] The Bureau of Land Management held similar views in direct conflict with the spirit of the executive order.

Opposed as they were to the executive order, the agencies did conduct studies—slip-shod at best—to assess the ecological effects of motorized recreation. In a report for the President's Council on Environmental Quality (CEQ), David Sheridan quoted Dr. Howard Wilshire of the U.S. Geological Survey, the acknowledged scientific expert on the damage done to wildlands by ORVs. After studying 62 Forest Service environmental analyses of ORV plans, Wilshire found that 60 of them were "virtually worthless when it comes to assessing the impact of ORV use on soils due to their lack of specific criteria and data."[5]

In April 1974, the BLM issued regulations leaving its lands open to ORV use until open or closed designations were made. However, in direct violation of the executive order, BLM did not "set a date for completing the designation of its lands."[6] The National Wildlife Federation sued the BLM, and Federal District Judge William B. Jones found the agency in violation of the executive order. Even after this judgment, the Bureau of Land Management continued to evade its responsibilities.[7]

The Council on Environmental Quality prepared draft language to strengthen the executive order in March 1977, after Jimmy Carter became president. It suggested that public lands be closed to ORVs "except areas and trails which are suitable and specifically designated as open." After the CEQ issue paper went out to federal agencies, it was leaked to motorcycle groups, who bellowed to their members that ORVs were going to be banned from federal lands. This was a lie; indeed, it was a knowing lie. It was also a hugely successful ploy.

Unfortunately, conservationists were asleep, while the motorcyclists and snowmobilers were wide awake. The federal government was deluged with opposition. Of the 80,000 letters and telegrams received, 78,000 supported wide-open ORV use on the public lands. Carter issued watered-down Executive Order 11989, adding a new section to Nixon's order that nonetheless directed federal agencies to immediately close areas if they determined that "the use of off-road vehicles will cause or is causing considerable adverse effects on the soil, vegetation, wildlife, wildlife habitat or cultural or historic resources." It also authorized agency heads "to adopt the policy that portions of the public lands...shall be closed to use by off-road vehicles except those areas or trails which are suitable and specifically designated as open."[8]

However, Secretary of the Interior Cecil Andrus quickly sandbagged any meaningful implementation of the new ORV executive order, sending a signal of capitulation to motorheads in a Department of Interior news release.[9]

Agency managers generally threw their lands wide open to dirt bikes, four-wheel-drive rigs, and snowmobiles, and designated few areas as closed. In his detailed study of ORV management for CEQ, David Sheridan wrote, "The Interior and Forest Service's reluctance to apply the available facts [numerous scientific studies quantifying ORV damage] may arise in part at least from a reluctance to take actions which are necessary to protect public resources but would cause all manner of political headaches."[10]

As the southwestern representative for the Wilderness Society in the 1970s, I worked my butt off to get national forests and BLM districts to allow ORV use *only* on routes and in areas specifically open. I could not understand why Forest Service and BLM staff resisted following the executive orders. Not controlling off-road vehicles caused erosion, created management chaos, harmed wildlife, and led to conflict between hikers and dirt bikers (and between grazing permittees and dirt bikers). Following the orders, it seemed to me, was not only good management, but would relieve headaches for the managers (after the initial fight with the motorcycle and snowmobile lobby).

It was only later that I realized the reason agency managers did not follow orders was because they—as individuals—were four-wheelers, dirt bikers, and snowmobilers themselves. Few Forest Service or BLM line officers were ever hikers or backpackers, but, until the 1970s, many had been wilderness horsepackers. The new generation of managers in the 1970s was not even that. They liked dirt bikes and Jeeps. I should not have been surprised. As I've written before in this column, the ideology of resourcism is driven to tame self-willed land (wilderness) and bring it under human will. By its very nature, driving a vehicle off-road roars of domination, whereas walking whispers humbleness.

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A primary job of conservation is to protect wildlands from whatever threatens a parcel's existing level of integrity.

HOWIE WOLKE, writing in this issue

What Bears Want

SOME MONTHS AGO I spent a glorious autumn weekend exploring a wilderness not far from my home in Vermont. Like many eastern wilderness areas, it is relatively small (about 46,000 acres), and recovering well from historical logging and mining operations. A friend and I shouldered packs and hiked several miles toward a remote lake at the base of the wilderness area's namesake mountain. After a few hours of hiking, we reached the shoreline. There, on a rocky spit jutting into the lapping waters, was another wilderness traveler, sitting alone, enjoying the beauty of the scene.

We stopped and chatted amiably. Wasn't the day lovely? He agreed it was. Had he heard loons? He had. What was his route? He'd come from the south and would be making a loop over the mountain and out to another trailhead that afternoon. Was he aware that he was in the heart of a designated wilderness area, where the bicycle at his feet was prohibited? Here, the conversation grew more wary; the biker feigned ignorance. We suggested that he be more careful where he rode, noting that the surrounding region contained hundreds of thousands of acres of non-wilderness public land where mountain biking is allowed. He listened politely enough, and we went off to find a campsite for the night.

To be sure, my companion and I would have been far angrier to find the fellow astride a dirt bike or ATV, throwing mud. Illegal (and legal) off-road vehicle use is indeed a large and growing problem throughout North America, and the direct impacts caused by mountain biking pale in comparison. But the biker's disregard for wilderness convention was still annoying, and the next day, when we followed his route and climbed the nearby mountain I was peeved again. The trail was steep, ascending to a rocky summit with sublime views and fragile vegetation. My doughy middle-aged frame could never have pedaled a bike over it, but my anger didn't spring from envy of the biker's steely quadriceps. I simply thought—this is no place for a bike.

front cover detail by Laura Cunningham

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Wild Earth is available on microfilm from University Microfilms, Inc., 300 North Zeeb Rd., Ann Arbor, Michigan 48106-1346. Statistical abstracting by Pierien Press, P.O. Box 1808, Ann Arbor, MI 48106. • Articles appearing in *Wild Earth* are indexed in Environment Abstracts, Environmental Periodicals Bibliography, The Alternative Press Index and Wildlife Review Abstracts. • Newsstand circulation through BigTop Newsstand Services (415-643-0161). • *Wild Earth* is printed at Cummings Printing, Hooksett, NH on New Leaf Everest 80# cover and New Leaf Eco-offset 60# text, both 100% post-consumer and processed chlorine-free. • Member, Independent Press Association

BUT *WHY* DID I think so? Am I a snobby hiker? Was the biker doing any more damage to the trail network than our feet? Was my attitude a vestige of historically accepted wilderness recreation that needs updating for the modern era? Or are there good reasons—historical, ecological, and ethical—to oppose mechanized intrusion into Nature's last strongholds?

I've been thinking about these questions as we put together this *Wild Earth*'s expanded forum on mountain biking and wilderness, which begins on page 20. Every group of conservationists working to see wilderness legislation introduced or passed by Congress must now factor the mountain biking community into the political equation. With bikers organizing to oppose some new wilderness designations in California and elsewhere, the conservation community is faced with the vexing issue of how to accommodate a growing recreational constituency without compromising the wild places we love.

Would opening designated wilderness areas to biking exacerbate the "creeping degradation" of the National Wilderness Preservation System that Howie Wolke decries in this issue? Or would the wilderness movement, swelled by millions of mountain bikers, stimulate Congress to designate vast new swaths of wilderness on federal public lands? The latter argument is argued cogently herein by Jim Hasenauer, a longtime board member of the International Mountain Biking Association. Conservation strategist Andy Kerr expands on this point, dissects the political options, and suggests that wilderness advocates should fully embrace cyclists in an expanded wilderness movement, propelled by muscle-powered recreationists.

Deeply immersed in conservation realpolitik, Kerr's argument is, essentially: Congress designates wilderness. Congress responds to constituent pressure. Mountain bikers, who are truly wilderness lovers at heart, are a huge potential constituency to support—or oppose—wilderness. Thus the wilderness movement (and wilderness areas) should accommodate them. (This line of reasoning adopts the Bush doctrine that "either you are with us, or you are with the terrorists," although in this case the "terrorists" are the off-road vehicle enthusiasts, clear-cutters, and miners who would terrorize wildlife and degrade the ecological health of America's public lands.)

Other commentators in the forum take a more skeptical and arguably more traditional view of what constitutes appropriate wilderness recreation. There is far from consensus on how wilderness advocates should approach the opportunity—or threat—embodied in the mountain biking lobby. *Wild Earth*'s role, of course, is to help foster spirited, respectful debate. We have tried to present a balanced spectrum of views and hope conservationists of all stripes will read them with an open mind—and then keep talking.

I've certainly tried to keep an open mind, although admit to being skeptical about just how actively the mountain biking community will work for new wilderness designations. Moreover, I'm dubious of Andy Kerr's assertion that "no case [against biking] has been made on ecological grounds." Really? Opening the

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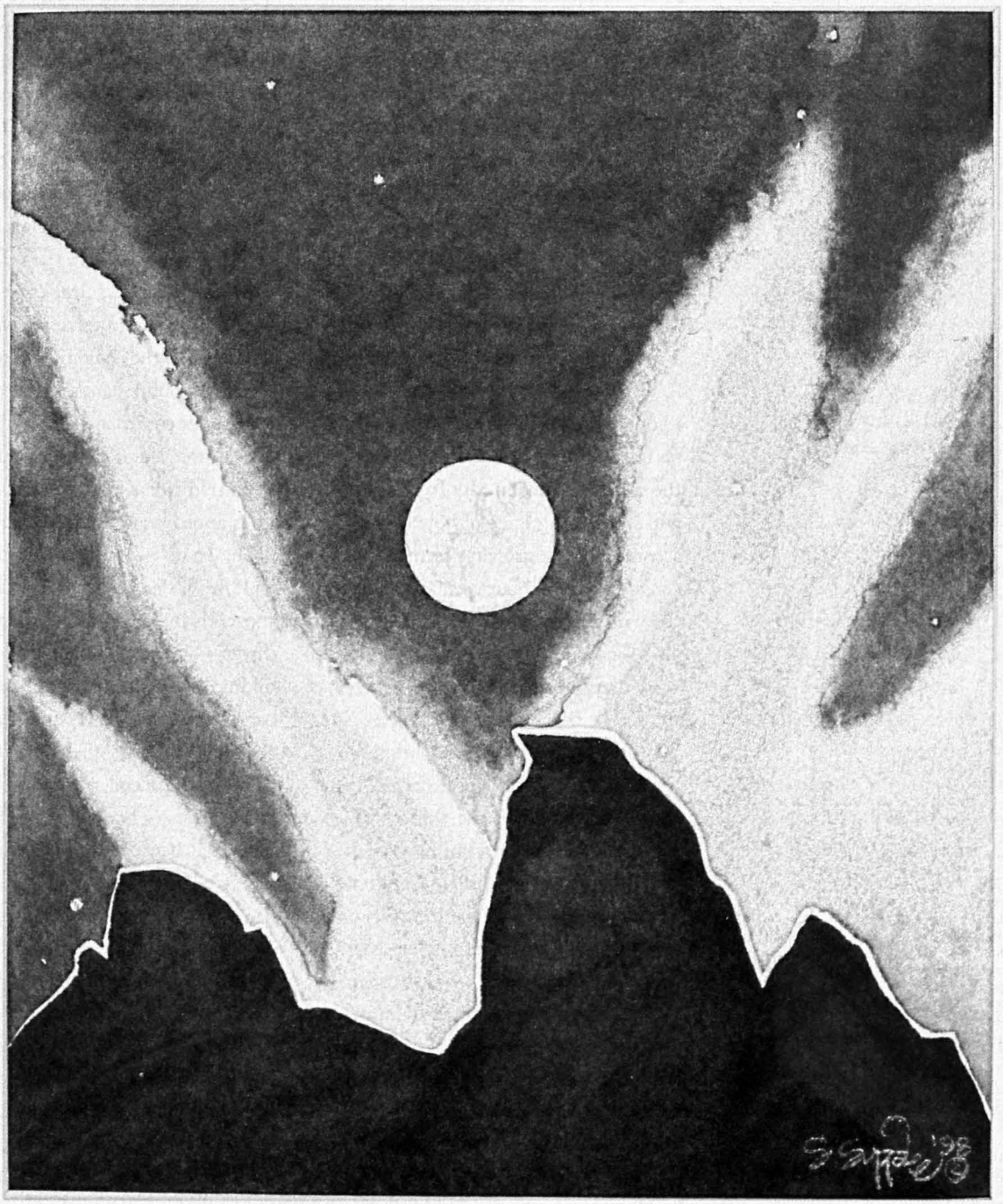
Wild Time

by Jay Griffiths



watercolor by Serena Supplee

THERE IS CLOCKLESSNESS, for sure, but no such thing as "timelessness." The wilderness is full of the phases of *time itself,* its qualities, its changes, its bear births, eagle marriages, and salmon deaths. It isn't Western time, but a wild and untamed time—and perhaps just as wilderness describes this land, so "wildertime" or "wild time" could describe time here.

I left Juneau to go into the Taku, one of the world's great wildernesses; four and a half million acres of wild land and four and a half million years of wild time. We rafted down the Taku River watershed—three rivers, the Sheslay, Inklin, and Taku Rivers, running 280 kilometers through British Columbia and Alaska—and I am writing this now, seven days later, from a valleyside high above the Inklin. On the opposite valley, a half-mile swath of spruce has been felled, scattered like matchsticks by a brief and petulant tornado. I sit writing this on a dead-straight fallen aspen tree, silver, softened by ice and searing sun, softened so its bark is a silver pelt, polished, smooth as silence.

In the raft-days behind me were volcanic peaks echoing with thunder; grassy pastures zipping with cicadas; pastures where roses, sage, alpine strawberries, and juniper, with foggy-purple berries and a smell of sweet extravagance, bloomed; and the river ran through box-canyons of gargantuan Homeric water which hurls rafts against cliffs and sucks them round whirlpools. In the raft-days ahead will come the mystery of a massive limestone mountain with underground streams; a 1600-foot waterfall that runs so fast and falls so slow; and finally the ancient glaciers, place of blue ice and—inexplicably—*ladybugs*. (As red and as evanescent as ladybugs are poppies, and they too can bloom along the ice foot of glaciers.) Here, across the valley, is a vast, curving, unimpeded parabola of a world, in uninterrupted flow.

What is wilderness? Nature without Audience. That which describes itself, but which is unnamed by man. The British poet Robert Service wrote of the neighboring Yukon province:

> There's a land where the mountains are nameless,
> And the rivers all run god knows where.

The act of naming is an act of taming and in the Taku some rivers and mountains are named, some not. Some have Western names, some Tlingit, and the difference between them is telling. The Western names include Mount Lester Jones, or Wright Peaks. Tlingit names include The Sleeping Giants, and Taku itself is the onomatopoeic representation of "where the swans or geese touch down to land."

AS AN UNNAMED PLACE is an untamed place, so an unnamed time is a wild time. The Taku is a wild river and, as rivers by almost universal analogy represent time, a *wild* river is a perfect setting for *wild* time. Things happen here, it is far from uneventful, but the trees torn up and tossed to the river-bank are unregistered and unrecorded. A whole forest falls without anyone ascribing a date. Entire cliffs fold their stone robes and slide into rivers without anyone clocking the time it happened.

As an English woman too confined in a tame and long-enclosed land, I have for years wondered what it feels like to be in a wilderness. Wilderness is a ferocious intoxication which sweeps over your senses with rinsing vitality, leaving you stripped to the vivid, your senses rubbed until they shine. It is an untouched place which touches you deeply and its aftermath—when landscape becomes innerscape—leaves you elated, awed, and changed utterly. Forget the lullaby balm of Nature tame as a well-fed lawn, here Nature has a lean and violent *waking* grandeur which will not let you sleep. Cultural synonyms for wilderness in dictionaries and thesauruses list: waste, space, useless, barren, virgin land, and seclusion. These are perniciously inaccurate. It is an aphrodisiac; it is a place of furious fecundity; not one of waste empty space, but of such ripe fullness that not four and a half million acres will contain it; not a place of seclusion but of rough engagement; not virginal, but erupting with the unenclosable passion at the volcanic heart of life.

But perhaps there is a reason for the mismatch between my perception and that of the editors of the *Oxford English Dictionary* and *Roget's Thesaurus*. Theirs is a once-correct, but now antique, conception, reporting back from a disappeared world. For, in the past, "wilderness" was something huge and vast that surrounded humanity. Wilderness was the Condition of the world within which mankind lived in perplexed pockets, plotting our little patches of garden plots hard by the great forests of wilderness. But then the human race gigantized in development, exploded in population across the world so that, past a critical point, wilderness and mankind changed places. It is now something *we* surround; there are pitiful pockets of wilderness dotted across the world; wilderness is now the Exception, and mankind the Condition of landscape.

To me, this is a model for our relationship with time: for, once, humans were surrounded by wild time and the stretch of time was everlasting, undefined, unenclosed, unnamed, uncharted, a mystery lasting longer in all directions than even the longest evening which never ends here in the land of the midnight light, and into this eternity mankind was dotted,

pitiful with our perplexed pocket watches and our brief lives, plotting our little watches of hours hard by the great eternities of wild time. Then we began to chart time, to clock it, plot it, measure and mark it, buy and sell it. As wilderness and humanity changed places, so too have wild time and mankind now swapped positions. Past a critical moment of moment-measuring, Western society's peculiar time-marking has become standard, a norm; the Western clock the Condition of time and wild time the Exception.

WILD LAND AND WILD TIME were both charted, logged, and discovered with the aid of theodolites, chronometers, and telescopes; inventions all made, incidentally, in the same period of history; objects of finding in an unfoundland, inventions designed to find and log an unfoundtime. "Logging" is a heavy word today, its meanings are many; to log is "to find and make inventory" and "to fell forests." Once it possessed such resonance of security in a pitiless world (a log cabin and a log fire), but it has now, past our critical moment, picked up the overtones of pitilessness itself, as rainforests are logged and wildernesses brought to their knees. The Taku is threatened by this. A mining company, formerly called Redfern Resources, now Redcorp Ventures Ltd., wishes to build a road across the wilderness to truck out copper ore, and logging companies are stampeding to negotiate the use of the road to log—in all senses—the Taku; both to find and make inventory, and to fell its forests; to find the land and to lose it at a stroke. Logging has become a threat to wilderness rather than a security from it. Likewise, roads and tracks, once paths of safety across a hostile world are, past a critical point of development, themselves a threat. As literal tracks, paths, and roads shrink remaining wilderness, so similarly clocks make endless tracks across hours, shrinking wild time. Robert Marshall wrote passionately against proposals for roads in undeveloped areas in order to preserve a "certain precious value of the timeless, the mysterious, and the primordial...in a world overrun by split-second schedules...."

Would you look at a river and say it was running out? Rivers don't run out—that's the point of rivers. The running of rivers was a definition of eternity to the Indians of the Six Nations federation. When the English first arrived in Pennsylvania, people from the Six Nations met them with meat, food, and animal hides. The people made a treaty with William Penn, promising their friendship "as long as the Sun should shine, or the Waters run in the Rivers." Today, time *is* spoken of as running out, and for all the familiarity of the expression, it betrays an ugly, strange attitude that, for the sake of modernity's exploitative money-making, time may be considered a finite thing.

Here by the Taku, time and the river are running out, for the government of British Columbia in 1998 rushed through approval for the road. (In June 2000, the BC Supreme Court ruled to halt the project, but it could still go ahead as both the province and Redcorp are appealing the judgement [see sidebar for update].) Ian Kean, a Canadian who has led a campaign against the road, says, "I've got a sense of urgency. In 10 years' time, there's not going to be a river like this to protect." The Tlingit peoples, with a riverine respect for time and for the Taku, made a poignant statement of their potential loss, describing the "premature" and "speedy" attitude of the white rulers who "fast-tracked" the project, and speaking of the "regulated timeline" for decisions that will rob "future generations" of Tlingits of their river right. The Tlingits, who have lived here for hundreds of years, were given 48 hours to respond to the decision. What is 48 hours to a river?

IN WILDERNESS, time is as diverse as the play of light across a year of landscape. Just as the human need for wilderness becomes more acute with increasing development and a cockroaching population, so our need for wild time gets greater as the encroaching clock shunts its way across the mind. If we lose wilderness we lose the visible picture of wild time; the future will never know the time of snow and fire, time which thinks in grandeur like an ancient tree, which moves in passages of stature like a mountain, which knows the long white wait of a waterfall, running so fast and falling so slowly.

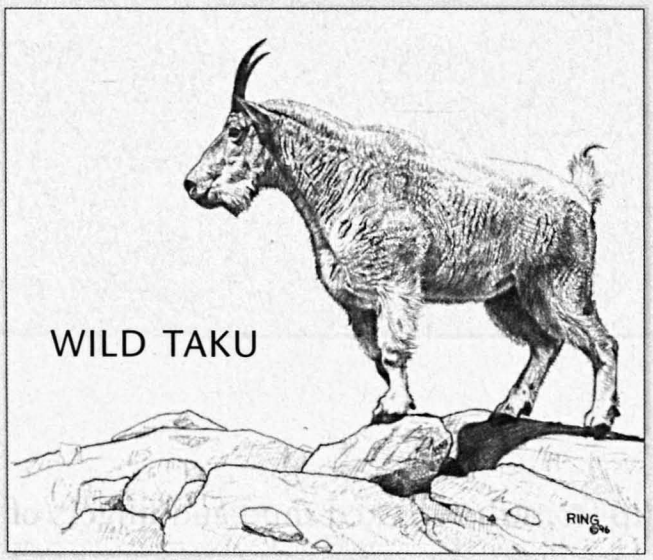
Here, the Taku is one of the most seasonally time-full places on Earth; in winter all bear-den-dark, while in summer the light stretches itself thin over the top of midnight so you cannot tell if it is the end of the longest of sunfalls or the beginning of the longest of sunrises. In the Taku, you can know the dredge of a primeval age enduring, or the sheer shine of liquid instantaneity in a salmon's leap. Here, time has a variety no clock will ever know or mark, where an eagle's veering flight puts time on pause as it unfurls to hover before you, wind made majestic, time held in a scroll of wings.

Nothing lolls like a bear can loll; here bears on the mooch snuffle huckleberries. Nothing moves quicker than the flash of claw in water as a bear catches fish in its paws. Nothing can compete for the sheer diversity of time; here a five-minute tornado can fell a forest and a scamp of a sudden current can skim a log a mile downriver. And then time can

stop on a glacier, leaving the signature of 10,000 years ago to last 10,000 years, written in the sheets of ice of an ancient frozen river, running now at the speed of never. From that glacial time, massive—macro—time you move to the minute—micro—time; in the insect world, an hour is like a season, and a season like a generation.

Red is, symbolically, the color of mortality; blood of life and of death: blue, the color of eternity. Here in this time-diversity, they are found side by side. The blue of a glacier, the red of a ladybug. Nothing is older than the blue glacier, 10,000 years in the making, 10,000 years in the unmelting. Nothing is younger than the bright red button of a ladybug hatched at the beginning of this sentence: here is the chasmic grandeur of wild time—a ladybug's little red-letter day tickling for a minute the glacial blue ice of eternity. ☾

Writer **Jay Griffiths'** *work has appeared in periodicals such as the* London Review of Books, The Guardian, The Ecologist, *and* Resurgence. *She lives in Wales, and is presently working on a book about wilderness. This essay is adapted from the final chapter of her new book* A Sideways Look at Time *(2002) and is used by permission of Jeremy P. Tarcher/Putnam.*



mountain goat, graphite by Martin Ring

After eight years of struggle by conservationists and the Taku River Tlingit First Nation, the majestic and wild Taku watershed is still at risk. The British Columbia provincial government's decision in December 2002 to approve the Tulsequah Chief Mine could result in the construction of a 100-mile road into the wilderness heart of the watershed and the operation of a gold and copper mine in some of the richest salmon habitat in the Taku system.

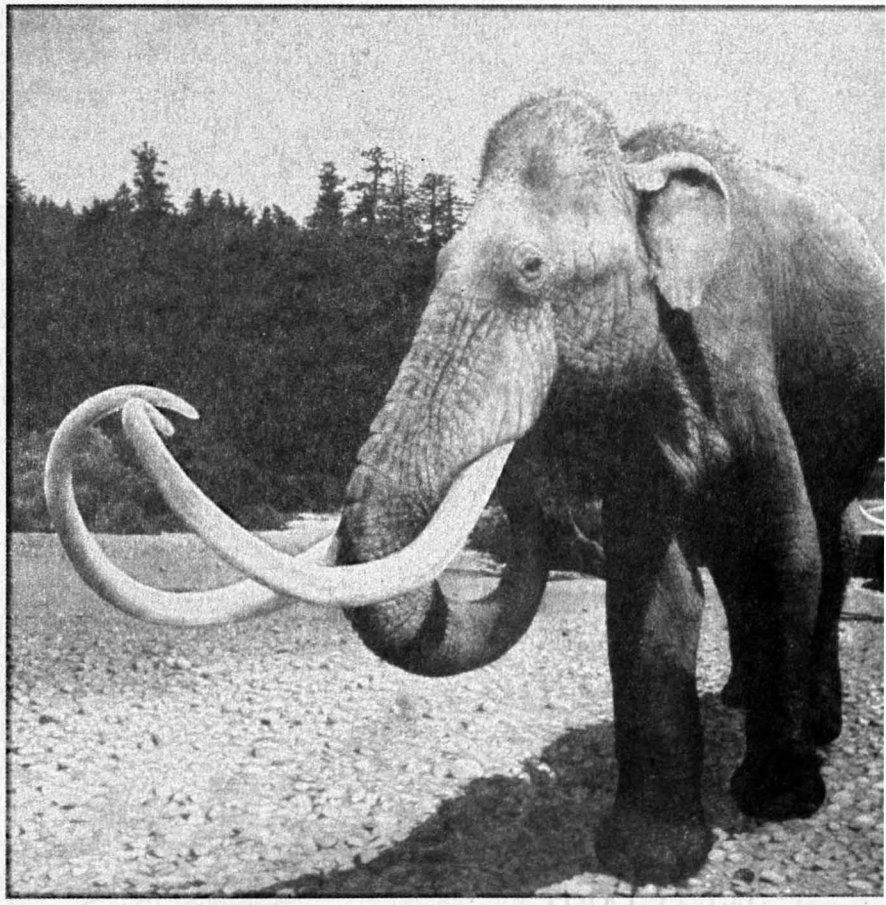
The Taku River watershed is a 7,000-square-mile, essentially pristine river basin draining the far northwest corner of British Columbia into southeast Alaska and the Pacific Ocean near Juneau. It is the largest undeveloped and unprotected watershed on the Pacific shore of North America and one of the most important salmon producing rivers in the British Columbia–Alaska transboundary region. It is home to globally significant populations of carnivores such as grizzly bears, black bears, wolves, wolverines, and lynx, and ungulates such as moose, mountain goats, stone and Dall sheep, and woodland caribou. The road threatens to degrade outstanding wildlife habitat, harm wildlife directly through pollution and roadkill, fragment an intact landscape, and undermine the culture and economy of the Taku River Tlingit Nation. Perhaps worst of all, the road may commence a rush by industrial resource interests to develop this astonishing wilderness watershed.

The Tulsequah Chief project was first approved by British Columbia in 1997, but that approval was quashed in a court challenge by the Taku River Tlingit Nation. British Columbia re-approved the mine in 2002 using dated and substandard fish and wildlife data from 1997. The access road route that was approved has been identified by BC government scientists as the worst option in terms of wildlife and fish impacts. BC has consistently claimed that adverse impacts will be mitigated by decommissioning the road upon mine closure, but has rejected legislation ensuring road decommissioning and has been actively marketing the Tulsequah Chief road to other resource interests before the project is even approved. The current primary obstacle to the mine going ahead is an ongoing Canadian federal assessment of the project, which could be completed later this year. Through the federal government's review process—and beyond, if necessary—conservationists will fight the industrial exploitation of the wild Taku.

David Mackinnon, Canadian Field Coordinator for the Transboundary Watershed Alliance • *For information on how to help stop the Tulsequah Chief Mine project and support the Taku River Tlingit's right to determine what happens on their traditional territory, visit www.riverswithoutborders.org or contact nola@earthwild.ca or david@riverswithoutborders.org.*

Human Cultural Agency in Extinction

by K. Alden Peterson

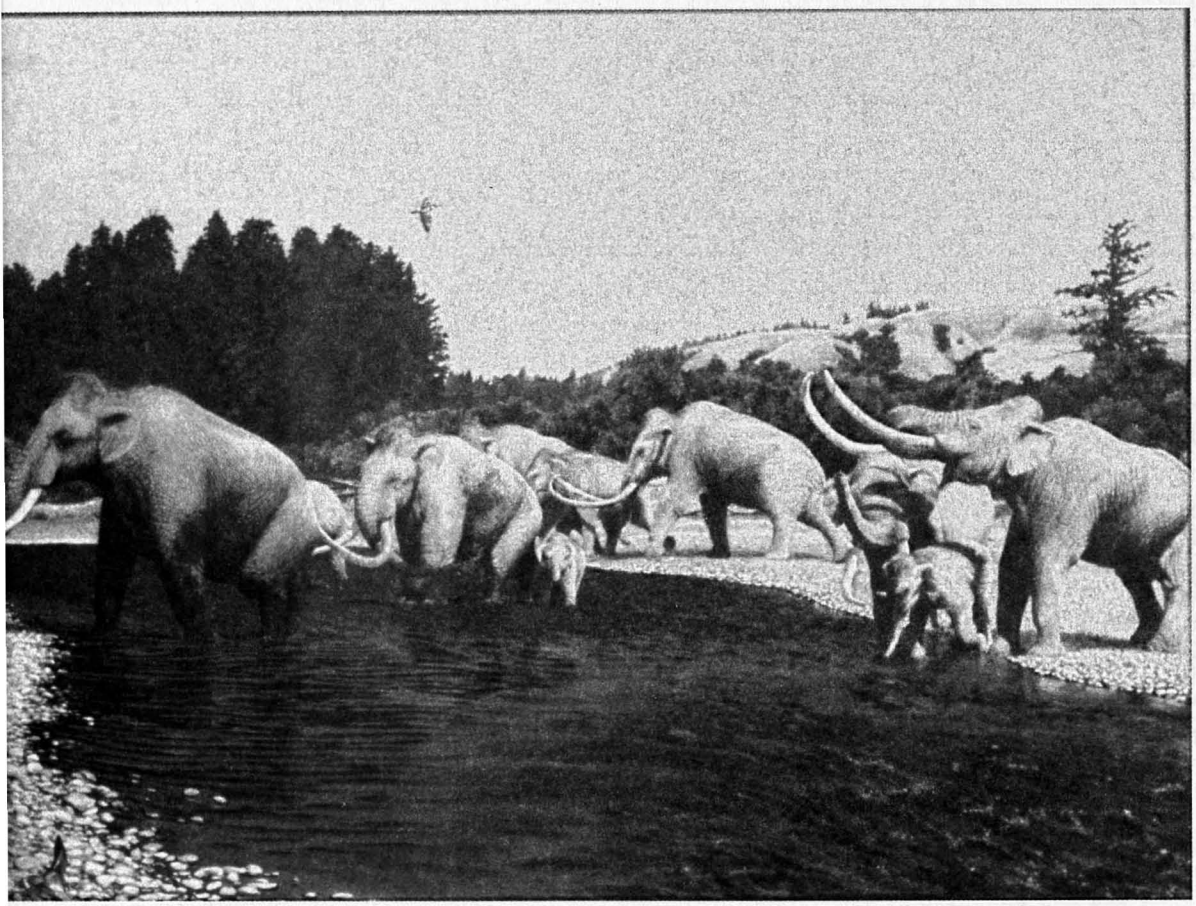


mammoth herd, alkyd on panel by Laura Cunningham

WHEN DID I LAST TAKE TIME to look up from the cracked mud and fingers of sand passing incessantly beneath my feet to notice the diminishing snowfields on the High Steens or the cloud-shadow mosaic painted on the Pueblo Mountains?

Our transect line stops as a member of the team, 60 meters to my right, records the position of a scatter of cultural stone flakes. I take the moment to shift my focus from traces of human passage across the landscape to the landscape itself. I'm working the summer as an archaeologist in southeastern Oregon searching prescribed sections of the Alvord Desert for signs of the earliest inhabitants of North America. We search for fluted projectile points knapped from obsidian or fine-grained basalt—the lithic signature of the Clovis culture. As I watch a dust-devil twist through the greasewood north of Black Point, it occurs to me that I am on a personal quest as well: the search for confirmation of a preconceived idea.

When the Clovis people wandered the Alvord, this desert looked radically different—shallow lakes filled these empty basins; mammoths, camels, horses, bison, lions, and sabertooth cats wandered the shores; and forest flora extended from the mountains down to the valley floors. However, the Clovis people discovered a world in transformation. The expansion of the Clovis culture across North America coincided with the climatic upheaval associated with the transition from the Pleistocene to the Holocene. Glaciers retreated and vanished, global atmospheric and oceanic circulation patterns shifted, and seasonal temperatures became more extreme. The Pleistocene-Holocene transition also produced



a world, outside of Africa, deplete in the largest mammals—an event known as the Late Quaternary Extinction (LQE). Throughout the Americas and Eurasia, the loss of mammals during this time can be correlated directly to size: 100% of mega-mammals (over 1000 kilograms); 76% of large mammals (100 kg to 1000 kg); 41% of intermediate-size mammals (5 kg to 100 kg); and 1.3% of small mammals (0.01 kg to 5 kg) became extinct.[1] In North America, the LQE meant that of the 35 genera of mega and large mammals roaming the continent at the end of the Pleistocene, 29 disappeared from the fossil record by 10,000 years ago.[2]

Pollen records from the Pleistocene-Holocene indicate that vegetation zones shifted and plant associations changed so completely that in many cases there is no modern analogy for what vegetation may have looked like in the late Pleistocene. It would be easy to indict climate-induced changes in vegetation as the most probable cause for the Late Quaternary Extinction were it not for two facts: 1) most of the fauna that became extinct at the Pleistocene-Holocene transition survived previous interglacial oscillations equal to or even more extreme than the climatic process leading to the Holocene;[3] and 2) the LQE, in North America, coincided with the arrival of fully modern human hunters.[4] As I struggle to see the Alvord through Clovis eyes, I cannot help wonder whether these earliest Americans were passive observers of, or active agents in, the Late Quaternary Extinction.

At 11,500 years ago, the Clovis culture reveals the first conclusive archaeological signature in North America, a signature that is continent-wide and presents strong evidence for direct human predation on extinct mammals. Twenty Clovis sites indicate indisputable associations of mammoths with human hunting or butchering.[5] These 20 human predation sites represent only 15% of the 61 confirmed end-Pleistocene fossil records for mammoths, but this small percentage provides overwhelming evidence for paleobiologist John Alroy, who has determined,[6] through his overkill simulations, that

humans needed to be responsible for only 9% of mammoth deaths to consign the species to extinction.

This earliest group of hunters in North America may be implicated in the extinction of mammoths; however, no similarly compelling fossil evidence exists for human association with any of the other non-mammoth herbivores[7] that went extinct in the late Pleistocene. Owen-Smith proposes the "keystone megaherbivore hypothesis" to provide a mechanism by which human predation on mammoths alone may have contributed to the extinction of the other 28 genera that succumbed during the LQE.[8] According to Owen-Smith, the largest herbivores can and do modify vegetation in such a manner as to increase habitat and forage for other grazing and browsing species.[9] The implication of the keystone megaherbivore hypothesis in context with the LQE is that humans need only kill the megaherbivores, which would start a cascading vegetation disruption capable of reducing available habitat for other non-prey herbivore species.

During the climatic changes of the Pleistocene-Holocene transition, the additional ecological stress created by the loss of the megaherbivores may have sufficed to push many other species toward extinction. An additional implication of the keystone megaherbivore hypothesis for the Pleistocene-Holocene transition is that a percentage of the vegetation changes noted in the fossil pollen record for this period may be of cultural rather than climatic origin as a result of the human role in the extinction of the megaherbivores. If left unrecognized, this human-induced vegetation change may exaggerate the interpreted effects of climate as an agent in the Late Quaternary Extinction of North America.

After the Late Quaternary Extinction roughly 10,000 years ago, extinction of species in North America seems to have ceased for a period of nearly 9,600 years. I like to imagine that this change requires the replacement of the megafauna-hunting Clovis culture with a new, ecologically aware culture. However, the more I study anthropology, the further from my grasp this vision flees. At 10,000 years ago, the Clovis people disappear from the archaeological record as rapidly as they appeared. The Folsom culture that followed utilized similar versions of fluted lithic points and primarily hunted bison; however, while the Folsom culture apparently replaces the Clovis culture in the archaeological record, it is never found in association with extinct fauna. After an equally brief period, the Folsom culture also vanishes along with fluted point technology and is replaced in the archaeological record by regional variations of lithic technologies; it is assumed that regional cultural diversity also existed.

Ethnographic literature contains many stories and examples of Native American resource conservation. However, I now believe that the key development responsible for the 9,600-year hiatus in extinction was cultural diversification and subsequent contested territories rather than a concerted effort toward conservation. This theory is supported by reports from the earliest European explorers into the interior of North America, who found that the largest concentration of ungulates (hoofed mammals) existed in the disputed boundaries between the various Indian nations.[10] Unlike the Clovis people, who were free to hunt and follow a preferred prey into that animal's refugium, later Native Americans may have been denied access to the final sanctuary of chosen prey if those locations existed within the territory of another people, or in the disputed lands between territories. Native Americans kept ungulate populations reduced by hunting pressures,[11] but were not able to escalate that pressure into extinction because of cultural geographic restriction.[12]

From an ecological perspective, the Late Quaternary Extinction in North America may have resulted from the ecological release of a new predator upon the continent. In order to describe human interaction with the environment in biological terms, however, the unique role of cultural transmission in the human species must be considered. Bettinger[13] proposes that to think of culture in terms of ecological theory, cultural groups need to be considered as pseudo-species. In these terms, the Clovis culture represents not only a new species, but a new pseudo-species as well—a new culture, a new technology, and a new predation strategy unleashed upon a continent previously uninhabited by humans. Freed from their primary constraint on predation, cultural geographical restriction[14] (or in biological terms, interpseudo-specific competition), the Clovis people hunted mammoths to extinction completely unaware of the catastrophic consequences of removing the megaherbivores from the North American landscape. As a result, this "ecologically released predator" precipitated the collapse of the Pleistocene fauna in North America and perhaps South America as well.

European imperialism, with its common goals of domination of indigenous people, acquisition of land, establishing agriculture, and resources procurement, defined yet another pseudo-species. When this monoculture arrived in the Americas 500 years ago, its technological superiority overrode the cultural diversity of the New World and unleashed, once again, an ecologically released predator. This new European pseudo-species invalidated the cultural geographical con-

straints that limited the hunting and resource exploitation of the Native Americans. Europeans began a new wave of extinction in the Americas.

Today, we have again re-invented a variation of the Clovis and Imperialistic European pseudo-species, releasing yet another predator. As we move toward an even broader definition of monoculture—the single world market economy—our various forms of market-demand predation become increasingly less constrained by cultural boundaries on a global scale. Cultural diversity produces refugia for natural diversity—be it the highly contested ground of the northern Plains in the early 19th century and the Korean Peninsula DMZ of the late 20th century[15] or the culturally divergent resource utilization of the prehistoric Great Basin.[16] Creating a single world community and a global market economy may result from high humanistic ideals; however, it will also produce a new monocultural pseudo-species. When monocultures prevail, the pursuit of resources becomes unopposed and a new predator is ecologically released. This time, even the most remote refugium will no longer fall beyond the range of the 21st century ecologically released predator. Like the Clovis people before us, we may not recognize the ecological consequences of our desires and innovations until it is too late.

THE RADIO AT THE END of the line crackles and word comes down that we are on the move again. I came to this desert seeking the origins of ecological awareness, but have only found another link in the long human history of ecological naïveté. I finish recording my thoughts in my notebook and stuff them back into my pocket. Turning my eyes to the ground, I focus for the glint of obsidian or jagged outline of a knapped edge in the rhythmic patterns of sun-baked silt and long sinuous trails of sand passing relentlessly beneath my feet. I will leave my obsession with a prehistoric precedent for ecological awareness in the desert. Ecological awareness and environmental conservation may not be evolutionary viable strategies.[17] Ecological awareness, as a culture paradigm, may be an entirely new idea.

I glance up at the horizon and think. I see three possibilities for the future: first, continual modification and homogenization of human cultures without considering ecological consequences; second, direction of human cultural change away from monoculture and toward true cultural diversity characterized by differential resource utilization; or third, recognition of the marvelous plasticity inherent within human culture and the creation of a new global pseudo-species, which transcends biological paradigms by incorporating ecological awareness and environmental conservation. Cultural evolution depends not on the vagaries of biological mutation. Cultural pseudo-species can and often do change instantaneously. ☾

A lifetime student of wilderness and human culture, **Kirk Alden Peterson** *is currently seeking a program focused in interdisciplinary research to study the origins and future of environmental thought. He lives in Reno, Nevada.*

NOTES

1. Brown, J. H. and M. V. Lomolino. 1998. *Biogeography.* 2nd ed. Sunderland, Massachusetts: Sinauer.
2. Klein, R. G. 1998. Human evolution and large mammal extinctions. In *Antelopes, Deer, Relatives, Present and Future: Fossil Record, Behavioral Ecology, Systematics, and Conservation,* ed. E. S. Vrba and G. S. Schaller, 128–139. New Haven: Yale University Press. All dates refer to approximate uncalibrated radiocarbon dates.
3. Owen-Smith, N. 1987. Pleistocene extinctions: The pivotal role of megaherbivores. *Paleobiology* 13(3): 351–362.
4. Klein 1998.
5. Haynes, G. 2002. The catastrophic extinction of North American mammoths and mastodonts. *World Archaeology* 33(3): 391–416.
6. Grayson, D. K., J. Alroy, R. Slaughter, and J. Skulan. 2001. Did human hunting cause mass extinction? *Science* 294(5546): 1459–1462.
7. Mammoths represent only 20% of the of the fossil records for extinct North American mammals during the Clovis time period (Grayson et al. 2001).
8. Owen-Smith 1987.
9. Owen-Smith (1987: 360) bases his study, in part, upon the removal of elephants from the Hluhluwe Game Preserve in Africa. One hundred years without the vegetation modification of elephants in the preserve resulted in the local extinction of three species of antelope, the reduction to low numbers of wildebeasts and waterbuck, and continually declining numbers of black rhino and kudu primarily as the result of habitat transformation.
10. Kay, C. E. 1994. Aboriginal overkill: The role of Native Americans in structuring western ecosystems. *Human Nature* 5(4): 359–389; Martin, P. S. and C. R. Szuter. 1999. War zones and game sinks in Lewis and Clark's West. *Conservation Biology* 13(1): 36–45.
11. Kay, 1994.
12. This concept of cultural geographical restriction and consequent prey conservation may explain the quandary of Africa, the ancestral home of *Homo sapiens sapiens*, where all eight species representing the seven surviving genera of megafauna still exist (see Owen-Smith 1987). If Africa is indeed the origin of modern humans, then cultural geographical restrictions on predation may have been in place long before modern hunting strategies developed.
13. Bettinger, R. L. 1994. How, when, and why Numic spread. In *Across the West: Human Population Movement and the Expansion of the Numa*, ed. D. B. Madsen and D. Rhode. Salt Lake City: University of Utah Press.
14. Carneiro, R. L. [1970. A theory of the origin of state. *Science* 169(3947): 733–738] defines a similar concept of "social circumscription" as a process leading to stratified societies primarily within a single culture. Here I choose different wording to emphasize ecological implications and cultural diversity.
15. Martin and Szuter 1999.
16. Bettinger, R. L. and J. Eerkens. 1999. Point typologies, cultural transmission, and the spread of bow-and-arrow technology in the prehistoric Great Basin. *American Antiquity* 64(2): 231–242.
17. Heinen, J. T. and R. S. Low. 1992. Human behavioral ecology and environmental conservation. *Environmental Conservation* 19: 105–116.

In the Last Oak Meadows

The *Large Marble* is extinct, unknown
why, probably fed on wild mustard.
Thirteen specimens are held
around the world: last taken, 1908.

The *Zerene Fritillary* ate violets
as a larva. It can't be found.
It's a name no one can trace.

Propertius Dusky Wings hides in ground debris
over winter. They're raked
and bagged, they're burned
with trash from urban forests.

Moss's Elfin lives with rocks.
The *Ringlet* prefers grass.
Where we see such empty space
we build.

The *Common Banded Skipper*—but try
to find one.

The last meadows are fenced.
The ministry would like to spray, and will,
and will we know
when iridescent wings,
quiet as oaks,
are gone?

Look close by lupines—
Icaroides Blue is possible.
They say one lives
in a recent clearcut near Shawnigan.

Greg Darms

Poet's note: In addition to Large Marble, there are several common names for the species mentioned in the first stanza, Euchloe ausonides, *including Creamy Marble and Creamy Marble Wing. The exciting part of this story is the rediscovery of the presumed extinct southern Vancouver Island subspecies, which I alluded to in the poem, in the San Juan Islands between Vancouver Island and the Washington State mainland.*

Butterfly Mind

Already *Nymphalis antiopa,* mourning cloaks
cut from velveteen,
dark chocolate trimmed in gold and
indigo, drift sunlit
above the frozen path, folding themselves
at evening behind the red bark
of the ponderosas. By June

painted ladies abandon
their pursuit of the lengthening day
to settle on the scattered
thistle. Then the California sisters
with their fiery wing spots,
and the so-called blues, violet and copper,
thumbnail sketches of dawn,
and at last those elegant dandies,
the swallowtails. The company

floats in the shafts of sunshine
like insights too dazzling and elusive
to pin down, examine,
use to advantage. When they light on
a flower or
a bit of excrement
they draw their wings together
displaying the less-admired undersides
as subtle and intricate. My friend,

the entomologist, keeps butterflies
skewered in boxes, a tiny flag inscribed
in Latin on each black pin. When I can
I beg their names and habits from him.

Still, so much is lost
without the drift and tilt,
the lift of the wing,
the delicate tap tapping on scat or nectary.

Ann Weiler Walka

National Wilderness Preservation System

UNDER SIEGE

by HOWIE WOLKE

FAR BELOW AND ANOTHER MILE across our final stretch of tundra, a patch of scrawny black spruce rises from the willow bush. These are the first trees we've seen in a week of backpacking through the wild passes and valleys of the Arctic National Wildlife Refuge. From this Brooks Range slope, the nearest road to the south is about 250 miles away. To the west, the Alaska pipeline and haul road loom a mere hundred miles distant. Follow the 69th parallel eastward and about the only microcosms of civilization all the way to Lapland are a few wilderness-encased villages on the west coast of Greenland. Better still, look to the north: nothing but sparse forest, wild mountains, tundra, ocean, and ice across the pole and "down" to northern Eurasia. Nowadays, there's probably no wilderness more remote than this.

Upper St. Vrain, Indian Peaks Wilderness Area, Colorado, scratchboard by Evan Cantor

In a few miles we end our trek at a landing strip along the Sheenjek River. There, we discover a "hunting camp" with various furnished, heated tents, including one as large as my house. Tundra is trampled and compacted. Two Cessnas are parked; takeoffs and landings are frequent. Our pilot—who is a conservationist—complains that the hunting outfitter illegally but with impunity uses his Cessnas to locate Dall sheep rams for his clients. So the actual "hunt" becomes primarily a hike to the sheep-flecked mountainside. All of this takes place within designated wilderness—and it's no anomaly. It is, in fact, the tip of an iceberg of wilderness abuse that impairs ecosystem integrity and native biodiversity—and permeates and degrades the entire National Wilderness Preservation System (NWPS). And partly because many conservationists think that their responsibilities end when a tract becomes designated wilderness, the iceberg grows.

In general terms, threats to the NWPS can be boiled down to three broad categories:

1) EXTERNAL. Global warming, air pollution, and other broad environmental threats generally stemming from human overpopulation.

2) STRUCTURAL. Fragmented wilderness units lack adequate size, proximity, and connectivity to protect native species and ecosystem processes. Also, the NWPS is biased toward monumental lands of rock and ice, deep canyons, and other unusual or spectacular features, and thus fails to represent a full range of native ecosystems.

3) INTERNAL. This neglected arena is the focus of this article and includes:

- violations of the spirit and intent of the Wilderness Act associated with agency malfeasance
- non-conforming uses (livestock grazing, airstrips, motorboats, dams, etc.) grandfathered in by the Wilderness Act or other legislation
- exotic species
- fire and insect suppression
- poor law enforcement of overt violations such as motor vehicle trespass
- creeping degradation, the huge category of often small abuses that cumulatively degrade the Wilderness System.

Despite the problems, I believe that the Wilderness Act of 1964 is the best law ever enacted—and possibly the most radical. After all, isn't civilization's history primarily one of will imposition, targeting among other things, self-willed (wilderness) land? Thus the very concept of wilderness preservation is the antithesis of civilization's ignoble quest, the ultimate roadblock to the civilized juggernaut.

In my own antithetical quest to elude walls and conventional employment, for 25 years I've worked primarily as a wilderness guide and outfitter. Having led backpackers through designated and proposed wilderness from the Cabeza in Arizona to the Brooks Range in Alaska and from the Appalachians to the Pacific rainforest, I can confidently report that designated wildernesses areas are our healthiest lands. Roadblocks work. But the woes within the NWPS are worsening, and as neglect continues, the *wild* in the wilderness retreats to nostalgia. (This also applies, by the way, to other wildlands with obvious wilderness potential, such as non-wilderness national park and wildlife refuge backcountry, and national forest and BLM roadless areas.)

Nearly every wilderness enthusiast can share horror stories about assaults on designated wilderness. *Wild Earth* publisher Dave Foreman once discovered a Forest Service crew cutting down old-growth snags in the Gila Wilderness. My stories include 10-lane pack trails in the Teton (Wyoming) and Bob Marshall (Montana) Wildernesses, with some heavily horsed trails in "The Bob" becoming deep stinking quagmires of eroded mud and horseshit. For miles. Elsewhere, eroding, ever-widening trails foul streams and fragment habitat throughout the Wilderness System.

I've tried to stop a 20-person Boy Scout troop from cutting live trees and eating frogs (seriously!) while transforming a fragile subalpine Selway-Bitterroot lakeshore into a dust bowl. I've seen meadow after meadow in Wyoming's Washakie Wilderness transformed by horses and cows into dirt gardens of unpalatable cinquefoil. Thousands of acres of Wyoming's Gros Ventre Wilderness have been grazed to dirt with multiple hoof-gouged trails—some eroded 6–8 feet deep—thanks to a wealthy hobby rancher's cattle. Here, streams run thick with red silt every spring and each downpour. Similar livestock scenarios blight numerous western wilderness areas.

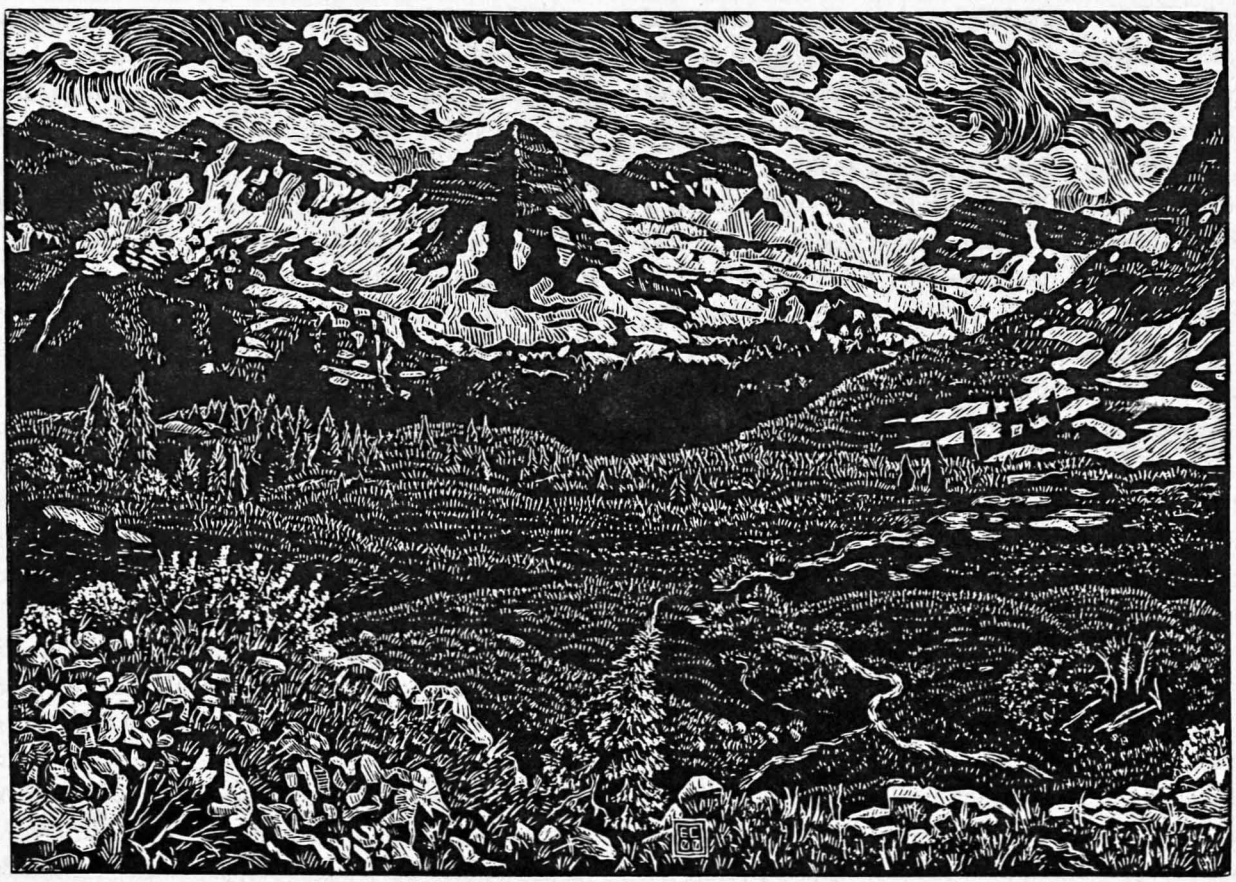
In the Sierras, the "John Muir Trench" winds among hundreds of denuded lakeshore campsites. In the Olympics some trails are absurdly overbuilt, with compacted bare-dirt camps every couple hundred yards. And in some of the more popular wilderness areas of the Appalachians, Sierras, and Cascades, peak season is so crowded that some wildlife populations no longer utilize the habitat. Motor boats and mercury pollute lakes of the Boundary Waters. The Everglades Wilderness is a complex ecological mess of water diversions,

pollution, and exotic species. Speaking of which, cheatgrass and knapweed bedevil tens of thousands of acres of western wilderness, and exotic fish wreak havoc upon aquatic ecosystems throughout the NWPS. We face a tough dilemma deciding how aggressively to fight exotics, for chemical fixes and biological controls are intrusive. Sometimes, the cure may be worse than the problem.

Perhaps the greatest insult to western wilderness is fire suppression, despite "fire management plans" for some larger wildernesses. Continued wilderness wildfire suppression will elicit a dreadful ecological price, even as managers give lip service, and usually lip service only, to wildfire's essential ecological role.

There's much more. On Georgia's Cumberland Island, the National Park Service allows a private hotel to transport their guests in trucks through the designated wilderness, and conducts *its own* bus tours through the wilderness. And at Smith Gulch on Idaho's Salmon River (a national wild and scenic river within the Frank Church River of No Return Wilderness), the Forest Service has allowed an outfitter to build a multi-cabin resort complex, under the guise of "outfitter camp." Both of these travesties are the subject of ongoing litigation, and both illustrate blatant and bold violations of the Wilderness and Wild and Scenic Rivers Acts.

Yet the bold violation is an easier nut to crack than are the countless small ongoing insults. Eroded trails and denuded camps, overgrazed meadows, exotic wildlife and weeds, air and water pollution, litter, fecal contamination, fire suppression, overzealous prescribed fire ignitions, motorized incursions (legal and not), overcrowding, low overflights, jetboats, air strips, overbuilt outfitter camps, dams and diversions, large careless Boy Scout groups, competitive sporting events, administrative use of motor vehicles and other machines, cabins, inholdings, and more are taking a toll. Let's be clear. Despite the bold violations which often elicit at least some response from conservationists, it's the cumulative effect of thousands of small insults that ultimately degrade the Wilderness System. This *creeping degradation* is insidious because many individual abuses seem minor. Given a chance, land does heal. But the price of neglecting all the little insults



Mt. Garfield, Raggeds Wilderness Area, Colorado, scratchboard by Evan Cantor

is the gradual cumulative loss of core wilderness values: the natural processes of self-willed land, ecosystem integrity and wildness, native biodiversity, soil and water quality, and solitude for the soul of many souls.

Clearly, the authors of the Wilderness Act instructed managing agencies to prevent degradation of the Wilderness System. Much has been written about the Wilderness Act's flexible definition of wilderness (section 2-c). What most people don't realize is that the definition—which includes the phrase "which generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable"—was primarily a blueprint for maintaining wilderness conditions. Moreover, section 2-a states that wilderness areas "shall be administered...in such a manner as will leave them unimpaired...and so as to provide for...the preservation of their wilderness character." Section 4-b further instructs agencies to be "responsible for preserving the wilderness character of the area," with this additional caveat: "and shall so administer such area for such other purposes for which it may have been established as also to preserve its wilderness character."

In my early years as a "wild preservative" (an Abbyism), I viewed wilderness stewardship as a body of issues that could wait, since bulldozers and chainsaws aimed at potential wilderness seemed more pressing. So my conservation efforts focused on roadless area defense, wilderness designations, and rewilding. "Eroded trails can wait," thought I. But a lifetime of wilderness exploration has convinced me that in the face of perceptible systemic decline, taking care of existing designated wilderness is urgent. Yes, roadless area defense, rewilding, and securing substantial additions to the Wilderness System must remain cornerstones of wildland conservation. But neglect of the existing NWPS must not be the price for our more traditional advocacy. We need another cornerstone.

Sometimes we conservationists fail to view our various campaigns as a dynamic continuum. Too many of us view our issue atop an importance hierarchy pyramid, which enables some to belittle others' work. This is ironic, since we so quickly pontificate on the inter-relatedness of ecosystem components. This duality—the ability to appreciate the ecological model and the failure to appreciate interrelated efforts to protect ecosystems—extracts severe costs. Intra-movement bickering is one, as is our tendency to see issues too much in a linear temporal continuum. Thus we wait until we solve the bulldozer and ATV problems—which may be a long wait indeed—before we worry about what's supposed to be already protected. By the same token with which our movement tragically fails to confront human overpopulation, we fail to see that continued wilderness neglect will doom the future of wilderness.

I discussed degradation with Wilderness Watch founder and board president Bill Worf. Wilderness Watch is a Missoula, Montana–based non-profit that fights degradation within the National Wilderness Preservation System. Worf explains that under the Wilderness Act, conditions within a wilderness area must not degrade beyond conditions at the time of designation. Given the alternative—descent down a slippery slope into perpetually less wild realms—Worf's view seems to make sense. Wilderness Watch rarely compromises its commitment to non-degradation within the NWPS.

By contrast, some conservationists believe that, at least for now, uncompromised opposition to all degradation will diminish support for further wilderness designations. I think that's a valid fear, particularly if we allow minor skirmishes to dominate the headlines, and especially if we fail to educate the public about *why* it's so important to draw the line on degradation. Certainly, if non-degradation is confused with the idea that wilderness should be entirely "pure," there is great potential to alienate wilderness allies. Many folks already (wrongly) see wilderness defenders as anti-people; thus, increased restrictions on wilderness area use can be a tough sell. So there lies our challenge, naked as Utah sandstone: to protect wilderness integrity while maintaining and expanding public support.

Dave Foreman worries that setting too high a purity standard for designated wilderness "creates the potential of alienating almost everybody who uses wilderness." He believes that too many required permits and too many lawsuits over minor insults will damage efforts to gather support for expanding the NWPS. He argues that "we have to recognize that in some wildernesses, you're not going to have a whole lot of solitude. Solitude is important, but it shouldn't be the main thing driving wilderness management." Foreman has a point. Solitude probably shouldn't be the main goal for small wildernesses permeated by outside motor noise or popular wilderness areas near large urban areas. In other words, solitude is important, but ecosystem integrity is a better yardstick with which to measure the need for permits and use quotas.

Like Foreman, Wilderness Watch Executive Director George Nickas also sees the expansion of the NWPS as ecologically essential. But he argues, "Saving real wilderness requires action and education, not degradation. Political expediency is a sorry excuse for compromising wilderness. Most people who visit wilderness and support more wilderness don't

want to harm it, and they don't want others to. Given the information and the opportunity, they'll support the intent stated in the Wilderness Act—to leave areas unimpaired for future generations." Unfortunately, too often we don't provide the public with essential information. So the question remains: where in the wild sands to draw the line against inappropriate uses of wilderness, and what is the cost or benefit of that line to public support and to the wilderness itself?

No doubt today's Wilderness System—small, fragmented, disconnected, and incomplete—would fail to fully protect wildness and natural integrity even if all were well within; thus my conviction that dramatic expansion is essential, starting with every public wildland that qualifies. And that won't happen without the public on our bandwagon. I am equally convinced, though, that our movement's failure to defend existing designated wilderness puts the very concept of wilderness at risk. Despite some important exceptions such as restored wolf populations and termination of some grazing allotments, my regular wilderness visits have given me a clear view of widespread systemic degradation. And when Congress enacts poor legislation with non-conforming uses (special livestock privileges, motorboats, motor corridors, dams, cell towers, mandated trails, etc.), it creates a backlog of management nightmares that can only worsen an already troubled system.

I suggested earlier that an integrated understanding—that accounts for both division of labor and time—of the various facets of wildland conservation would better serve the ideal of wild natural wilderness. Yet for those of us who lack a functioning crystal ball, the future looks fuzzy indeed. No one can say how the wild cards of human demographics, global warming, and global trade will ultimately impact wilderness. Maybe, with increasing numbers of humans and exotics zipping around an increasingly warm and wounded planet, degraded, exotic-infested wilderness is inevitable. But I'm not ready to passively accept that, grasping to the hope that in lieu of an unlikely surge of human wisdom (social and economic empowerment of women, rejection of industrial domination and religious orthodoxy, burgeoning biocentrism, etc.), some great cosmic belch might somehow reduce human biomass or cool things down so that wild wilderness with native species and natural processes can thrive.

Whatever the future, a primary job of conservation is to protect wildlands from whatever threatens a parcel's *existing level of integrity*. Thus, non-degradation is fundamental to wildlands conservation, not just to wilderness. Roadless areas shouldn't degrade into roaded multiple-use lands; multiple-use lands shouldn't degrade into clearcut monocultures, eroded wastes, or strip malls. And so on.

If we view our landscape as a continuum of land uses, with designated wilderness managed for the highest levels of wildness and natural integrity, the non-degradation principle for wilderness becomes a logical extension of the conservation movement's traditional effort to prevent degradation of the natural world. Similarly, if we see our movement's division of labor in this context, it's logical for conservation organizations to make some room in their agendas for wilderness stewardship. Wilderness Watch is a small organization with limited resources, and its four-person staff needs more help from fellow conservationists in limiting wilderness degradation.

Moreover, to view the National Wilderness Preservation System in the holistic landscape sense is to realize that when we embrace or accept non-conforming uses of wilderness, we allow our most pristine lands to become more ordinary, to more closely resemble lands that represent many of the reasons for today's global ecological crisis.

Earlier this fall, I scraped together three days for the kind of trek that I now experience too infrequently—a solo wilderness walk with no clients in my wake. Early one morning atop an obscure Selway-Bitterroot peak, I enjoyed a 360-degree view. Around the compass, the illusion of pure ecological wilderness gripped me: nothing but unspoiled mountains and forests, recent burns and old growth, plunging canyons and gentle basins, with howling wolves and bugling elk. All appeared perfect.

Of course, familiar with the details of a wilderness more or less degraded throughout, I knew the illusion. But for the moment, I was content to simply enjoy the beauty and wildness that, despite the problems, make "big W" designated wilderness the best idea and the best landscape that humankind has ever pondered. As humans, we live by the stories that best illustrate and reinforce our worldview. To the extent that the pure wilderness illusion serves to inspire the defense of wilderness areas and the wilderness idea, long may it prosper. To the extent that it creates an excuse to neglect wilderness area stewardship, may we develop the wisdom to see that unimaginable beauty and eternal vigilance can and must go hand in hand. ☾

Howie Wolke *is a wilderness guide who is active with several conservation groups. The author of* Wilderness on the Rocks *and a co-author of* The Big Outside, *he lives in western Montana near the Selway-Bitterroot Wilderness.*

Mountain Biking

scratchboards by Suzanne DeJohn

A Niche for Bicycles

by Jim Hasenauer

LAST YEAR, in a conversation with a California wilderness advocate, I suggested that a boundary adjustment placing a popular multi-use trail outside a proposed wilderness would enable the mountain bike community to support designation for that parcel. She said, "but then, there wouldn't be any trail in there to hike."

There's the rub. If wilderness advocates are out to save wild places and the wildlife that depend on them, the mountain bike community is with you. If you're out to secure hiking trails or to enjoy the wilderness experience at our expense, we've got a problem.

There's a natural affinity between the mountain bike and the mainstream environmental communities. Our bond is a great love of wild places, both the ones we visit for renewal and reinvigoration and the ones that we'll never visit, but know are there. We love living in a world that is still wild. According to an Outdoor Industry of America report, there are 46 million Americans who rode bikes on a singletrack trail at least once in 2001. These are people inclined to work for habitat, open space, and public land protection—and do.

When it comes to federal wilderness—what bike advocates call "Big W Wilderness"—though, mountain bicyclists are troubled. Current regulations ban bicycles in designated wilderness. That ban distorts the debate. Whenever a wilderness proposal contains a significant riding trail, cyclists work to ensure that the trail does not receive a wilderness designation. We advocate boundary adjustments or alternative land designations. Since wilderness advocates see other land use designations as flawed, any whittling down of a proposal is viewed as a loss. Publicly, wilderness advocates typically discount the cyclists' loss of a trail. We suspect that privately, many are happy to see us removed. This opposition positions cyclists and wilderness advocates as adversaries.

Both sides get strategic. Wilderness proponents suggest clearly unacceptable proposals in their packages so that they can withdraw them and cite compromise with cyclists. When cyclists fight to maintain access to trails they're riding, they're accused of being selfish. Some mountain bike organizations have already decided that the conservation community is the enemy. They've adopted the Blue Ribbon Coalition language of the "environmental industry" "locking out citizens from their lands." These distortions happen at the extremes, but those extremes bring pressures on already fragile relationships. Suspicion replaces trust; hostility blocks cooperation.

This negative energy and divisiveness is tragic. But there is a daring yet conservative way out of this dilemma. The 1964 Wilderness Act did not ban bikes; it banned "mechanical transport" which in 1965 was defined as "propelled by a non-living power source." Bikes were allowed in wilderness until 1984 when regulations first offered in 1977 went into effect. Revising regulations to accept bicycling as an appropriate use of some trails in some wildernesses would completely transform the wilderness coalition and the wilderness debate.

This would not be an amendment to the Wilderness Act, nor need it be a foot in the door to allowing a number of unwanted activities. It's a regulatory change that recognizes bicycles for what they are: muscle-powered, human-scale, low-impact devices not significantly different from other recreational equipment that is allowed in wilderness. It's a regulatory change that acknowledges that responsible bicyclists, like other responsible wilderness visitors, can enjoy the solitude, splendor, adventure, discovery, and awe of traveling through untrammeled land.

The early wilderness philosophers probably didn't even consider bicycle use in the years leading to the Wilderness Act. Bikes then were seen as toys. What is likely is that the 1977 and 1984 bans on bicycles were rooted not so much in wilderness philosophy, but in the chilly reception bicyclists received at that time when they first showed up on hiking and equestrian trails.

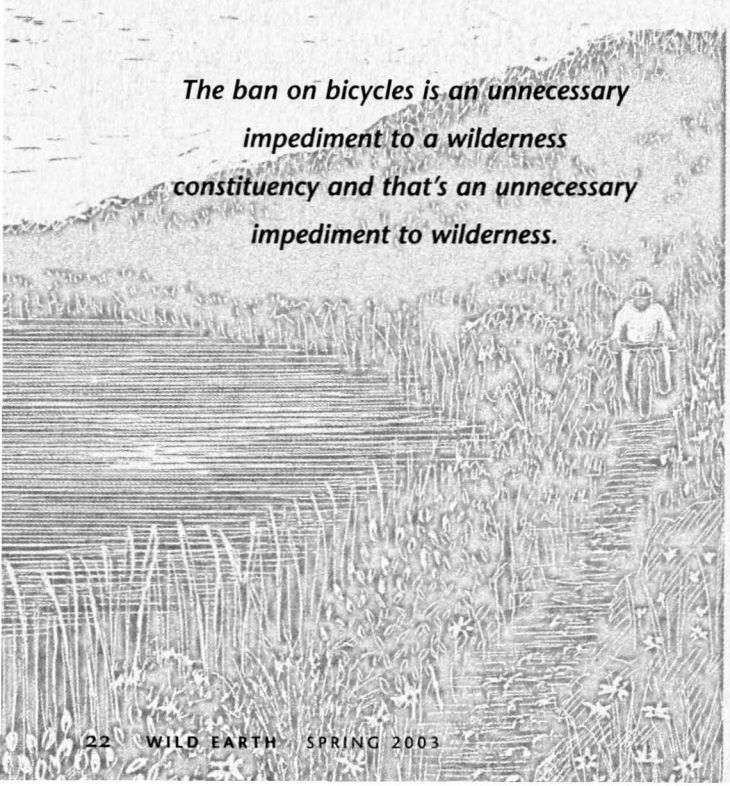
The mountain bike was invented in the mid-1970s and first mass-produced in 1981. As they became popular, deci-

sion-makers were justifiably cautious about their use. Environmental impacts weren't known. There were complaints from existing trail users, especially on the urban fringe. It was often these hikers and equestrians, in concert with environmental groups, that succeeded in closing a number of trails to bikes. The most frequent claim used to demonize bikes was that they were essentially motorcycles. That led to the preferred management tools of separate facilities or outright bans. The dates suggest that the wilderness prohibition was merely one of several early trail closures during this period.

Since then, bicyclists have organized and become ardent supporters of public lands. Many of the early closures have been reversed. Studies show that bike impacts are similar to those of other non-motorized trail users. Some land managers now have more than 25 years of experience managing bikes.

Although relations between bicyclists and other trail users have improved considerably, user conflict remains an issue. Irresponsible behavior by some mountain bikers certainly contributes to this. So do media images of stunts and bike racing. Some people, not used to sharing trails, have vague concerns and fears when approached by a bicyclist. These are human problems that are manageable. Experience and trail etiquette can mitigate this conflict.

Unfortunately, there's a small but vocal number of trail users for whom the very sight of a bicycle ruins their solitude. Many of the wilderness advocates who don't want bikes in wilderness don't want them anywhere. These folks are entitled to their point of view, but that prejudice shouldn't guide a movement committed to protecting North America's quickly dwindling wild land.



The ban on bicycles is an unnecessary impediment to a wilderness constituency and that's an unnecessary impediment to wilderness.

There's been a lot of talk recently about new approaches to wilderness and the importance of compromise and new coalitions. A regulation change would certainly empower the wilderness movement in a new way: it would create a new coalition without compromising the fundamental wilderness philosophy of wild land for its own sake, of rich and diverse habitat, of appropriate recreation, of stewardship that is thoughtful and appreciative.

A regulation change allowing bicycles would raise new management issues of both biological and visitor carrying capacity, but there are well-established ways of making those decisions. It would also require a kind of local decision-making that many wilderness advocates historically fear. Which trails in which areas should be open to bikes? How best to disperse visitors? These debates would be lively, but they would take place inside the councils of the wilderness movement, and when decided, we could speak with one political voice.

There are other advantages. Bicyclists volunteer. Often, equestrian groups oppose new wilderness because of concerns that trail maintenance couldn't be sustained. One of the irrefutable contributions of the mountain bike community has been the commitment to trail maintenance. That's a significant benefit. Wilderness advocates often promise wary gateway communities that there are economic rewards to be gained from nearby wilderness recreation. That factor would be multiplied by bicyclist numbers.

In many proposed wilderness areas, there are real people riding real trails. They should not have to give them up. They will especially reject arguments that mischaracterize their trail use as inappropriate.

To allow the natural community to thrive, we must work through challenges in our social community. The ban on bicycles is an unnecessary impediment to a wilderness constituency and that's an unnecessary impediment to wilderness. Lifting the ban would invigorate that constituency. It would mean bikes on some trails in wilderness—and much more wilderness for all. ☾

Jim Hasenauer *is a professor of communication studies at California State University at Northridge and has served on the International Mountain Bicycling Association's Board of Directors since 1988. He's a member of the California Recreational Trails Committee and the California Roundtable on Recreation, Parks and Tourism. These opinions are his own.*

Mountain Biking in Wilderness

Some History

by Douglas W. Scott

In December 1933, the director of the National Park Service floated the idea that construction of the Skyline Drive parkway along the wild ridgetops of Shenandoah National Park would be a terrific opportunity for that section of the Appalachian Trail to "be made wide and smooth enough that it could serve as a bicycle path."[1]

Benton MacKaye, father of the Appalachian Trail, was apoplectic. The Appalachian Trail was to be a "real wilderness footpath," he told the director, and one of the prerequisites was "that it is to be a footway and not a wheelway."[2] MacKaye was an enthusiastic bicyclist but believed that like any form of mechanization, bicycles did not belong in wilderness. He "first saw the true wilderness" in 1897, he wrote in his journal, during a long ramble through the White Mountains of New Hampshire, preceded by a 10-day bicycle trip from Shirley Center, Massachusetts. As he and his companions set out on the wilderness hike, he wrote: "The country we are about to traverse is one, I am told, undisturbed by civilization in any form....We have said 'good-bye' to the bicycles and civilization and will now pursue our way on foot through the White Mountains."[3]

As these episodes illustrate, from their earliest thinking about a practical program for preserving wilderness, wilderness pioneers were intent on excluding all vestiges of "mechanization" from such areas. And that includes anything with wheels, such as bicycles or wheeled game carriers.

In 1930, Robert Marshall defined wilderness as "a region which...possesses *no possibility of conveyance by any mechanical means*."[4]

In 1949, Aldo Leopold wrote, "Recreation is valuable in proportion to the intensity of its experiences, and to the degree to which it *differs from* and *contrasts with* workaday life. By these criteria, mechanized outings are at best a milk-and-water affair."[5]

In 1964, the Wilderness Act set out the essence of federally designated wilderness as being its "*contrast* with those areas where man and his works dominate the landscape" with "increasing population, accompanied by expanding settlement and *growing mechanization*."[6]

MacKaye, Marshall, Leopold, and the others who founded the Wilderness Society in 1935 saw wilderness as "a serious human need rather than a luxury and plaything," concluding that "...this need is being sacrificed to *the mechanical invasion in its various killing forms*." Expressing their concern about human intrusions that bring "into the wilderness a feature of the *mechanical* Twentieth Century world," the society's founders identified wilderness areas as "regions which possess *no means of mechanical conveyance*."[7]

The words of the Wilderness Act

As historian Paul Sutter notes, "for Leopold the essential quality of wilderness was how one traveled and lived within its confines," a view shared by the other founders of the Wilderness Society.[8] As he drafted the Wilderness Act in 1956, Howard Zahniser, executive director of the society, drew on this well-understood and fundamental concept of wilderness. In a nationwide radio broadcast in 1949, he had emphasized that "wilderness will not survive where there is mechanical transportation."[9]

As defined in the dictionary, and as reflected in this whole line of twentieth century wilderness thinking, the term "mechanization" embraces a broader category than just the term "motor vehicles."[10] Congress adopted this crucial distinction when it enacted the Wilderness Act. Section 4(c) of the act prohibits certain uses, some absolutely and others with limited exceptions:

> Except as specifically provided for in this Act, and subject to existing private rights, there shall be no commercial enterprise and no permanent road within any wilderness area designated by this Act and, except as necessary to meet minimum requirements for the administration of the area for the purpose of this Act (including measures required in emergencies involving the health and safety of persons within the area), there shall be no temporary road, no use of motor vehicles, motorized equipment or motorboats, no landing of aircraft, no other form of mechanical transport, and no structure or installation within any such area.[11]

The plain words of the statute distinguish between the use of motor vehicles *and* any "other form of mechanical transport"—and separately prohibit both. The canons of statutory construction require distinct meaning be given to each provision and each item in a list of items, preventing the assumption that when Congress chose to use two different words or phrases, these were intended to have the same meaning.[12]

Thus, distinct from the phrases involving motors per se, the prohibition on any "other form of mechanical transport" must mean some class of transport devices other than those with motors.

The Forest Service initially got it wrong

Despite the clear words of the law, the first Department of Agriculture regulations (drafted by the U.S. Forest Service and finalized in 1966) violated the canons of statutory construction on this point. This error was highlighted in the first law review analysis of the Wilderness Act, published just a month later.

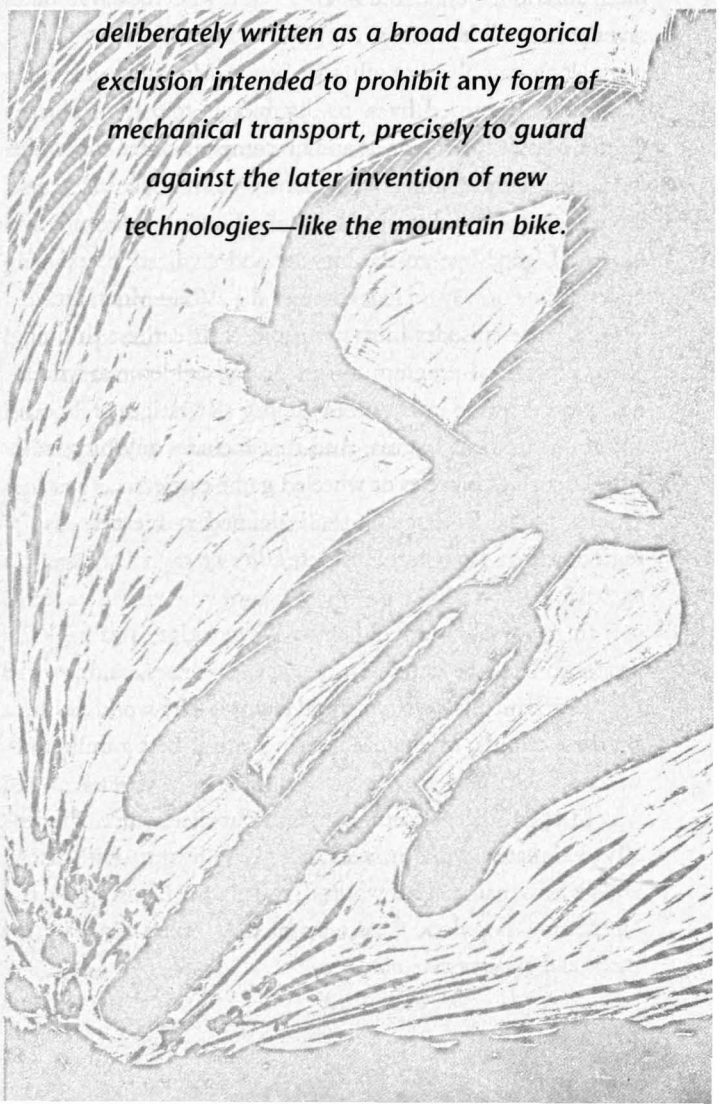
Commenting on the identical wording as it appeared in the draft form of the regulations, Michael McCloskey noted:

> In its regulations to implement the act, the Forest Service has defined "mechanical transport" as "any contrivance...propelled by a nonliving power source." As a nonliving power source is the same as a motor, mechanical transport is thus defined as being the same as "motorized transport," and there is no exclusion of horse-drawn vehicles, bicycles, or cargo carriers. The wording of section 4(c) is that there shall be "no use of motor vehicles, motorized equipment or motorboats, no landing of aircraft, no other form of mechanical transport...." In an effort to give meaning to each item enumerated, the rules of statutory construction would suggest that duplicate definitions should be avoided. For this reason, the Forest Service would appear to be in error in saying that the phrase "mechanical transport" means no more than the preceding phrase "motor vehicles." The meaning of the sentence would appear to be that the final phrase refers to modes of mechanical transport that are not motor vehicles, motorboats, or motor-driven aircraft. By a process of elimination, this would seem to leave only items such as bicycles, wagons, and cargo carriers as the referent for the phrase.[13]

Responding to the draft regulations in September 1965, both the Wilderness Society and Sierra Club—the national organizations most intimately involved in the drafting and enactment of the Wilderness Act—had put the Forest Service on notice of its error. In comments for the Wilderness Society, its executive director wrote:

> The definition of mechanical transport...should specifically include contrivances powered by living power sources (such as wagons drawn by horses, bicycles, and wheeled cargo carriers) as well as contrivances propelled by nonliving power sources. (See Paragraph 4(c) of the

The Wilderness Act's prohibition of any "other form of mechanical transport" was deliberately written as a broad categorical exclusion intended to prohibit any form of mechanical transport, precisely to guard against the later invention of new technologies—like the mountain bike.



Act, which distinguishes between motor vehicles, motorboats, and "other forms of mechanical transportation [*sic*]."). The use of various types of wheeled equipment should be specifically prohibited within the regulations to conform with this provision of the Act.[14]

To correct their obvious error and clarify exactly what is included within the phrase "other form of mechanical transport," the Forest Service subsequently perfected its regulatory definition in the sections of the *Forest Service Manual* that direct its implementation of the Wilderness Act:

> *Mechanical Transport.* Any contrivance for moving people or material in or over land, water, or air, having moving parts, that provides a mechanical advantage to the user, and that is powered by a living or nonliving power source. This includes, but is not limited to, sailboats, hang gliders, parachutes, bicycles, game carriers, carts, and wagons. It does not include wheelchairs when used as necessary medical appliances. It also does not include skis, snowshoes, rafts, canoes, sleds, travois, or similar primitive devices without moving parts.[15]

Other agencies that manage wilderness never made this mistake. In its original regulations, the Bureau of Land Management expressly listed bicycles as a prohibited form of mechanical transport.[16]

Mountain bikes: Exactly the sort of mechanical transport the law intended to prohibit in wilderness

Mountain bicycles did not exist until long after the Wilderness Act became law. It is understandable that drafters of the earliest Forest Service regulations did not name bicycles as a likely form of mechanical transport. At the time, they could not reasonably have been expected to foresee technological developments that would adapt bicycles to mountainous terrain, both on and off trails. In any case, the words of the statute itself are the controlling law, not the agency's interpretation.[17] A bicycle is obviously a *mechanical* device and obviously a *form of transport.* The plain words of section 4(c) of the Wilderness Act prohibit bicycles in wilderness areas. Ditto for wheeled game carriers.

The Wilderness Act's prohibition of any "other form of mechanical transport" was deliberately written as a broad categorical exclusion intended to prohibit *any* form of mechanical transport, precisely to guard against the later invention of new technologies—like the mountain bike. ☾

A long-time student of the history of wilderness preservation, **Doug Scott** *has been a lobbyist and strategist for the Wilderness Society, Sierra Club, and Alaska Coalition. He is policy director of Campaign for America's Wilderness. His briefing papers on Wilderness Act interpretation and precedents and a longer paper on mechanization and wilderness can be found at http://leaveitwild.org/reports.*

NOTES

1. Arno Cammerer to Myron Avery, December 2, 1933, quoted in Paul Sutter, 2002, *Driven Wild: How the Fight against Automobiles Launched the Modern Wilderness Movement* (Seattle: University of Washington Press), 185.
2. Benton MacKaye to Arno Cammerer, December 30, 1933, quoted in *Driven Wild.*
3. Journal quoted in Larry Anderson, 2002, *Benton MacKaye: Conservationist, Planner and Creator of the Appalachian Trail* (Baltimore: John Hopkins University Press), 34–35.
4. Robert Marshall, 1930, The Problem of the Wilderness, *The Scientific Monthly* 30: 2 (February): 141, emphasis added.
5. Aldo Leopold, 1949, *A Sand County Almanac and Sketches Here and There* (New York: Oxford University Press), 194, emphasis in original.
6. 16 U.S.C. 1131(c), emphasis added.
7. These quotations are from a 4-page pamphlet, *Reasons for a Wilderness Society* (January 21, 1935), emphasis added.
8. *Driven Wild*, 72.
9. Howard Zahniser, script of radio broadcast, January 13, 1949, on "Newsreel Digest" program, Mutual Broadcasting Company, 1.
10. The word "mechanical" is not defined by presence or absence of a motor. *The American Heritage Dictionary of the English Language, Fourth Edition* defines this family of terms: MECHANICAL: "1. Of or pertaining to machines or tools." MECHANISM: "A machine or mechanical appliance." MECHANIZE: "To equip with machinery." MACHINE: "1. a. A device consisting of fixed and moving parts that modifies mechanical energy and transmits it in a more useful form. b. A simple device, such as a lever, a pulley, or an inclined plane, that alters the magnitude or direction, or both, of an applied force; a simple machine."
11. 16 U.S.C. 1133(c), emphasis added. This wording was virtually identical in the first wilderness legislation introduced at the outset of the 8-year campaign leading to the Wilderness Act. That first version provided that "there shall be no road, nor any use of motor vehicles, nor any airplane landing field or other provision for mechanized transportation..." Section 3(b) of S. 4013, 84th Congress, 2nd Session, June 7, 1956, 15.
12. "It is the '"cardinal principle of statutory construction"...[that] it is our duty "to give effect, if possible, to every clause and word of a statute"...rather than to emasculate an entire section.' *United States v. Menasche*, 1955, 348 U.S. 528, 538, 75 S.Ct. 513, 520, 99 L.Ed. 615 (quoting *NLRB v. Jones & Laughlin Steel Corp.*, 1937, 301 U.S. 1, 30, 57 S.Ct. 615, 621, 81 L.Ed. 893 and *Montclair v. Ramsdell*, 1883, 107 U.S. 147, 152, 2 S.Ct. 391, 395, 27 L.Ed. 431)." Cited in *Bennett v. Spear*, 1997, 520 U.S. 154, 137 L.Ed.2nd 281.
13. J. Michael McCloskey, 1966, The Wilderness Act of 1964: Its Background and Meaning, *Oregon Law Review*, 308, emphasis added. McCloskey was referring to the Secretary's proposed regulation, dated July 12, 1965. The portion of that draft quoted in the law review did not change in the final regulation as adopted a year later.
14. Stewart M. Brandborg to Edward P. Cliff, Chief, Forest Service, September 28, 1965, 3. Similar concern was expressed by the Sierra Club in a statement dated September 30, 1965.
15. Forest Service Manual 2320.5(3). This is the current manual provision, which was adopted sometime in the early to mid-1980s.
16. These BLM regulations were adopted in 1985 (43 CFR 8560.0-5). They were superceded by an updated set of wilderness regulations in 2000 (43 CFR 6301.5). The revised regulations expressly prohibit "bicycles, game carriers, carts, and wagons."
17. The courts have ruled that "An administrative agency is permitted to change its interpretation of a statute, especially where the prior interpretation is based on error, no matter how longstanding." *Chisholm v. F.C.C.*, 538 F.2d 349, 364 (D.C. Cir.), *cert. denied* 429 U.S. 890, 97 St.Ct. 247, 50 L.Ed. 2d 173 (1976).

Mountain Biking in Wilderness

Which Way?

by Andy Kerr

IN OUR EFFORT to designate additional federal wilderness areas, conservationists face a fork in the trail. The political alliance of traditional, muscle-powered recreationists who have historically supported wilderness preservation is splitting. While this constituency is united in opposing motorized recreation in wildlands, new technology now allows the enjoyment of the backcountry using non-motorized mountain bikes, a mechanized form of transport prohibited by the Wilderness Act.

The proliferation of mountain bikes in the backcountry—including many areas conservationists are proposing for wilderness protection—is resulting in mountain bikers organizing to oppose new wilderness designations. If not handled properly, this important faction of the human-powered recreation constituency may be driven into the willing arms of off-road vehicle enthusiasts.

Wilderness advocates have several options to address this challenge: (1) advocate to maintain the current prohibition against "mechanical transport" in the Wilderness Act; (2) create or modify proposed wilderness boundaries to avoid mountain bike conflicts; (3) amend the Wilderness Act to allow bicycle use; (4) except the Wilderness Act prohibition against mountain bikes on a trail-by-trail basis (while maintaining the ability of wilderness managers to regulate such use); (5) propose alternative congressionally sanctioned protective land designations that avoid the wilderness-mountain bike conflict; or (6) propose a new congressional designation of "wilderness lite."

Every choice, including maintaining the status quo, has consequences and involves tradeoffs. However, I suggest that alternative 4 is the best strategy and political choice to maximize both the number and size of new wilderness areas and—more importantly—maximize the protection against greater, impending threats to public wildlands.

Mountain bike impacts

The impacts of mountain bikes on wilderness can be categorized as (1) human safety, (2) social, (3) ecological, and (4) political. All are distinct, though sometimes confused in the minds of wilderness advocates and users.

HUMAN SAFETY. My casual interviews of other wilderness users often yielded concerns about the safety of mountain bikes. Many feared collisions between hikers and careening mountain bikers. When prodded, most did not volunteer a similar fear about a human runner or fast-moving equestrian. Nevertheless, the interviews uncovered no actual cases of collisions of any kind, but "close calls" with runners or equestrians.

SOCIAL. Not unlike the social differences between human-powered pedestrians and horse-powered equestrians in wilderness, there are also differences between human-powered pedestrians and human-powered bicyclists. Because it is socially unacceptable to simply state that one doesn't like a general kind of people (e.g., "eco-jocks"), dislike is often expressed as disdain for their activity, whether mountain biking, horsepacking, dirt-biking, etc. Adding a new, popular recreational use of designated wilderness may lead to additional cultural schism between user groups.

ECOLOGICAL. Little research has been done, and the few studies that exist are inconclusive, with most researchers suggesting that the impact of heavy boots or a fat tire on a wilderness trail is comparable and mostly depends on how the devices are used.[1] At most, mountain bikes might cause more erosion than hiking boots, but less than horseshoes. The concern that too many tire tracks cause environmental damage is no different than too many boots or too many horseshoes.

POLITICAL. The potential political contributions of the mountain biking community to wilderness designation are very significant and the topic of the remainder of this article.

Who are these mountain bikers?

A national study concludes:

> Mountain bike leaders are overwhelmingly biocentric in their thinking, believing that nature has intrinsic value exclusive of what it does for humans, that humans do not have the moral license to infringe on this right, and that many of our environmental problems are rooted in our societal tendency to dominate, control and exploit nature.[2]

Mountain bikers are essentially the same as many other wilderness advocates. They love Nature; they hate exploitation of the land. They grieve when they see clearcuts like other wilderness advocates. They simply prefer a somewhat quicker trip into and out of wilderness areas than do wilderness traditionalists. (The above excerpt may be somewhat less

applicable to the equestrian community, but they nonetheless are usually allies with conservationists in wilderness politics.)

Facing the real enemies

Conservationists face enough real enemies when working to preserve and protect wilderness: loggers, road-builders, miners, grazing permittees, and off-road vehicle users are the primary destroyers of wildlands, not mountain bikers.

Mountain bikers, hikers, and horseback riders are all products of different times. Fewer people ride horses today, but it was once a common method of traveling through wild country. Lighter camping equipment and more leisure time facilitated the explosion in wilderness hiking beginning in the 1960s. Most recently, new technologies have facilitated another kind of muscle-powered access to the wilds. The "mountain bike" was reportedly invented in 1979. Their popularity has since exploded. (Have you noticed the floor space devoted to mountain bikes at your local REI or EMS store lately?) New wilderness proposals in many states include areas with trails increasingly used by mountain bikers. Since mountain bikes are prohibited in designated wilderness, it is logical that mountain bike use would have become established in *de facto* wilderness (wildlands that are as wild and as important as designated wilderness, but without legislative protection).

Some citizen wilderness proposals include roadless units of 1,000 acres in size. This doesn't leave many remaining natural recreation opportunities for mountain bikers. Do we want the public to view the wilderness debate as one of rapacious loggers, voracious road-builders, gluttonous miners, and obnoxious off-road vehiclists versus water quality and quantity, fish and wildlife, and future generations of young children *or* a pissing match between elitist hikers and equally elitist mountain bikers? We may be forced to choose.

Alternative courses of action

As mountain bikers become increasingly organized and understandably concerned about their access to federal public lands, the wilderness movement will be forced to respond. The threshold question for wilderness activists is: with whom do you want mountain bikers to ally in future wilderness battles? If you really don't like them (for social reasons and perhaps concerns about human safety, because no case has been made on ecological grounds), and you believe that you can win new and adequately sized wilderness areas without the mountain bikers—then do nothing. Sit back and watch to see if the ORV crowd can make common cause with cyclists.

Wilderness advocates should embrace the mountain biking community as full partners in the wilderness movement.

However, if you believe that the mountain biker lobby is expanding in size and clout and that this major pro-wilderness constituency must be accommodated—or if you believe that bikers aren't now a major player but it would be politically disastrous for them to join anti-wilderness forces, and/or you believe that mountain bikers *could be* important allies in defeating anti-wilderness efforts—then you must choose another approach.

I am aware of at least one national conservation organization that has the goal of keeping mountain bikers "neutral" on wilderness designation. Usually in politics (as often in war), a constituency remaining neutral undoubtedly benefits one side more than the other (the "neutral" Swiss were more useful to Germany during World War II, while "neutral" Sweden was more helpful to the Allies). Neutrality is easiest for the neutral if the party no has interest in any particular outcome. However, when a neutral party does have an interest in the outcome, they can be expected to (quietly) support one outcome over all others even as they continue to publicly affirm their neutrality.

The political neutrality of the mountain biking community generally harms wilderness advocates and aids anti-wilderness forces. Indeed, how can wilderness advocates expect mountain bikers to remain neutral about legislation that could exclude them from the wild places they love?

Mountain biker interests, as manifested through the International Mountain Biking Association (IMBA),[3] have generally shown patience, thus far, in dealing with wilderness advocates and their proposals that could eliminate mountain biking from tens of millions of acres of public land.

IMBA's strategy regarding wildlands protection consists of engaging mountain bikers on the issue by broadcasting popular mountain bike routes that would be lost by wilderness designation and advocating for alternative non-wilderness protective designations that would both retain mountain biking and preserve Nature. IMBA has been restrained in its opposition to wilderness because most of its members are wilderness lovers. However, how long can mountain bikers support a law and concept that rejects their chosen form of enjoying wildlands, especially in cases where wilderness proposals include lots of favorite mountain biking areas?

Below are six alternative courses of action open to wilderness advocates regarding mountain bikes and the cases for and against.

1) MAINTAIN THE STATUS QUO. Wilderness advocates could simply lobby for new wilderness areas and ignore any conflicts with the mountain biking community.

Case For: The Wilderness Act bans "mechanized transport." Wilderness management agencies have interpreted this provision as banning mountain bikes in wilderness. Later, three agencies modified their regulations to explicitly ban bicycle use. Perhaps fewer wilderness acres will be protected under this alternative, but the integrity of the National Wilderness Preservation System will be maintained.

Case Against: The Wilderness Act is neither the 11th Commandment nor the 28th Amendment. It is a law with flaws that has allowed livestock grazing in most western wilderness areas, mining in many, even road-building and logging in extraordinary circumstances. Wilderness advocates need to work to concentrate on closing the loopholes that allow bulldozers, chainsaws, and bovines into designated and *de facto* wilderness, rather than defend a provision that keeps relatively harmless mountain bikes out. Wilderness needs mountain bikers as defenders, not opponents or "neutrals." Wilderness advocates will end up with fewer areas, and less protected acreage, if we let ourselves be diverted by this trivial collateral issue.

2) MODIFY WILDERNESS PROPOSAL BOUNDARIES TO AVOID MOUNTAIN BIKE CONFLICTS. Wilderness advocates could propose new wilderness boundaries that exclude popular mountain bike routes.

Case For: Excluding high-conflict mountain bike areas avoids the fight with the mountain bike community. The integrity of the Wilderness Act is maintained. Mountain bikers could then join wilderness advocates in seeking protection for these areas.

Case Against: Cherry-stemming and building corridors into and through wilderness proposals to exclude popular mountain biking routes will leave the wildlands more vulnerable to road-building, mining, logging, and off-road vehicle use. Unless the corridors are very, very narrow (wide enough for a mountain bike, but too narrow for a motorbike), four-wheeled motorized vehicles could use them. In addition, if wide enough to contain timber, the corridors could be logged as well. Whatever the width, mischievous mining claims could be filed and cause problems.

3) AMEND THE WILDERNESS ACT TO AVOID GENERAL CONFLICT WITH MOUNTAIN BIKERS. Wilderness advocates could support an amendment to the Wilderness Act allowing mountain bikes.

Case For: Wilderness advocates must focus all of their attention on the real threats to wilderness (logging, mining, off-road vehicles, etc.). Mountain bikes are likely no worse than hiking boots and less damaging to trails and watersheds than horses. We need the mountain biking community to be wilderness champions—not sitting out the fight, or worse, joining the other side.

Case Against: The Wilderness Act has never been amended. Re-opening the law for this issue is risky (because it could also result in further changes to the act) and unworthy because mountain bikes are inconsistent with the wilderness ideal. It is better to proceed on a case-by-case basis with the mountain bike community to minimize or avoid conflicts in wilderness proposals.

4) EXCEPT THE WILDERNESS ACT PROHIBITION AGAINST MOUNTAIN BIKES FOR CERTAIN EXISTING ROUTES WHEN DESIGNATING NEW WILDERNESS AREAS. Wilderness advocates could agree that specific mountain bike routes be included in new wilderness areas by providing for their continued use in designating legislation, subject to direction by wilderness managers to further regulate use, including banning mountain bikes if necessary to prevent resource damage.

Case For: Legislating mountain bikers' interests into future wilderness areas would convert mountain bikers into advocates for new wilderness. It avoids a political confrontation with mountain bikers that the wilderness movement cannot afford. Congress now makes statutory reference to maps to depict official wilderness boundaries. A new color could be added to depict specific existing trails that would be open to mountain bikes in new wilderness areas with specific statutory language defining the width of the routes.

Case Against: Legislating exceptions to the Wilderness Act is a slippery slope that could open the law to further amendment. It is better to designate less, but more pure, wilderness if politics dictate that mountain bike routes must be left outside of wilderness boundaries. Conservationists may have to choose quality over quantity for our Wilderness System.

5) PROPOSE AND SUPPORT OTHER PROTECTIVE DESIGNATIONS AS ALTERNATIVES TO WILDERNESS. Wilderness advocates could avoid the conflict by proposing existing congressionally sanctioned alternative designations such as national recreation area, national conservation area, national scenic area, wild and scenic river, or national monument to protect areas where mountain biker conflicts cannot be avoided or resolved.

Case For: The integrity of the Wilderness Act is maintained.

Case Against: Alternative protective designations should be in addition to (or overlay)—not in place of—wilderness designation and should protect and restore adjacent non-wilderness quality lands that still have natural and other public values worth conserving. Wilderness quality lands should be designated as wilderness.

6) PROPOSE AND SUPPORT A NEW CONGRESSIONAL DESIGNATION, PROBABLY NOT CALLED, BUT ESSENTIALLY, "WILDERNESS LITE." Wilderness advocates could propose a new conservation designation that is wilderness in every way except as pertains to mountain bikes.

Case For: The integrity of the National Wilderness Preservation System is maintained.

Case Against: If a "wilderness lite" category was accepted by Congress to accommodate mountain bikes, what else could such a designation allow that is not allowed in wilderness (logging, roads, mining, off-road vehicle use, aerial transportation)? If a weaker, politically easier compromise designation to wilderness becomes available to Congress, few, if any, additional wilderness areas will be established in the future.

The debate in context

The ramifications of any of these choices are many and varied. Below are some issues to bear in mind.

THE PRISTINE WILDERNESS ACT MYTH. Some wilderness activists assert with pride that the Wilderness Act has never been amended. Congress has periodically amended most environmental protection laws such as the Endangered Species Act, Clean Air Act, and Clean Water Act, but the original Wilderness Act remains as originally enacted by Congress in the United States Code. However, while not explicitly amending the statute, numerous provisions in subsequent wilderness bills do affect certain provisions in the Wilderness Act on an area-by-area basis. Exceptions have been made for water developments, livestock grazing, mining, motorized access, religious and cultural purposes, fire prevention, trail maintenance, management of hydrological, meteorological, and communication facilities, law enforcement, and other uses.[4]

THE ROLE OF WILDERNESS MANAGEMENT PLANNING. If allowed in wilderness, mountain biking—like hiking or equestrian use—would be subject to agency management

planning. So, if mountain bikes are too numerous and cause harm where they are legally allowed, then management restrictions would be appropriate to preserve wilderness character (just as for hikers and horsepackers).

OVERPOPULATION. An often unacknowledged factor in wilderness issues is the excessive number of people who use designated or *de facto* wilderness areas. Population growth is increasing while wildlands are decreasing. Our attempts to preserve more wilderness, without simultaneously addressing population growth, will preclude our efforts to protect, as the Wilderness Act calls for, "an enduring resource of wilderness." The reluctance of wilderness advocates to also be population control advocates results in our appearing elitist by attempting to limit the number people who enjoy wilderness areas.

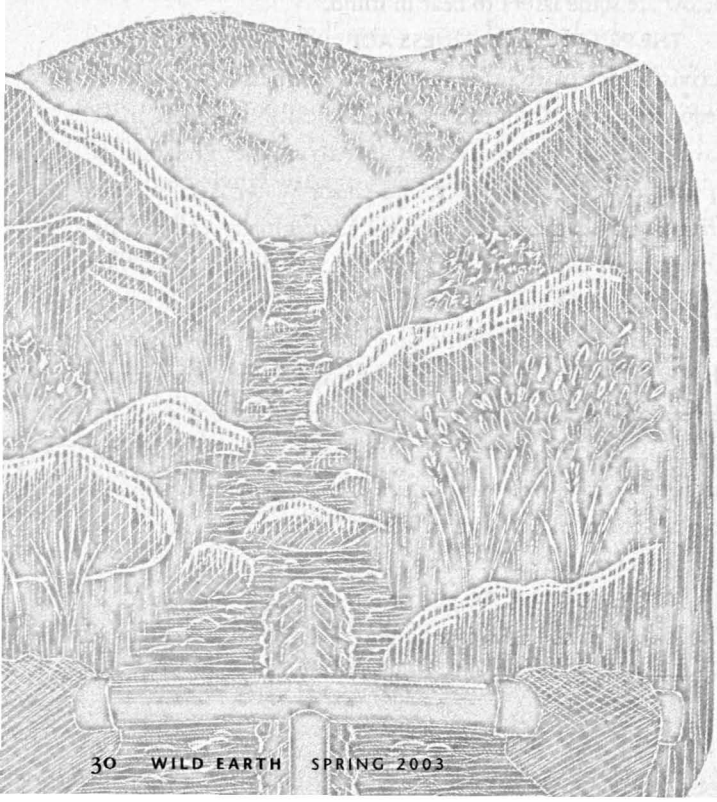
Recommendation

Wilderness advocates should embrace the mountain biking community as full partners in the wilderness movement. Like the hiking and equestrian communities, mountain bikers are natural wilderness supporters.

Edward Abbey famously noted that wilderness needed no defense, but only more defenders. It is a disservice to the wild and to the future of wilderness advocacy to get embroiled in a petty dispute between hiking and biking interests. Wilderness has real enemies that must be defended against. The people who would build roads, dig mines, log wild forests, graze cows, and drive off-road vehicles in the last strongholds of wild country on our public lands are the true wilderness enemies. They are powerful, but not as powerful as the rest of us—if we can only avoid internecine cat fighting.

Culturally, mountain bikers are much closer to hikers than to motorized recreationists. However, if the wilderness tent isn't large enough to accommodate mountain bikers, what choice do they have but to oppose wilderness to protect their interests? The enemies of wilderness are trying to exploit the mountain biking issue for their own gain. The Blue Ribbon Coalition would love to peel mountain bikers away from the wilderness advocacy camp.[5] Representative Jim Hansen (R-UT), former chair of the House Resources Committee, has attempted to amend the Wilderness Act to allow mountain bikes, and other politicians could try again in yet another cynical attempt to divide wilderness advocates.[6]

Wilderness advocates should ask themselves this question: *Am I first a recreationist or a conservationist?* If you answer "conservationist," then you should embrace mountain bikers as political allies. If you are a "recreationist" first, then you need to decide if you prefer automobile-filled roads, stump-dotted clearcuts, open-pit mines, cow-bombed meadows, and screaming two-stroke engines over having to step aside for an occasional mountain biker dude puffing by. ☾



Andy Kerr *(www.andykerr.net) was in the fourth grade when the Wilderness Act was passed. He has been involved in every one of the seven wilderness bills creating new wilderness areas in Oregon in the past quarter century. He has a "citified" mountain bike for use in town, and has no intentions to ever bike in the wilds.*

NOTES

1. M. Lanza. 2001. Trail shock: Studies weigh mountain biking and hiking impacts. *AMC Outdoors Magazine* April: 19–21.
2. S. J. Hollenhurst, M. A. Schuett, M. S. Olson, D. Chavez, T. Mainieri. 1995. A national study of mountain biking opinion leaders: Characteristics, preferences, attitudes and conflicts. Report PSW-93-0029CA, PSW-99-0034CA. Albany, California: USDA Forest Service.
3. See *www.imba.com*.
4. Ross Gorte. 1998. *Wilderness Laws: Prohibited and Permitted Uses.* Washington, DC: Congressional Research Service, 98-848 ENR.
5. Tellingly, the web address for the Blue Ribbon Coalition is www.*sharetrails*.org (emphasis added).
6. H.R. 3172 (101st Cong., 1st Sess.). This bill consisted of one sentence: "Section 4(c) of the Wilderness Act (16 U.S.C. 1133(c)) is amended by striking 'mechanical transport,' and inserting 'mechanical transport (except for nonmotorized bicycles)'." The purpose of this bill, cosponsored by more than a dozen Republican representatives, was to encourage mountain bikers to ally with conservatives and adopt their views on wilderness. This legislation died in committee; no bill has been introduced addressing bicycle use in wilderness since 1989.

Mountain Biking in Wilderness

Don't Tread Here

by Brian O'Donnell and Michael Carroll

RECENTLY A NUMBER of mountain bike organizations, a few members of Congress, and even some long-time wilderness activists have suggested that mountain biking should be permitted in congressionally designated wilderness areas. Such a change would require Congress to amend the Wilderness Act. Even if such exceptions to the Wilderness Act's prohibition on mechanized use were narrow, and not a wholesale opening of the National Wilderness Preservation System to cyclists, we believe the notion is dangerous: Mountain bikes are simply incompatible with designated wilderness.

We may seem like an unlikely duo to be making this argument. After all, we live in what is arguably the mountain bike capital of the world—Durango, Colorado. Our friends, colleagues, and neighbors are mountain bikers. Both of us are avid trail users and one of us is an active mountain biker. Neither of us comes from the "purist" camp of the wilderness movement. That being said, this debate has implications beyond mountain bikes and wilderness. It addresses a more fundamental question: Will we keep some parts of the American landscape natural and wild and free—or must every acre be easily accessible to people and their toys?

Mechanization is not consistent with wilderness

Wilderness areas not only protect Nature, but also provide an opportunity for people to experience and connect with wild places at a basic level, using muscles, not machines. Wilderness values—the reasons for protecting wilderness—go far beyond the traditional recreational uses of wilderness such as hiking, hunting, fishing, and camping, despite these activities' importance to millions of Americans.

We need to keep in mind what the Wilderness Act says. In its definition of wilderness, the act refers to protecting the "earth and its community of life" and "outstanding opportunities for solitude" before mentioning the word "recreation." Further, it refers to "primitive recreation," not just "recreation." This is no accident or oversight, but the very heart of the Wilderness Act.

Protecting a portion of our land from mechanized recreation was one of the main reasons that the National Wilderness Preservation System and the wilderness movement were created. As Aldo Leopold (a founder of the Wilderness Society) wrote in *A Sand County Almanac* in 1949, "Mechanized recreation already has seized nine-tenths of the woods and mountains; a decent respect for minorities should dedicate the other tenth to wilderness." While mountain bikes were not around in Leopold's era, dramatically increased mechanized use in the backcountry was. Wilderness areas offer an escape and provide a primeval experience for the wilderness visitor.

Some argue that allowing mountain bikes in wilderness is a decision that is open to the discretion of area managers. However, Section 2 of the Wilderness Act of 1964, which established the National Wilderness Preservation System, was clear about the intent of the system:

> In order to assure that an increasing population, accompanied by expanding settlement and growing *mechanization* [emphasis added], does not occupy and modify all areas within the United States and its possessions, leaving no lands designated for preservation and protection in their natural condition, it is hereby declared to be the policy of the Congress to secure for the American people of present and future generations the benefits of an enduring resource of wilderness.

Once wilderness areas are designated, the Wilderness Act requires that the areas be managed in a manner that "will leave them unimpaired for future use" and ensures the "preservation of their wilderness character." The mechanized nature of bicycles runs contrary to the concept of "wilderness character." This is especially true with today's high-performance, off-trail mountain bikes.

Not your father's mountain bikes

Mountain bikes' impacts on the land are large and getting worse. Since mountain bicycles were invented, technological changes have completely transformed the cycling industry. These changes include the development of lighter and stronger materials for frames, wheels, and components; suspension systems similar to those on dirt bikes, all-terrain vehicles, and SUVs; and gearing that enables riders to conquer slopes once thought too steep to ride. This new technology has made terrain previously open only to experts accessible to average riders, enabling more than just top athletes to ride through highly technical terrain deeper and deeper into the backcountry.

While most mountain bikers have continued to ride on dirt roads and well-established multiple-use trails, technological innovations have enabled bicyclists to engage in off-road and off-trail activities similar to those of dirt bikers and off-road vehicle users. This new style of riding has resulted in a dramatic cultural shift in the mountain bicycling community towards the "extreme" aspects of the sport including "downhilling" and "freeriding." This shift from the "backpackers with wheels" image to the extreme is apparent in all aspects of the sport. One need only to flip through the pages of the latest mountain bicycling magazine to see examples of this shift—a shift in *how* and, more importantly, *where* people are riding. From downhillers dropping off cliffs to freeriders skidding down steep washes like extreme skiers, the image and direction of mountain biking is being shaped by this new trend.

Coupled with this shift toward extreme riding, many mountain bicycling organizations have also launched aggressive trail construction programs. Like other trail-building groups, mountain bikers identify one-way loop trails as the ideal systems for their users. Loop trails are designed to have one control point or trailhead where the system begins with a wide variety of trails built off of that point that vary in length, terrain, and difficulty. The aggressive push of mountain bike organizations to build ever-growing webs of trails poses serious problems of habitat fragmentation, increased erosion, and wildlife conflicts.

As interest in extreme riding continues to grow, as trail networks burgeon, and as new technology makes it possible for ever-more mountain bicyclists to participate, even the most remote wild landscapes may become trammeled—and trampled—by knobby tires.

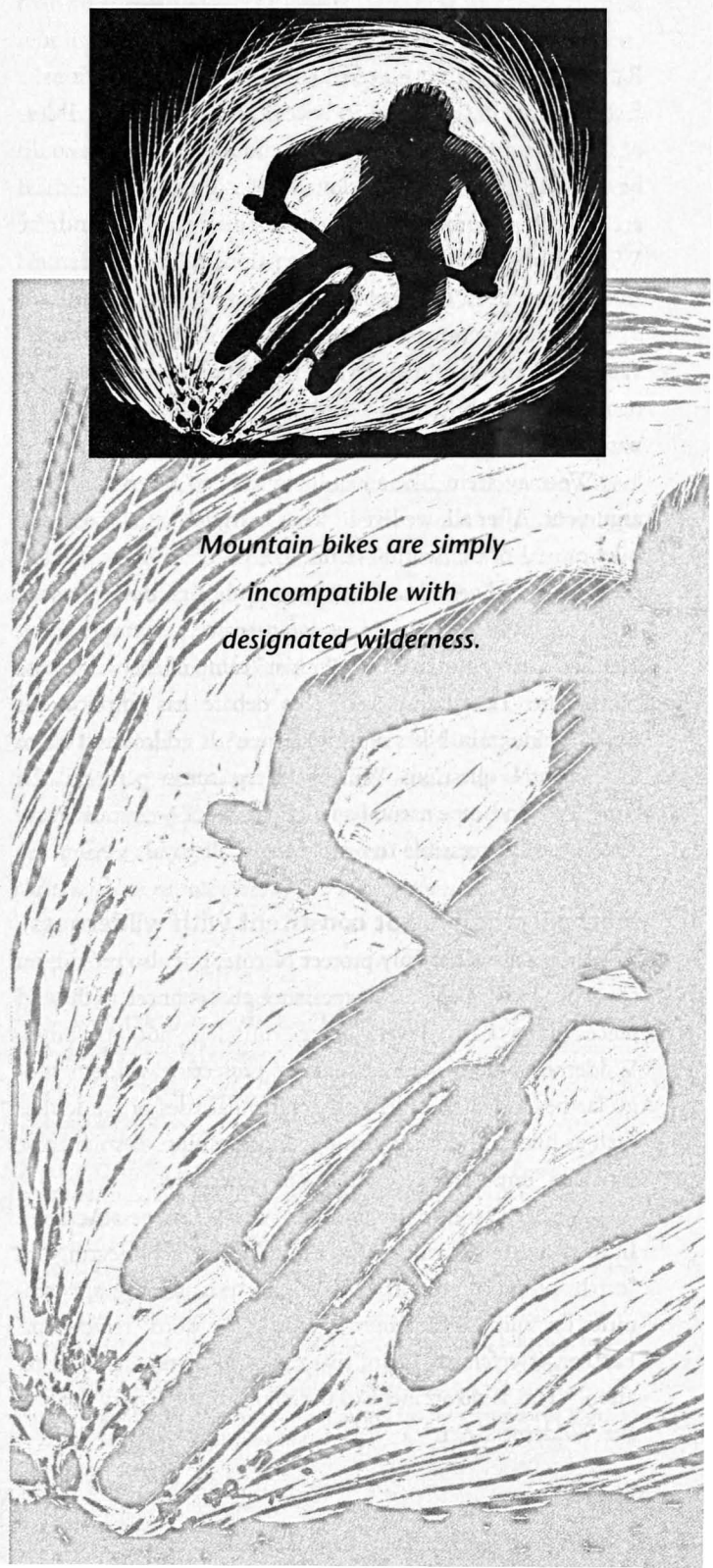
Mountain bikers are not excluded from wilderness areas

In a recent letter titled, "Mountain Bikers Beware," former U.S. House Resources Committee Chairman Jim Hansen (R-UT) wrote, "Mountain bikers would be prohibited to visit these areas if they are made wilderness." Not true.

While admittedly the technology has advanced, mountain bikers are not yet cyborgs. They are not welded to their bikes. Wilderness designation does not exclude mountain bikers, wilderness only excludes mountain bikes. This is an important distinction. Most mountain bikers pursue numerous recreational activities such as skiing, climbing, and hiking. They are not shut out of wilderness. Wilderness is meant to remain free from mechanical recreation, whether it is conducted on an ATV, motorcycle, or mountain bike.

Political landscape

Mountain bike organizations have on several occasions proven adept at organizing their members *against* new wilderness areas when they have feared a loss of access for bicycles. It would be a mistake, however, to believe that this



Mountain bikes are simply incompatible with designated wilderness.

organizing work would be transferable to advocacy *for* wilderness should the Wilderness Act be modified to permit bicycles in wilderness areas.

Would this new biking constituency swell the ranks of wilderness advocates, directly leading to congressional designation of significantly more wilderness? We contend that mountain bikers are, for the most part, more passionate about biking than creating new wilderness areas. They have organized most effectively when their individual riding opportunities on specific trails are at risk of being eliminated. It is a major stretch to argue that bikers, when not facing the immediate threat of closed trails, would participate in the political wilderness process (in favor of wilderness) with equal passion and effectiveness as they have previously demonstrated in opposing wilderness.

We must not forget the current political climate. Some congressmen who would amend the Wilderness Act or change its original meaning have an ambitious anti-wilderness agenda aimed far beyond the issue of mountain bike access. Opening the Wilderness Act to amendments that allow mountain bikes would provide a smokescreen behind which all manner of extractive industries and off-road vehicle organizations—think Blue Ribbon Coalition—would sneak in their own gutting amendments.

There is a better approach to resolving this issue than amending the Wilderness Act. Leaders of the mountain biking community and grassroots wilderness advocates have built a solid and mutually respectful dialogue. After a series of meetings, key leaders of the International Mountain Biking Association and of state and national wilderness groups have recently issued a joint statement of agreements. While we will not agree over every acre sought by both bikers and wilderness advocates, we can talk and find a reasonable meeting of minds. All over the country, local dialogue is proving successful. As a result, mountain bikers are a part of coalitions supporting numerous wilderness proposals, while key trails (often along the edges of the wilderness) offer access for bikers to enjoy wilderness vistas.

Increasing emphasis on habitat protection

With the growing sophistication of the ecological sciences we have learned a great deal in recent years. Conservation biology has rightfully entered the wilderness movement. In many states conservationists are prioritizing the protection of biologically diverse places over areas with scenic or recreational qualities. Wilderness areas are now seen as cores in connected networks of wildlands that serve many values, but with ecological integrity as the central goal.

The destruction of wilderness and the fragmentation of habitats and ecosystems is death by a thousand cuts. Will introduction of mountain bikes—and their penetration farther into wilderness—promote additional fragmentation and human conflicts with the natural world? Yes. In a time when ecosystem protection and wildlife habitat conservation has become the overriding rationale for saving wilderness it is inappropriate to consider weakening wilderness protections. The need is for more wilderness, protected all the more strongly.

Wilderness requires humility

Dave Foreman has written, "No other challenge calls for self-restraint, generosity, and humility more than Wilderness preservation." Protecting wilderness is truly about humility. Public lands policy should not be driven by a "what's in it for me?" ethos—for backpackers or bikers or any other recreational constituency. It should be about sustaining the health of the land community.

An ecological revision of President Kennedy's famous words should guide us: "Ask not what wilderness can do for you, but what you can do for wilderness."

Some have argued that the Wilderness Act needs updating. Yet this one piece of legislation has been a powerful, effective bulwark for nearly 40 years. It is folly to imagine a wilderness law that simultaneously protects wilderness ecosystems and provides the opportunity for a primeval wilderness experience but does not exclude mechanized uses.

A line must be drawn somewhere between which activities are appropriate in wilderness and which are not. The Wilderness Act correctly drew that line based on mechanization. We will grant that mountain bikes are much closer to that line than dirt bikes and other off-road vehicles. Nonetheless, a strong line has been drawn in the Wilderness Act, and it must be strongly defended. ☾

Brian O'Donnell *is associate director and* **Michael Carroll** *is communications director for the Wilderness Support Center in Durango, Colorado. The Wilderness Support Center (www.wilderness.org/ourissues/wilderness/wsc.cfm) works with grassroots groups across the nation to build and implement successful wilderness protection campaigns.*

Mountain Biking in Wilderness

A Modest Proposal

by Dave Foreman

SOME THINGS ARE OBVIOUS: mountain bikes do more damage to the land than hikers. To think otherwise ignores the story told by the ground. Although I have never ridden a mountain bike, I am very familiar with their impacts. For the last seven years I have regularly run three to six miles several times a week on a network of trails in the Sandia Mountain foothills two blocks from my home (recently, I've been walking these trails because of a back injury). These trails receive use from walkers, runners, and mountain bikers; they are closed to motorized vehicles.

Because I'm clumsy, I keep my eyes on the trail in front of me. I run or walk in all seasons, in all kinds of weather. I have watched the growing erosion on these trails from mountain bike use. The basic difference between feet and tires is that tire tracks are continuous and foot tracks are discontinuous. Water finds that narrow, continuous tire tracks are a rill in which to flow. Also, because many mountain bikers are after thrills and speed, their tires cut into the ground. Slamming on the brakes after zooming downhill, sliding around sharp corners, and digging in to go uphill: I see the results of this behavior weekly.

Some advocates claim that mountain bikes don't cause significant erosion on trails designed and engineered for their use. This may be true. On the one trail I run that seems to have been built for bikes, there is much less damage from tires. But what percentage of trails meets such standards? Few. Moreover, I regularly see mountain bikers cutting off cross-country, even on steep slopes, for more of a challenge. They seem blind and deaf to the damage they cause.

Admittedly, backpackers and horsepackers can cause damage to wilderness trails. But this is a poor argument to suggest that we add another source of damage to those trails.

Are mountain bikers conservationists, a powerful political constituency ripe to become wilderness advocates? I smell wishful thinking here. I suspect that most bicyclists don't go into the backcountry for contemplation or to experience self-willed land. They want an outdoor gymnasium. They're after speed and thrills. This doesn't mean they are bad people or can't be responsible when they pay attention. Some mountain bikers are conservationists and even support wilderness areas. I know a few of these folks. They are perfectly happy to walk in wilderness; they do not want to open wilderness areas to bicycles any more than they want them open to snowmobiles or ATVs. This is another point. Wilderness areas are not closed to mountain bikers any more than they are closed to me. Any mountain biker can hike in wilderness as easily as I can. (On the other hand, some of the macho fellows who ride motors in the backcountry have arteries that look like cheese-filled manicotti. They might be able to walk into wilderness, but will they walk out?)

Then there are active mountain bikers who are part of the anti-wilderness movement. One southern California mountain bike website spouts the John Birch Society lies about the Wildlands Project. One prominent mountain biking magazine is published by Hi Torque Publications, which also publishes five dirt bike and ATV magazines with strong anti-wilderness editorial policies.

Nonetheless, the growing number of backcountry bicyclists is an important political issue, and one that conservationists need to handle with care. (Other editorials in this forum show that wheels of any kind have never been considered appropriate in wilderness areas. I need not repeat their arguments.) We are faced with the possibility of many mountain bikers opposing additional wilderness areas. Can we continue to maintain the integrity of the wilderness idea, protect tens of millions of ecologically important acres as new wilderness areas, and keep most of the mountain biking community from joining motorheads and other opponents of wilderness? I suggest an open discussion within the wilderness community on the following strategy:

1) Existing wilderness areas must remain completely closed to bicycles and other human-powered wheeled contraptions.

2) No amendments should be made to the Wilderness Act.

3) In legislation establishing new wilderness areas, certain trails currently in use by mountain bikers and where resource damage is minimal may be specifically designated as open to continued mountain bike use in very narrow corridors excluded from the wilderness, but closed to motorized vehicles and extractive use. There are precedents for such corridors. For example, the Cebolla Wilderness Area under Bureau of Land

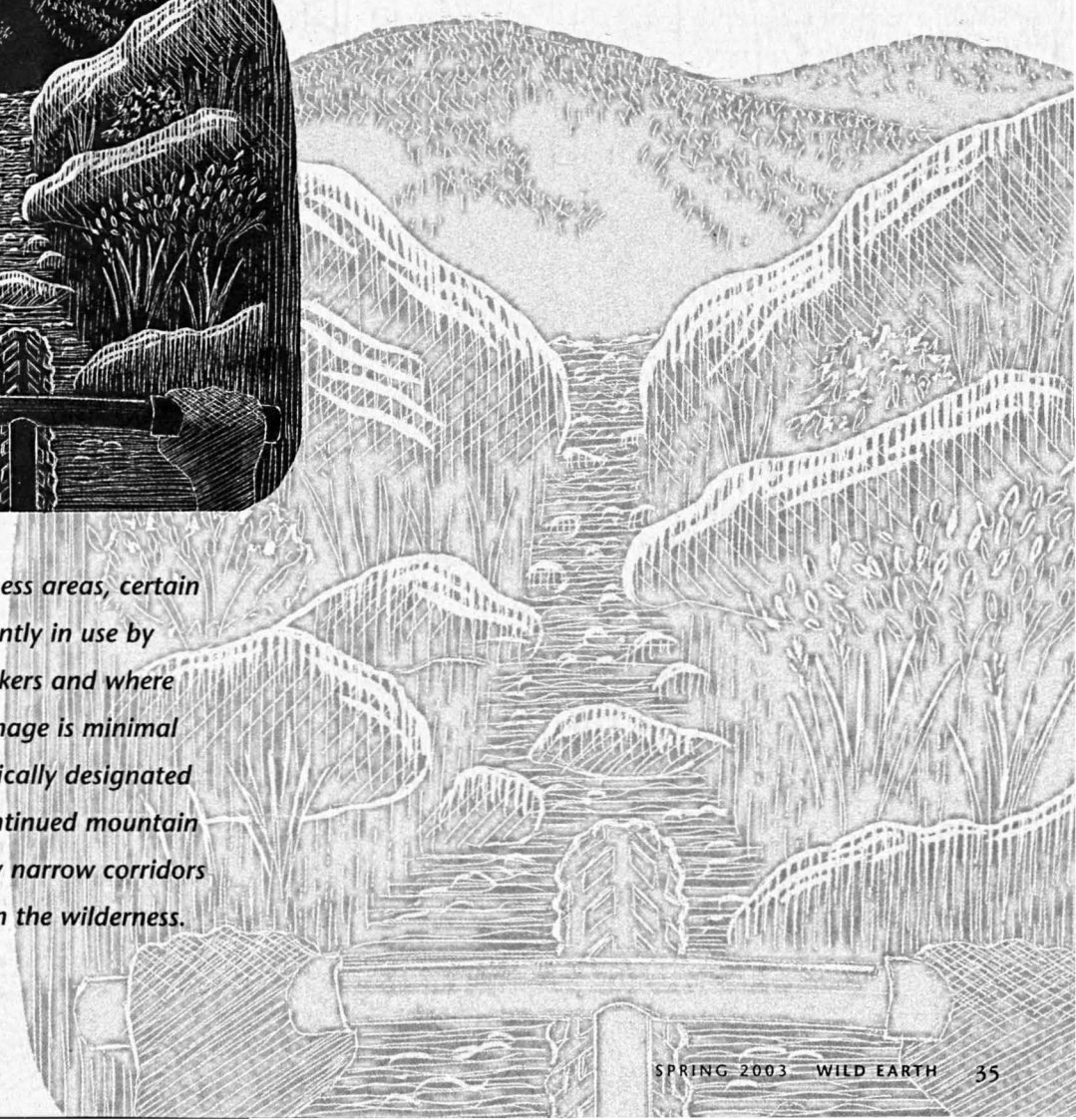
Management jurisdiction in New Mexico has several narrow vehicle corridors with locked gates open only to the grazing permittee. Such nonwilderness corridors are not ideal, but they are better than no new wilderness area being designated.

4) Such trail use should not be permanently mandated in law, but allowed at the discretion of the relevant manager so long as damage does not become excessive. Enforcement against motorized trespass and self-policing by the mountain bike community will be linked to continued access.

5) Where there are public land roadless areas laced with existing and popular mountain bike trails and where the impact is within acceptable limits, conservationists may want to propose designations such as national recreation areas or national conservation areas, instead of wilderness areas. (We do not need a new special designation.) These designations should still close the area to motorized use, timber cutting, and other extractive uses. We should be very conservative in making these alternative designations, however. Wilderness—not "wilderness lite"—is still the best option for protecting wild places for Nature and traditional backcountry recreation.

These guidelines could form the basis for honest talks between wilderness conservationists and responsible mountain bikers on how to protect and restore the ecological health of our public lands while allowing reasonable access for muscle-powered recreation. ☾

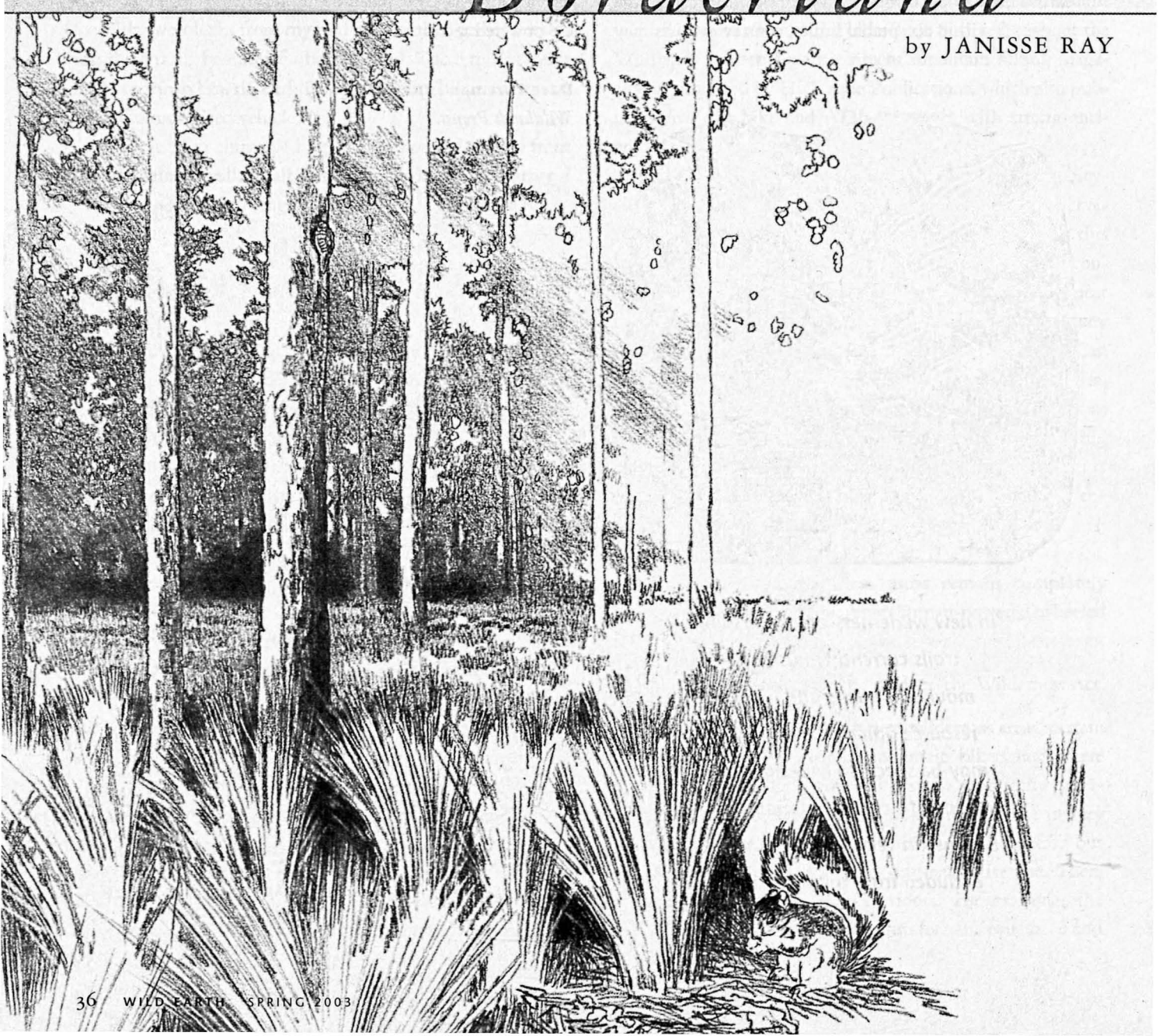
Dave Foreman *is publisher of* Wild Earth *and chairman of the Wildlands Project.*



In new wilderness areas, certain trails currently in use by mountain bikers and where resource damage is minimal may be specifically designated as open to continued mountain bike use in very narrow corridors excluded from the wilderness.

Borderland

by JANISSE RAY



I HEADED FOR LONGLEAF pine forest, driving south from the farm, crossing the state line into Florida at Jennings. From any direction the landscape, agricultural and silvicultural, wouldn't be much different. Was there no rest for land anywhere?

Cotton field. Pine plantation. House.

House. Cotton field. Clearcut. Pine plantation. Trailer. House.

Hardly any forest was left. It flew past me. Field. Plantation. Field. Clearcut. Church. Trailer. Field. I saw this everywhere I went.

Across the state line, I pulled over for a roadkill raccoon. I wanted to make my son Silas a coonskin cap, and I needed the tail; where the coon had been killed, a hawk was dead, too, hit on the road, and I moved both of them to the grassy ditch and sawed off the coon's tail. I felt odd, taking the tail like that, dumping the young coon cheerlessly by the road, but the tail was large and bushy, striped, pretty, and Silas would value it.

Where I-75 crosses the county road, I stopped at a convenience store. The store was full of cigarette smoke, and against my better judgment I bought a box of crackers, brushing away a coat of dust to read the price.

More fields, more young pines. A few houses. Then, when I got to Blue Springs State Forest, where County Road 143 meets State Road 6, there was forest.

Longleaf forest.

It stood out like a kingdom of heaven, suddenly tall and very green, praising the sky. It triggered something in the back of my mind—some prehistoric, mossy, creaky memory of what the forest that used to be here, that once covered this land, looked like. It came edged out, this old memory, as if I had been suffering from ancestral amnesia and had just been hit on the head.

You'd have to drive a hundred, two hundred miles to see anything like this. I was glad I had.

We have so little left that we're forgetting what it looks like. In books at home and in files and in my mind I have pictures of longleaf pine forest. I've seen two virgin tracts, and some handsome, mature ones. Still, I forget. What about people who don't know how it was—young people and newcomers?

They may not like it at first. The forest takes some getting used to, because there's only one kind of tree. Some people want more tree diversity than that—they want to be able to stroll through a forest and say, "Magnolia. Maple. Hornbeam. Cherry laurel." I'd send those people about a mile west to the Withlacoochee River and have them meander in the floodplain.

But here, in the uplands, that was the way it was supposed to look. One kind of tree—longleaf pine—everywhere I turned. Sometimes I want diversity—I don't want to wear blue every day—but with these pines, I want stability. I want them relentless in their monotony, their monarchy. Only a powerful tree can claim a whole landscape for itself, a piece of a continent, from Virginia through the Southern coastal plains, clear out to east Texas, 93 million acres. It has to be a noble, indomitable tree.

GROWING UP in Georgia, I witnessed a fragmented landscape, with only pieces of true forest left here and there. The landscape, I thought, mirrors our lives. For obvious reasons, then, and for reasons not so obvious, I began early to associate homeland with loss.

Somehow, as the landscape fell apart, so did what bound humans to it. Perhaps what got increasingly lost were the stories we told each other—about the hornet's nest we found in the woods while walking, or ghostly flutterings through a dark wood that turned out to be phosphorescent moths. Perhaps we needed each other less to weather the vagaries of a life dependent on the world, on rain and trees and sulphur springs, or to help interpret the mysteries of the world as they were destroyed.

Decade upon decade, a sassafras stood in the middle of the upper field at the farm, a record-size sassafras. Carefully, year after year, my grandfather and my uncle plowed far around it, and when the tractor chopped its roots into pieces, they gathered them and brought them home for my grandmother to make tea, a spring tonic. After my grandfather died and the fields were leased, perhaps the farmer plowed too close to the tree, and whether this was the reason for its death or whether it died of some other, natural cause, I do not know. But die it did, leaving a hole in the middle of the field where it had stood. Some of us had used the tree as one might use a particular mountain, to orient by, as a landmark. In its dark limbs, the sassafras held the stories of my family and my people.

longleaf pine forest, graphite by David Williams

How fragmentedly we live, in broken families, crippled communities, landscapes chopped into pieces; we become disconnected from the sources of our survival, the land and each other, alienated from the earth and from things that hold meaning. I had come back to the farm to live in the stories of my people, to live a life that made sense. Somehow it wasn't working. Too much had been lost. Instead of wholeness I was finding scraps. Day after day I stared my life in the face, examining what I was missing. I was desperately lonely in the fragmentation, which was as much grief as anything, hanging on to remnants of beauty, spirit, art, touch, truth. For months I had felt cut off from the landscape of poetry. What else to call magic and spirit and truth? I had found only glimpses. Bitterly now I admitted that I had been torn apart in my homeland, these coastal plains, separated from intimacy, cut off from much of what I knew myself to be, waiting for the chance to flourish, to grow again. Waiting for what might not happen—for the logging to stop and the land to heal, and simultaneously for the communities that depended on the land to function again.

The last summer I lived in Montana I noticed on the ground by an interstate exit a sign that had belonged to a homeless person, ballpoint letters on a scrap of cardboard, and I stopped for it. "Anything Will Help," it said, and I hung it on my apartment door, seeing it as found art, and a good reminder to myself to be helpful. Now I felt something of what that signmaker must have felt.

I WENT TO Blue Springs to write a story. I parked and walked out into the forest, eating cheese and crackers (they *were* stale). I sat on a pine log, eyeing an empty gopher tortoise shell. Soot from a recent burn soon streaked my pants black. The forester arrived. He worked with the state Division of Forestry, the lead management agency for this tract, which was almost 2,000 acres, purchased in 1994. Previously it was owned by Champion International and managed as a quail-hunting preserve for the timber company's executive guests.

"This was their playground," Doug, the forester, said. He looked like Dustin Hoffman, clean shaven, with chocolate eyes and dark eyebrows; his black hair threw gray sparkles in new sunshine. It had been raining for two days and I was camping that night, so I welcomed the sun.

Dustin Hoffman drove me around the hunting roads. He answered questions, but he wasn't verbose. The trees were 50 to 95 years old, most around 75. Foresters burned about 600 acres a year. Longleaf restoration was under way in the few fields on the property. The red-cockaded woodpecker cavities might have been abandoned—the birds hadn't been seen since 1994—although one cavity appeared active. He saw a bobcat there once.

He told me that gopher tortoises in the forest had been dying. Last year, after a prescribed burn that torched the waist-high grasses, between 30 and 40 shells were found, glaring bone white against the scorched ground. "They were in different stages of decomposition," he said. "They didn't die in one year's time." In the forest across the highway, the loss was worse. "You could quickly count 50 shells."

red-cockaded woodpecker, graphite by David Williams

Joan Diemer Berish, renowned tortoise researcher, tested live animals on the sites for the respiratory virus they can carry. The tests came back negative. Why, then, were the tortoises dying? Was it fragmentation of a landscape they depended on?

It wasn't until the forester showed me where to camp and told me the gate combination, just before he left, that I learned what lay inside him. He confided how much he loved his job, caring for the state forests. "You're excited about camping out here," he said. "It's kind of like that every day for me. Work is something I look forward to."

"You're a lucky man."

"I know," he said. "On every wood desk that's made, a skull and crossbones should be carved."

AT BLUE SPRINGS, I hiked for hours, miles in the forest, and was never bored. I spotted almost every species of woodpecker possible. A juvenile raccoon scrambled up a sapling and peered around at me. Deer tracks sprinkled the ground. In this one piece—nearly 2,000 acres—the longleaf forest could almost be what it was supposed to be, even while it was surrounded by clearcuts and pine plantations and fields.

THAT NIGHT, as a young owl made her harrowing cry in the dark, I was cradled in poetry. The next morning I rose early and walked again. Before I dismantled the tent, I again lay awake in it, loving the warmth, the quiet, the stillness, my drowsiness, 2,000 lovely acres completely to myself, wondering again why it had been so long since I felt whole.

Most of the longleaf trees in the Blue Springs forest weren't old growth—their crowns hadn't begun to flatten, nor had they gone to heart pine. But they were close, closer than anything for hundreds of miles, a forest springing from the fields, plantations, and clearcuts. I wanted the forest left alone to be as whole as it could be. I wanted it to be what it had always been, what it wanted to be. I wanted it for all the years of my life, and beyond. ☾

Naturalist, activist, and writer **Janisse Ray** *returned to her native home, the coastal plains of southern Georgia, in 1997. Her experiences reconnecting to the land and culture are described in her forthcoming book,* Wild Card Quilt: Taking a Chance on Home *(Milkweed Editions, May 2003; www.milkweed.org), from which this essay is excerpted. Her first book,* Ecology of a Cracker Childhood, *has won several awards, including the Southern Book Critics Circle Award.*

Pygmy Owl

You know how strong
fate can be, but can you imagine
the sharp stab of the talons
to the back of the head?

The pygmy owl drops on a steep angle
a collision course with the ground
wings splayed
like an angel.

It falls with fervor
upon Mouse
one of the world's warm breathers
groceries in a grey sleeve of fur.

Did you not think
the same could happen to you?
And is it any different
than love?

The owl pulls hard
tearing at tissue and tendon
it waves the tiny carcass around
like a victory banner.

Charles Finn

On Loons and Language

A Conversation with Jeff Fair

BIOLOGIST AND WRITER **Jeff Fair** has spent a considerable chunk of his adult life in the company of loons. Beginning in 1978, he was one-half of the first field team that surveyed common loons in northern New Hampshire for the Audubon Society of New Hampshire's Loon Preservation Committee. In love with the North Country landscape as much as with loons, he directed this recovery effort from 1981–1991. Thereafter, Fair returned to fieldwork as a consulting biologist studying loon populations on large, hydroelectric reservoirs in northern New Hampshire and Maine.

In 1995, Fair migrated to Alaska, where not one but five species of loons summer and nest. His focus now includes the rare yellow-billed loons of extreme northern Alaska, but he returns briefly to New England each summer to participate in ongoing loon studies.

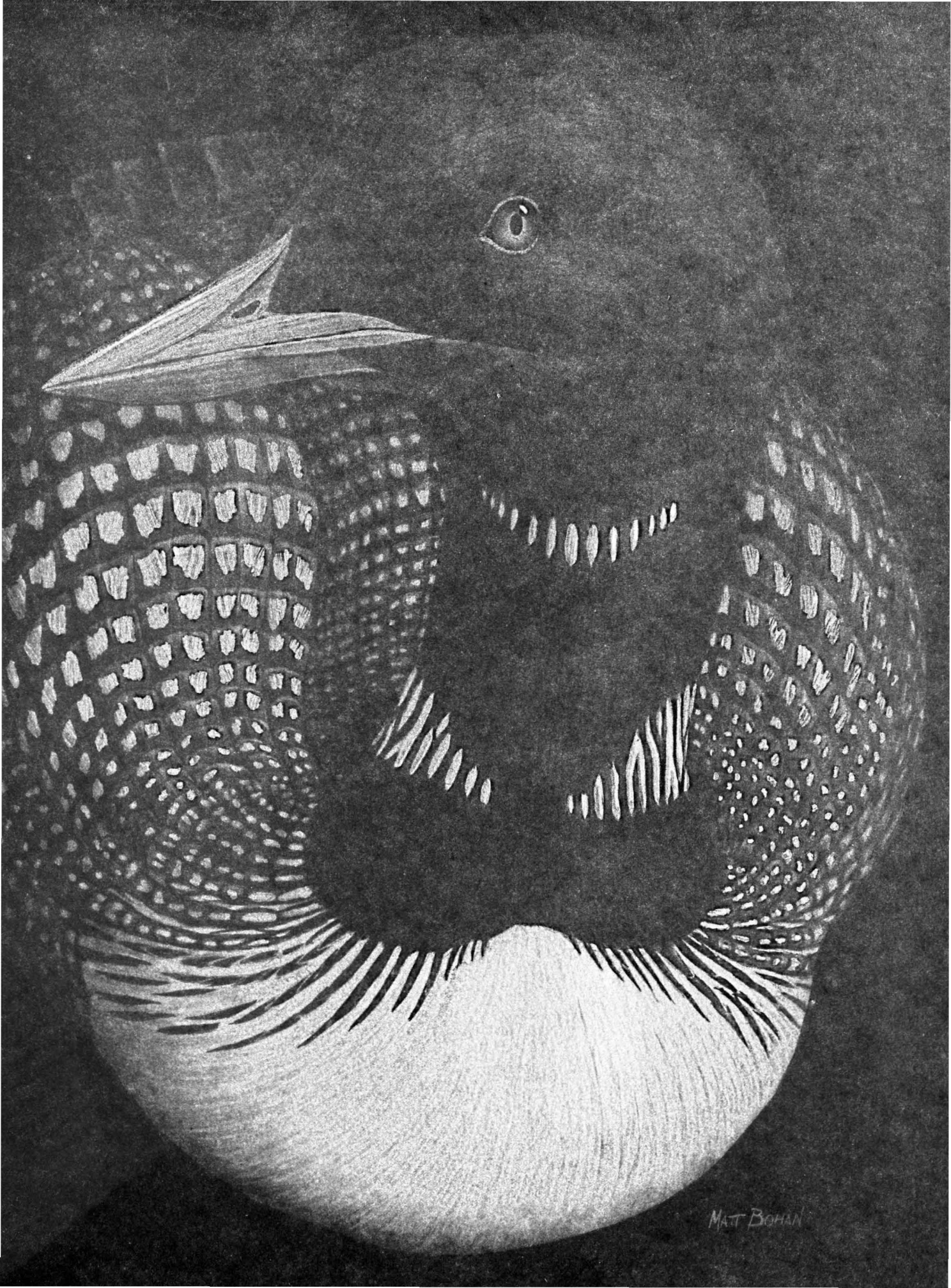
Jeff Fair is the author of four books, and an essayist whose work has appeared in *Natural History, Alaska* magazine, the *Christian Science Monitor, Equinox, Wild Earth,* and other publications. He is a contributing editor to the Appalachian Mountain Club's biannual journal *Appalachia*.

Wild Earth editor **Tom Butler** arranged to meet and interview Jeff Fair on August 19, 2002, at a place where they would likely see common loons—New Hampshire's Second Connecticut Lake. That water body, just south of the Canadian border, is one of a series of artificial lakes created by hydroelectric dams along the Connecticut River's upper reaches. Their wide-ranging conversation on loon ecology, language, and conservation, part of which is published here, transpired over an afternoon spent paddling a canoe and sitting on a cobble beach on the lake's far shore.

TOM BUTLER: There are five species of loons?

JEFF FAIR: At last count, yes: the common loon (*Gavia immer*) that we see around here, and the red-throated (*Gavia stellata*), arctic (*Gavia arctica*), Pacific (*Gavia pacifica*), and yellow-billed (*Gavia adamsii*) loons. The Pacific and arctic loons are very similar, almost physically identical. Together, they used to be called arctic loons, but the species was split into two, due to some minor physical differences. Most of the birds that used to be called arctic loons in the U.S. are now Pacifics. Arctics are their Asian counterparts, although a few nest in Alaska. The genus is holarctic in distribution, with loons nesting across North America, Greenland, the British Isles, northern Europe, and through Siberia.

common loon, watercolor by Matt Bohan

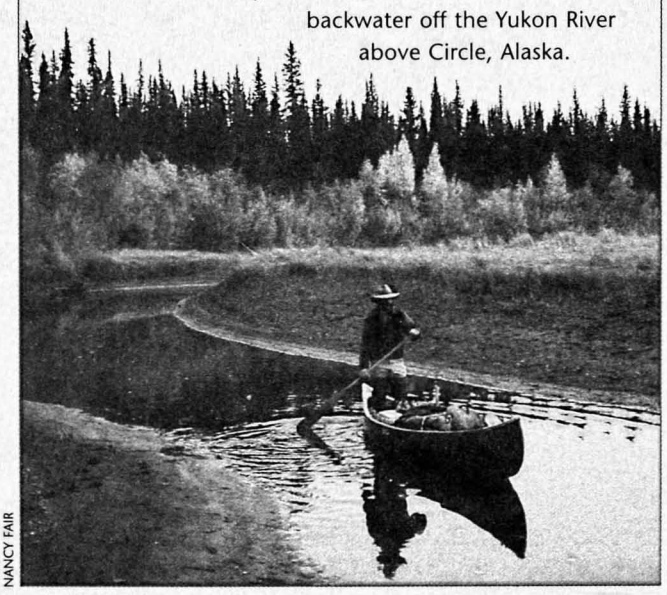

MATT BOHAN

You've spent much of your career working to conserve common loons in northern New England. Are populations decreasing in the Northeast?
It appears that they are stable and possibly increasing slightly in areas where they were most threatened in the past.

What are the primary threats?
The basic threat to loons is human behavior and attitude, and so is the basic answer. Everything flows from that, whether it's water level changes for recreation or hydropower, disturbance by boats, disturbance at the nest, or enhanced predator populations. At one time shooting was a major threat. Fortunately, we don't get much of that anymore. We're also poisoning them with heavy metals and other toxins.

Do you think that sinker swap programs—getting anglers to clean out their tackle boxes and exchange their old lead sinkers for steel—will be helpful?
Definitely. Mark Pokras's research down at Tufts University suggests that lead poisoning from ingested sinkers is the primary cause of unnatural death for adult loons in the Northeast. I don't know how significant that mortality is, relative to the region's population, but it's certainly part of the problem. And we have a solution to it. Sinker swap programs also raise the issue, educate people about loon ecology, provide an example of positive management, and give us fishermen—and there's a lot of us who love to fish—a chance to help the loons.

"A lot of what happens biologically out here really is magical; there's a great beauty and wonder to it, and we can't reduce it completely to statistics and data."



Jeff Fair looks for loon nests on a backwater off the Yukon River above Circle, Alaska.

NANCY FAIR

People are fascinated with loons. We celebrate their songs as the voice of the wilderness, and we find them especially beautiful. You've spent more than two decades of your life with them. Do you love loons?
I guess you could say that.

They're not just an object of scientific curiosity?
No. I must admit, they were simply an excuse for me to get into the North Country when I was first looking for work as a biologist up here. Now I'm pretty connected to them. I think people always have been. They're a high-profile species in many human cultures. [*We have paddled a mile or more and not seen a loon. Now, in the far end of a shallow cove we spot what appears to be a loon chick. It dives and though we watch closely, we do not see it resurface.*]

Loons are an icon for conservation action—a flagship species—but as far as we know, they're not an ecological keystone, are they?
No. As far as we know, at least in the short term, this system would continue to function pretty much as it has, whether loons are on this lake or not. But the common loon *is* an indicator species of habitat quality—and I don't mean simple human presence or absence. Loons and humans have coexisted for millennia. But if humans are around, we need to be aware enough to avoid behaviors and habitat changes that might push the loons out. If loons disappear, look for a poison in the habitat, or human activity that is negatively affecting them.

So loon persistence is an indication of cultural accommodation?
Or commensalism of a sort, yes, where humans coexist with them. You called loons a flagship species; I call them a "jumping-off" species—loons get people involved. Once you're attracted by loons, you begin to consider the fishery, and the water quality, and where you never gave a whit about a Jefferson salamander, now you're protecting its habitat. Pretty

soon you realize that when you're protecting loons, all of a sudden you're involved with other species as well. The connections become apparent, including those to your own health. When loons are full of mercury from the fish they eat from these lakes, then you know that when you eat the fish, you're getting poisoned, too.

But the basic attraction stems from their beauty?

That, and as you said before, they represent the wilderness—or the wild character of places that we live in and enjoy, too. And then there's that haunting voice. I've heard a lot of stories of people being afraid, the first time they hear it. And scary things often become beautiful to us—high, rugged mountains, white-water rivers, grizzly bears, and so on. Finally, loons are mysterious. They can be right here in front of us one minute, dive, and we never see them again. [*Off a nearby point of land, two adult loons appear, about 100 yards apart and converging.*]

Loons seem to embody wildness. It's not possible to keep them alive in captivity, is it?

Not for long. Most loons in rehabilitation centers die in a few days or weeks. The longest they've been kept is just over a year. They definitely embody wildness, and part of that is their reticence and disappearing acts. Native Americans heard them as human spirits, or auguries of death, voices from the distant time. I don't think much has changed.

Speaking of distant time, aren't loons the oldest bird lineage in North America?

We used to say that, and we know that loon-like birds go back roughly 60 million years. They are often called "primitive," and they are on the first page of taxonomically arranged bird guides, but they're actually highly specialized in their current forms, which probably appeared about the same time as many other bird orders. It hardly matters though. It depends on what you define as a "species" to say how old it is, and that definition is under scrutiny now. Loons may not be as primitive as we thought, but they certainly bring back that primordial time to us humans.

There have been humans in this particular landscape for maybe six or eight thousand years. The loons were here long before that—so in that respect they are our elders.

Yes, they are our elders. They were here when we first came and have been here throughout our history.

Are you hopeful that there will be loons here in 10,000 years?

I'm not sure I can even imagine 10,000 years. If they make it—if we all make it—another hundred years, I think there's hope. So for now, we'll do what we can, and then it'll be for our kids and their children to celebrate and worry about. Of course I hope they'll survive. I think loons bring out a part of human nature that's pretty wild, and our interaction with them is one of the richer parts of our life in this part of the country. [*The loon pair is together now, not far off our starboard bow. A bald eagle materializes from shore and flies over. One of the loons raises its voice in a mournful-sounding cry, which echoes around us.*]

They're calling for their chick?

I believe so.

Tell me a little bit about loon vocalizations.

Bill Barklow, a professor at Framingham State College, did his Ph.D. work on the meanings of loon calls, which really advanced our knowledge. [*Loon song again in background.*] Common loons use four basic calls, and we know generally how they function, but there are quite a few variations—loons may attach part of one call to another at times and do a lot of juggling with the different calls. [*Another call from the adult.*]

And what we're hearing now is...

That's the *wail*, sort of like a wolf howl. There's also the *tremolo*, the *yodel*, and the *hoot*. And a number of whistle-like calls uttered by the young chicks. The hoot is a short, one-note call, usually given quietly, but sometimes you can hear it fairly audibly among family members when they are close together. You might get a loon's attention by making a short hoot—it may look at you or even move a little closer. The wail, which we're hearing now, is generally about getting the family together. You're likely to hear it when one adult leaves the nest and calls for its mate to take over incubation. In Alaska, and now here today for the first time in New Hampshire, I've heard loons wail when an eagle flies over, which makes sense, because an eagle is a potential predator of loon chicks. Bringing the family together provides group protection. The tremolo generally indicates excitement or distress, and it's the only call given in flight.

The yodel is especially complex, and probably conveys a lot of information. Why else would loons have evolved such a complex language? So thinking of merely four calls with four meanings is sort of like saying that if we have 100 words in our vocabulary, we can only have 100 thoughts. Seems to me

it's more infinite than that. It's reasonable to think that there's a lot more meaning in the vocalizations of loons than we know, or perhaps can know. Anyway, the yodel is the territorial call, given only by males, as far as we know.

Do males have non-overlapping territories?

Pairs have non-overlapping nesting territories. If there's an incursion by a strange loon, the male will often yodel to establish territorial rights, and if things escalate, the female may tremolo along with him.

You mentioned the complexity of the yodel. What do we know about it?

Loon vocalization is being studied by a number of people, including Charlie Walcott at the Cornell Lab of Ornithology and Dave Evers at the BioDiversity Research Institute in Maine. In the early days of this research, biologists were analyzing yodels to see if we could tell individual males apart by their voice prints—audiospectrograms. At that time it was assumed that we couldn't efficiently capture and handle loons. Dave Evers later developed a technique for safely capturing and banding them with colored leg bands so that we can recognize individuals.

Now that there are hundreds of loons banded, this group of researchers is able to record yodels from the same territories year after year, to answer questions like, Is it always the male yodeling? Is it the same individual year after year? and so on. Then a few years ago, they began to notice a surprising phenomenon: a different color-band combination appears on the territorial male—a different male has moved into the territory—but its yodel is statistically indistinguishable from that of the original male.

And those new loons are not in the same kin group? They haven't just learned that song from Dad?

In fact, they have changed their yodel, because some of them had been recorded on their former territory with a different yodel; then they move to the new territory and have a yodel indiscernible from this territory's former male.

So where does the song come from?

That's the fascinating question. We know that an animal's call is often developed in relation to its environment. [*One of the loons, now very near our drifting canoe, delivers a nervous laugh.*] Many loon calls, like that tremolo we just heard, are about the same frequency or pitch as the cries of gulls. It's a frequency that carries well through the white noise of aquatic environments. The calls have a specific shape that is molded by the landscape.

I got the idea that, if a male loon's yodel changes when he enters a new territory, perhaps he's describing that new terrain. Just as I would come out here on this lake and describe this place and then go to Manhattan and describe that place, you would change your description of Manhattan and here in a similar way—and our descriptions of each place would be similar. I see potential in this explanation. I'd been reading David Abram's book [*Spell of the Sensuous: Language and Perception in a More-Than-Human World*] just before I first heard about this. I couldn't help wondering, if aborigines in Australia map the land with language and songs—could the loons be doing something similar?

Now think of this: During all the yodel recording we've done—dozens of loon territories across twenty years—no one noticed a territory's yodel change. But through natural attrition, we should have expected roughly 5% changeover of adults each year.

What is the life span of common loons?

We believe it's 20 or 30 years, probably not more than 20 years as an adult breeder. If we assume 20 years, then each year one-twentieth of a stable population would be replaced. One-twentieth of the yodels, if they were peculiar to the individuals, would have changed. We didn't see it.

Would you expect an individual to return to the same territory every year?

We used to believe that loons were fiercely monogamous and always returned to the same territory. With Evers' banding evidence, we now know that it's more like an 80% fidelity to the territory. That means that we might expect about one-fifth rather than one-twentieth of those yodels to change. But they didn't. Some biologists have speculated that the yodel might be related to the female, the mate—but now we know that the mates change about one-fifth of the time. So it seems to me more likely that...

...They are singing the landscape?

I think so.

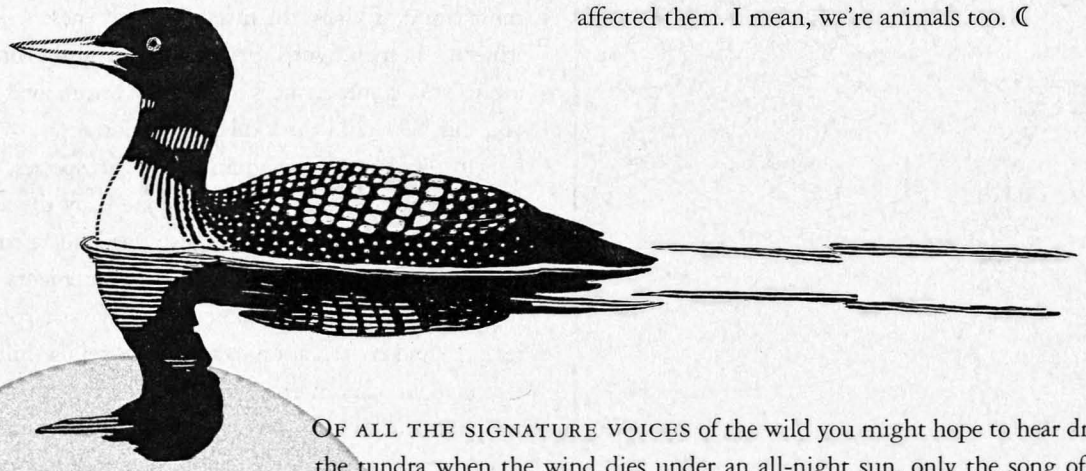
Or the landscape is singing through them.

I like to look at it that way. All living things are part of the landscape, after all, made of its elements. [*Another loon wail from one of the pair, and a chick suddenly appears with them.*]

What makes this landscape language sound so lovely to us?
Well, in biological terms, I'd call it...magic.

That's a beautiful way of putting it.
I like the paradox; we need to marry our science to our wonder. All the best scientists have that sense of wonder, or they wouldn't be interpreting things in creative ways and exploring toward greater truths. A lot of what happens biologically out here really is magical; there's great beauty and wonder to it, and we can't reduce it completely to statistics and data. There's room for a little bit of magic in our interpretation and a lot of celebration of the wild creatures we study.

This notion of language being affected by landscape—do you ever speculate about what the loons are saying about a particular place?
I don't. In order to speculate on that, you'd have to know how a loon receives its world, and I don't think we can ever know that. Without being anthropomorphic, though, we can put such a consideration in human terms and think about human cultures in various landscapes and how the landscapes have affected them. I mean, we're animals too. ☾



Yellow-Billed Loon

Anthem for the High North

by Jeff Fair

OF ALL THE SIGNATURE VOICES of the wild you might hope to hear drifting across the tundra when the wind dies under an all-night sun, only the song of the yellow-billed loon signifies the arctic north alone. The keening of wolves, the clamor of snow geese, the counterpoint of ravens, the bellow of brown bears, the cries of lonely petroleum geologists, and even the strains of the four other loon species may be heard across a broader range of latitudes and habitats. Among them, only *Tuullik*, the yellow-billed loon, sings exclusively above 65° north latitude, here in Alaska. This is the voice of the high north, shaped by the latitude and the lay of these boreal prairies.

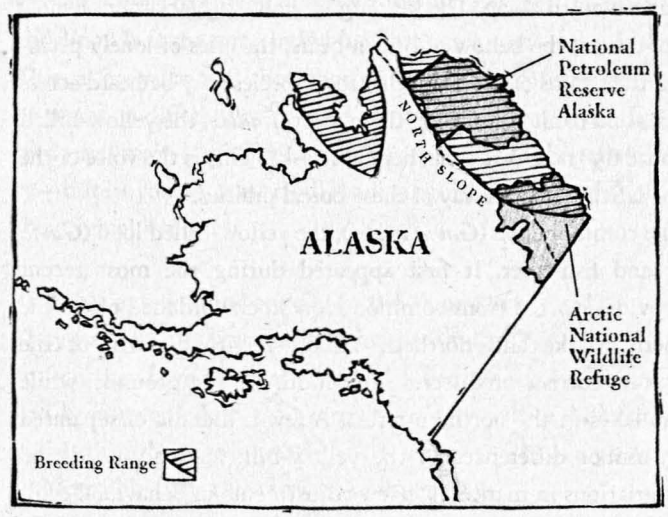
Closest relative to the common loon (*Gavia immer*), the yellow-billed loon (*Gavia adamsii*) too is a diver and fish-eater. It first appeared during the most recent Pleistocene glaciation, having evolved from common loon stock cordoned off in the arctic refugia of northern Alaska and northern Yukon Territory, north of the Wisconsin ice field. Thus its current predilection to tundra nesting grounds, while the common loon prefers lakes in the northern forest. A few millennia of separated evolution rendered only minor differences in the yellow-bill: an ivory-hued and upturned beak, minute variations in markings, a few adjustments in behavioral ecology, and a slightly huskier voice.

Lorn and stirring, sometimes humanlike in quality, its overtures may well become the conservation anthem of Alaska's western arctic. For the yellow-billed loon builds its nest on the margins of deep lakes in the wild tundra destined to become oilfields over the coming decade. Few if any nest on the coastal plain of the Arctic National Wildlife Refuge in northeastern Alaska, the area subject to years of contentious national debate over oil development. The great preponderance of its small U.S. population breeds west

yellow-billed loon, scratchboard by Dana Gardner

of there, on the National Petroleum Reserve-Alaska, a vast tract of 23.5 million acres of arctic prairie set aside by Congress for oil extraction and currently being apportioned out by the Bureau of Land Management (BLM) to oil companies for immediate development.

Little more is known about this bird except for its scarcity. The yellow-billed loon is one of the rarest nesting water birds in all of North America, as demonstrated by the low numbers recorded each year during U.S. Fish and Wildlife Service aerial waterfowl surveys. About 2,400 nest on the arctic coastal plain of Alaska, perhaps fewer than 3,200 statewide. Its current world population, including Canadian and Russian birds, may be as low as 16,000. The yellow-billed loon exhibits the low productivity typical of loons, raising fewer than two chicks per pair per year, and accomplishes this in the briefest of open-water seasons. In some years, due to late thaw or early freeze-up, the season is simply too brief to allow for nesting, incubation, and complete fledging of chicks.



Above: The approximate distribution of the yellow-billed loon in North America. *Below:* The overlap of the yellow-billed loon's breeding range and federal lands along Alaska's North Slope designated for oil exploration and development is significant.

MAP SOURCE: M. R. NORTH, 1994, YELLOW-BILLED LOON, IN *THE BIRDS OF NORTH AMERICA*, ED. A. POOLE AND F. GILL, NO. 121.

The yellow-billed loon is also one of the wildest and most timid of birds, the first to leave its nest when a single itinerant human figure appears on the rolling tundra a mile away. This comes as no surprise. Its voice alone would tell you this. So would the local Inupiat hunters.

Inspired by the low numbers of this species, the potential disturbance to its breeding grounds by the activities of heavy industry, and the egregiously inadequate treatment in recent BLM environmental impact statements for arctic developments, agency biologists have sharpened their research and conservation focus on the yellow-billed loon in recent months. A more accurate survey is in the works. The word "listing" has been whispered. And, in a first-ever satellite telemetry tracking attempt, all five yellow-billed loons instrumented on arctic Alaskan breeding grounds migrated to Asian offshore waters to overwinter—answering one question, while raising several more about this mysterious and precious creature.

In the yellow-billed loon's voice, native Yup'ik, Inupiat, and Athapaskan people have heard wisdom, warnings, the roots of their own traditional songs. Some western scientists are beginning to suspect a description of the land itself in the loon's music. It may behoove us all to listen, to make allowance for the survival of these wild callings, perhaps to learn from them something about our own existence, our own culture, and the world we live on. Perhaps to learn something about that wild open northern prairie we think we own, even though it is *Tuullik* who sings its song. ☾

Jeff Fair *is an independent field biologist and author. His status report on yellow-billed loons in Alaska was recently published by the Wilderness Society and Trustees for Alaska. Last summer, as the literary contingent of a high-arctic loon research team, he slept near the nests of these creatures and wrote about them in* Alaska *magazine (August 2002).*

maps, pen-and-ink by Todd Cummings

Shark-Eating Men

by Richard Ellis
illustrations by the author

THERE ARE SOME 350 SPECIES of shark in the world's oceans, and most of them do not fit the public's preconceptions of large, toothy predators cruising menacingly offshore ready to gobble somebody up. Most living shark species are less than two feet long and are harmful only to the small fishes and cephalopods that make up their usual diets. (There are even sharks, known as heterodontids, whose teeth aren't sharp at all but are pavement-like, enabling them to crush the shells of bivalves.) Many of these mini-sharks are deepwater inhabitants whose populations would be only minimally affected by fishermen even if they were deemed edible. But some of the larger species *are* edible or otherwise desirable to humans and are found in nearshore waters, which puts them at risk. Indeed, an important 1999 analysis of the world's shark populations by José Castro, Christa Woodley, and Rebecca Brudek of the National Marine Fisheries Service laboratory in Miami concludes that "nearly all species for which we have catches and landings data for more than ten years are in severe declines."

Sharks (and other elasmobranchs—"strap-gills"—including skates and rays) are particularly vulnerable to overfishing. They are what biologists call K-selected, which means they have large

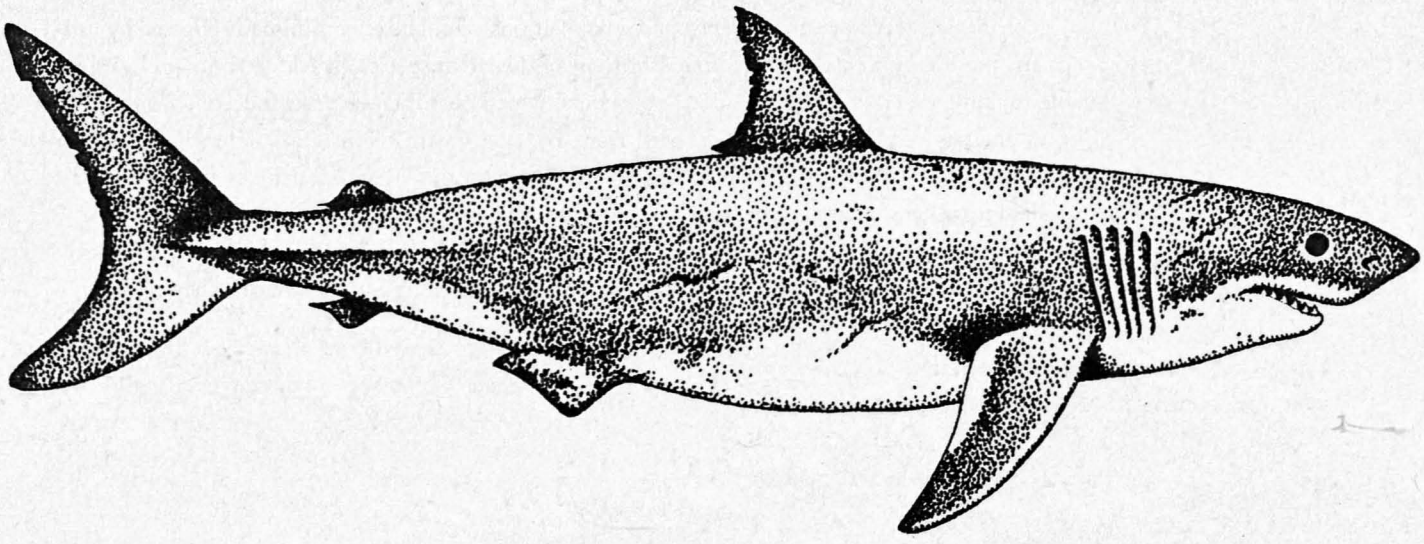
young, slow growth rates, late sexual maturity, and long lives, all of which result in low rates of population increase. Moreover, fishing pressure on sharks has increased worldwide, as pointed out in a 1998 report by Merry Camhi and colleagues for the International Union for Conservation of Nature and Natural Resources (IUCN):

> Shark fisheries have expanded in size and number around the world since the mid-1980s, primarily in response to the rapidly increasing demand for shark fins, meat and cartilage. Despite the boom-and-bust nature of virtually all shark fisheries over the past century, most shark fisheries today still lack monitoring or management....As a result, many shark populations are now depleted and some are considerably threatened.

Among the most numerous of all sharks, the spiny (piked) dogfish (*Squalus acanthias*) aggregates in large schools throughout its cold- and temperate-water range around the world. It is fished heavily and used widely, in the words of Leonard Compagno (1984), "fresh, fresh frozen, smoked, boiled, marinated, dried, salted, and in the form of fish cakes for human consumption; it is also utilized in liver oil, pet food, fishmeal, fertilizer and leather." It's no accident, then, that its numbers are in free fall. Castro and his colleagues classify the piked dogfish as a Category 4 species ("substantial historical declines in catches and/or locally extinct"). The spiny dogfish has the longest gestation period of any vertebrate—22 months—so removal of adult females (which are larger than males and therefore more desirable to fishermen) is extremely hazardous to the population.

Spiny dogfish were long considered trash fish—those inadvertently trapped in nets set for other species and sometimes destroying the nets in their unwillingness to be caught. In the early 1990s, however, New England fishermen searching for alternatives to depleted stocks of cod, haddock, and flounder began fishing for the more plentiful, and unregulated, dogfish. Fishermen teamed up with politicians to promote dogfish consumption, in the process giving the species the more appetizing name of "cape shark." With the help of steady European demand—particularly in Great Britain, where the species constitutes a large proportion of the fish in fish-and-chips—the dogfish experiment quickly grew into a fully developed fishery, and that soon became a disaster. In 1998, scientists declared the northwestern Atlantic spiny dogfish population overfished, reporting dramatic declines in the number and size of mature females.

After years of stalling, in March 2000 the New England Fishery Management Council submitted its final plan to the National Marine Fisheries Service to restrict fishing for this species. But by then, Massachusetts fishermen had so overfished the little sharks that the secretary of the U.S. Department of Commerce, William Daley, imposed quotas of four million pounds effective May 1, 2000. Four million pounds may appear to be the opposite of a reduced quota, but the Atlantic States Marine Fisheries Commission is under pressure to increase the quota for adult females after the emergency ruling expires in 2003. In October 2002, despite alarming scientific reports of an absence of dogfish pups, the commission voted overwhelmingly to double current dogfish quotas.



great white shark, pen-and-ink

So far, Castro and his colleagues (1999) have not placed any shark species in Category 5 ("rare throughout the ranges where they were formerly abundant"), but several species other than dogfish qualify for Category 4. These are the thresher shark (*Alopias vulpinus*); the shortfin mako (*Isurus oxyrhinchus*); the porbeagle (*Lamna nasus*); the tope (*Galeorhinus galeus*); the leopard shark (*Triakis semifasciata*); the dusky shark (*Carcharhinus obscurus*); the sandbar shark (*Carcharhinus plumbeus*); and the night shark (*Carcharhinus signatus*). Individuals of all these species are relatively large, and all have been the object of a directed fishery. In every case, the sharks are caught for food, but sometimes leather and liver oil are by-products of their use.

A particularly insidious threat to shark populations is finning, the practice of catching sharks, cutting off their dorsal and pectoral fins, and then throwing them back in the water to die. The fins are used to make shark's fin soup, an expensive delicacy in China, Singapore, Hong Kong, and other Asian countries. In some restaurants, shark's fin soup may sell for $100 a bowl. Many shark fisheries around the world—in Mexico, for example—are in business largely to supply fins to this market. In some parts of the world, finning is so widespread that local shark populations have become endangered. In Honolulu, 2,289 sharks were landed in 1991. By 1998, the number had leapt to 60,857—a 2,500% increase—and of that total, 99% was for fins.

Introduction of the Shark Finning Prohibition Act on March 13, 2002, banned U.S. fishing vessels—anywhere in the world—and foreign vessels fishing in U.S. waters from possessing fins unless the rest of the shark's carcass is also on board (Raloff 2002). In August of that year, U.S. Coast Guard officers boarded the Honolulu-based *King Diamond II* off Acapulco and found 64,000 pounds (32 tons) of fins and no other shark parts. The *King Diamond* had not actually caught the sharks; the Korean fin broker on board had evidently bought them from Asian vessels plying the eastern South Pacific around Fiji and the Solomon Islands and was planning to sell them in Guatemala. The fishing vessel was escorted to San Diego and the cargo confiscated. In the Pacific, where most finning takes place, there are no restrictions on finning or on bringing in severed fins, with or without the carcasses. (Fins can sell for a wholesale price of $200 per pound, whereas shark meat might bring 50 cents per pound, demonstrating the unfortunate economics of finning.)

STAR OF FOUR Hollywood movies, the great white (*Carcharodon carcharias*) is the most famous shark of all. Although its anthropophagous inclinations were greatly exaggerated in *Jaws*, the great white actually does attack people every once in a while. Peter Benchley's 1974 novel (and the subsequent movies) assigned the shark such a reputation for malevolence that people decided the oceans would be safer if no great whites were around to threaten them. The vendetta against *C. carcharias* that commenced soon after publication of the novel is still going on. Brave fishermen set out to capture "the man-eater" to prove their manhood and to display mementos of their triumph above their fireplaces or around their necks. (A good-quality great white shark tooth, which could be more than two inches in length, sells today for about $150; a set of jaws might fetch more than $3,000.) A vengeful, dedicated hunt, conducted on a largely inshore species, has not benefited the scattered populations of *Carcharodon carcharias*. Castro and colleagues (1999) placed the great white in Category 3 ("species that are exploited by directed fisheries or bycatch and have a limited reproductive potential") and observed that "populations may be small and highly localized and very vulnerable to overexploitation." Although we still know too little about the migratory habits of the great white, it is now protected in those waters where it is most likely to show up. White sharks were first protected in South Africa in 1992; since then, Namibia, the Maldives, Malta, Florida, and California have fully protected the species, with fishermen no longer allowed to catch them.

A particularly insidious threat to shark populations is finning, the practice of catching sharks, cutting off their dorsal and pectoral fins, and then throwing them back in the water to die.

Because of their cosmopolitan distribution, it might be possible to reduce or even eliminate a local shark population without raising the specter of global extinction. "Local extinction," wrote Castro and colleagues (1999), "refers to the disappearance of a species or population in a given geographic area, while the species is still extant in the rest of its range. Extinction refers to the disappearance of the species on a global scale....There are few recorded cases of local extinction of sharks or elasmobranchs in general....Nevertheless, it is possible that given enough time and sufficient fishing pressure, some sharks could become globally extinct." Jack

Musick and Beverly McMillan (2002) asked, "What are the chances that some species of sharks, or many, will go extinct?" Their answer:

> Some scientists argue that it is impossible to drive widely distributed coastal shark species, like sand tigers and the handsome duskies that used to be regular visitors to the Virginia coast, to extinction. [We] believe they are wrong—that there is a point of no return at which remnants of populations become so few that there are not enough breeders to continue. We may be on the brink of finding out just where that point is.

Perhaps the greatest misconception about sharks is that they are particularly dangerous to people. The truth is closer to the opposite. Twenty-five years after the publication of *Jaws*, Peter Benchley wrote an article for *Audubon* magazine titled "Swimming with Sharks," in which he noted: "Somewhere between 40 million and 70 million sharks were killed in 1994. The International Shark Attack File estimates that for every human being killed by a shark, 10 million sharks are killed by human beings." Contrary to conventional wisdom, conflicts between man and shark almost always end in favor of the man, especially if the man is in his own element and not the shark's. Under those circumstances, the conflict is known as "fishing."

Benchley, also in his 1998 *Audubon* article, stated: "Now it is widely accepted that sharks in general, and great whites in particular, do not target human beings. When a great white attacks a person, it is almost always an accident, a case of mistaken identity." In the summer of 2002, with attendant publicity and appearances on every network television talk show, Benchley published *Shark Trouble,* in which he commented:

> Shark attacks on human beings generate a tremendous amount of media coverage, partly because they occur so rarely, but mostly, I think, because people are, and always have been, simultaneously intrigued and terrified by sharks. Sharks come from a wing of the dark castle where our nightmares live—deep water beyond our sight and understanding—and so they stimulate our fears and fantasies and imaginations.

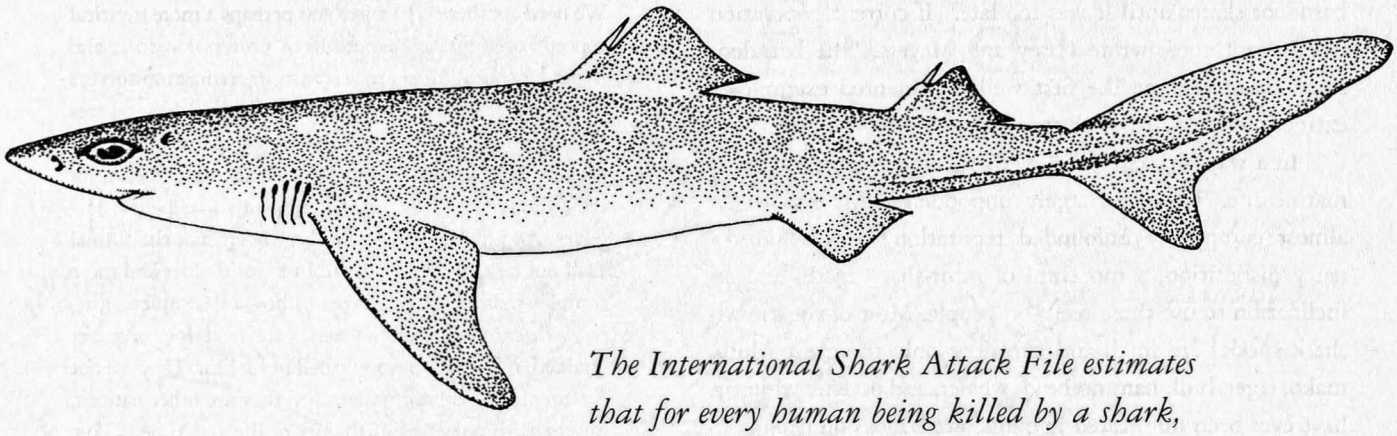
In a 1973 article co-authored with his wife Claire, Perry Gilbert, a shark expert and, later, director of Mote Marine Laboratory in Florida, sang the virtues of sharks:

> The shark, with a modicum of fine traits, might be considered one of the most successful animals that has ever lived. To other animals it is far from delicious. Its tough hide makes it almost inedible, and while it has the grace that sheer power bestows, it is not really beautiful....It has, however, one enviable attribute and this has contributed greatly to its success....Cancer is virtually absent from its primal myomeres.

Some researchers decided that shark cartilage contains a protein that inhibits the angiogenesis (development of new blood vessels) needed to provide nourishment for tumor and cancer growth. Tumors need a large supply of blood to survive, and cartilage contains substances that prevent the formation of blood vessels. Since 1979, at Mote Marine Laboratory, Carl Luer has been exposing nurse sharks and clearnose skates to powerful carcinogens, including aflatoxin B and methylazoxymethanol, and has been unable to get tumors to grow at all. Working with A. B. Bodine, Luer has seen that the carcinogens reach the DNA of the elasmobranch cells, but the cells seem to repair themselves before any sort of mutation can result. In an article in the *Journal of the National Cancer Institute* in 1993, James Mathews wrote, "Most researchers agree that continued study of the shark's intriguing anatomy may yield answers to treating cancer in humans." Certainly an animal that is so successful in resisting cancer is worth more to medical and pharmaceutical researchers than to those who would hack off its fins to make soup.

Despite the total absence of evidence, someone, somewhere was going to cash in on the possibility that shark cartilage could prevent cancer in humans. First came a New Jersey company called Cartilage Consultants, Inc., which obtained a patent for pills made of powdered shark cartilage. The *Journal of the National Cancer Institute* announced that "there is no proof that it is effective when taken this way," and Luer, in an article written for Mote Marine Laboratory, asserted, "The statements made by cartilage pill promoters that it is cartilage that gives sharks their immunity to cancer, then, are inaccurate and irresponsible." We are still a long way from finding—or even suggesting—a shark-related cure for cancer. Indeed, although irresponsible medical claims might serve no useful purpose for humans, it might further endanger the sharks.

In February 1993, the television program *60 Minutes* aired a story on shark cartilage as a treatment for cancer in humans, bringing forth an outraged response from the people who were doing the research. In the March 1993 newsletter of the American Elasmobranch Society, Carl Luer wrote, "We cannot support the marketing of shark cartilage for this application, especially since the promoters of the product intend to



The International Shark Attack File estimates that for every human being killed by a shark, 10 million sharks are killed by human beings.

—PETER BENCHLEY

rely on the natural resource as an endless supply of material." If it were true that shark cartilage could somehow prevent cancer in humans, perhaps the taking of sharks might be justified, but since no such evidence exists, they should not be caught and ground up for their components. In a letter to the same newsletter, Kumar Mahadevan, director of Mote Marine Laboratory, stated, "No evidence—not even a logical connection—exists at this stage to assume that shark cartilage tested on blood vessel growth in the laboratory should produce significant tumor regression when given to cancer patients." Assuming that we could consume shark cartilage to protect ourselves from cancer was like believing that we could eat sawdust made from redwood trees to make ourselves taller.

In 2000, a new chapter opened in the shark cartilage story. A study published then concluded that sharks not only get cancer but even get cartilage cancer. Gary Ostrander and John Harshberger found at least 40 cases of cancer in sharks and other cartilaginous fishes after surveying scientific papers and tumor samples from the National Cancer Institute's Registry of Tumors in Lower Animals. In an article published in *Science* magazine on April 14, 2000, Ostrander is quoted as saying that he hopes the study will help explode the "huge myth" that sharks are immune to cancer—a misapprehension shared even by "people in my own field." It's hard to believe that susceptibility to cancer can save your life, but that's what happened to the sharks. Chalk up one for the elasmobranchs.

CANCER NOTWITHSTANDING, elasmobranchs (sharks, skates, and rays) are far from immune to overfishing. The thornback ray (*Raja clavata*) is now considered close to extinction, according to monitors of the North Sea populations. With the decline of cod and haddock, fishers have trawled for bottom dwellers and have virtually eliminated them—as well as destroying the seafloor. Replacing the ubiquitous fish-and-chips, skate-and-chips became for a time a popular menu item, as did skate with black butter. With overfishing, however, these dishes have become as rare as dodo pudding.

Probably the most surprising and unexpected near extinction in recent years has been that of the barndoor skate (*Raja laevis*), which nobody was fishing for at all. For generations, cod fishermen hauled in these unwanted elasmobranchs, which, at a total of 16 square feet, approach the dimensions of their namesake. Like many elasmobranchs, *R. laevis* is K-selected, and thus is slow to mature, reproduces slowly, and has offspring that are small in number but large in size. Indeed, newborn barndoor skates are already 10 inches across, sizable enough to get caught in trawls from their day of birth and therefore never having a hope of reproducing. "Forty-five years ago," Jill Casey and Ransom Meyers noted in a 1998 *Science* article, "research surveys on the St. Pierre Bank (off southern Newfoundland) recorded barndoor skates in 10% of their tows; in the last 20 years, none has been caught and this pattern of decline is similar throughout the range of the species." What happened? When the distant-water fleets were scooping up codfish, redfish, and everything else that swam in eastern Canadian and New England waters in the 1970s, a large part of the bycatch was barndoor skates. Fisheries biologists, lately studying the decline of more valuable food fishes, didn't notice the disappearance of

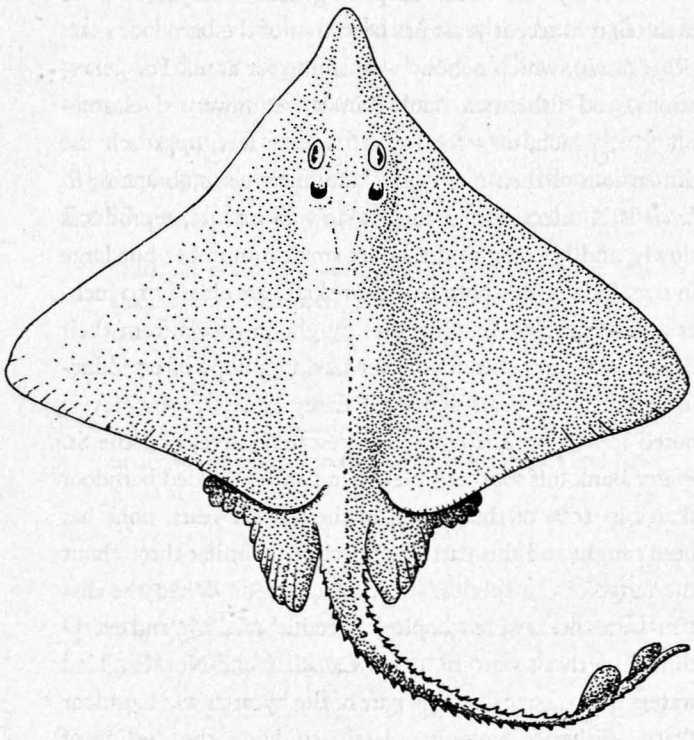
spiny dogfish, pen-and-ink

barndoor skates until it was too late. "If current population trends continue," wrote Casey and Meyers, "the barndoor skate could become the first well-documented example of extinction in a marine fish species."

In a way, sharks are bellwethers for the conservation of marine life. They are largely unpopular animals with an almost completely unfounded reputation that includes a nasty disposition, a mouthful of razor-sharp teeth, and an inclination to use those teeth on people. Most of the known shark species are small and harmless; only the great white, mako, tiger, bull, hammerhead, whaler, and oceanic whitetip have ever been implicated in deliberate attacks on people.

We must always remember that the sea is the sharks' domain, not ours. To approach the shark's competence in water, we need fins, snorkels, face masks, scuba gear—and even with these artificial aids, we are awkward and uncomfortable interlopers. Before we can protect a species, in the sea or out, we need to realize that it has as much right to be there as we do—probably more, if longevity of the species is factored in. To see any animal as inferior insults that species and all life on Earth. A more appropriate way to look at life was suggested by Henry Beston in 1928:

> We need another and a wiser and perhaps a more mystical concept of animals. Remote from universal nature, and living by complicated artifice, man in civilization surveys the creature through the glass of his knowledge and sees thereby a feather magnified and the whole image in distortion. We patronize them for their incompleteness, for their tragic fate of having taken form so far below ourselves. And therein we err, we greatly err. For the animal shall not be measured by man. In a world older and more complex than ours they move finished and complete, gifted with extensions of the senses we have lost or never attained, living by voices we shall never hear. They are not brethren, they are not underlings; they are other nations, caught with ourselves in the net of life and time, fellow prisoners of the splendour and travail of the earth. ❮



barndoor skate, pen-and-ink

Richard Ellis *is research associate at the American Museum of Natural History in New York. His 14 books about the creatures of the ocean include* The Book of Whales, Monsters of the Sea, *and* Aquagenesis. *In addition to illustrating his own books, Ellis' artwork has appeared in publications such as* Audubon *and* National Geographic *and has been exhibited in museums and galleries around the world.* *This essay is excerpted from the forthcoming book* The Empty Ocean: Plundering the World's Marine Life *by Richard Ellis, published by Island Press, and is used by permission of Brandt & Hochman Literary Agents, Inc. (©2003 by Richard Ellis, all rights reserved).*

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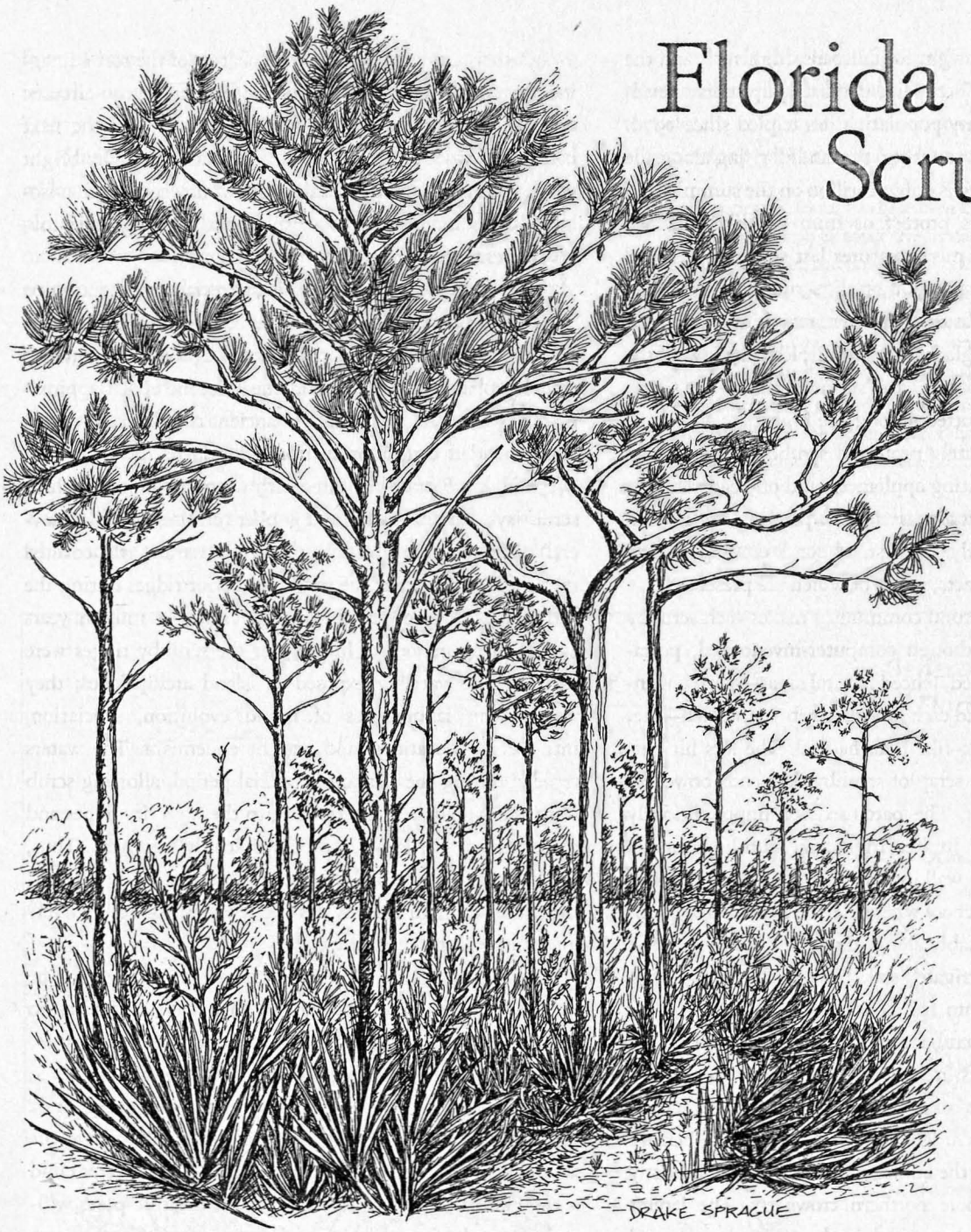
Florida Scrub

Paradise Almost Lost



by George Rogers

AN ARTICLE ABOUT a new museum and garden in the *Palm Beach Post*'s "Good Life" section of June 23, 2002, proudly reaffirms a traditional Florida transformation: "From Pine Scrub to Paradise." What a pity in crowded Palm Beach County to delight still in replacing the oldest and most diverse natural system in the state—Florida scrub, a dwarfed, gnarly, evergreen, sun-baked, xeric community on hyper-sterile, highly drained, usually white sands—with an artificial garden.

Florida scrub may be unspectacular to the untrained eye, but it is a natural garden exquisitely attuned to place. That place usually occupies high, dry, north-south ridges—

Florida pine scrub, pen-and-ink by Drake Sprague

places that are also just right for railroads, highways, and the active adult lifestyle. Where I live in coastal Jupiter is a developer's dream. The county population has tripled since 1970. Golf courses are beyond counting, the landfill rising alongside the Florida Turnpike needs only a carillon on the summit, and the gated communities protect us from the likes of "Mr. Bear," whose suburban misadventures last summer provided media amusement. From origins on the scrubby coastal ridge, low-density sprawl metastasizes ever westward into the northern remains of the Everglades. As a result, less than 2% of the original Palm Beach County scrub survives, chiefly as a string of parks and reserves dotted among the high rises and malls along U.S. 1. Inadequately protected scrubby places attract construction debris, rusting appliances, and off-road vehicles. The statewide scrub picture is similar: patchy, almost 90% eliminated, inadequately understood, and eroding into a grab-bag of remnant tracts, many of which are preserved.

The loss of this natural community makes each scrubby patch more precious, though computer-inventoried, porta-pottied, glossy-brochured, fenced natural areas—with endangered species planted and each Florida scrub-jay banded—feel at times more city park–like than natural. The loss hit personally when a favorite scrap of scrubby flatwoods bowed to the inevitable last year. The patch existed unpretentiously between the Town of Jupiter municipal buildings and a Wendy's Restaurant, a walking-distance study site for students at Jupiter High School where I lend a hand. A tiny remnant persists uncomfortably alongside some big new cultural asset rising above the irrigated sod.

Extending a bit into neighboring states, the dominant vegetation in "Florida" scrub is sand pine, Florida rosemary, and a clique of smallish oaks (mainly scrub oak, myrtle oak, sand live oak, and Chapman's oak) in the company of varied tough-leafed shrubs, scattered hardy wildflowers, sedges, and lichens. Florida rosemary is not the culinary herb, but rather a bristly bush related to the more northern crowberry. The largest remaining area of pine-dominated scrub in Florida is in and near Ocala National Forest, where "multiple-use" management includes logging for pine pulpwood. Oak-dominated scrub is best represented along the Atlantic Coastal Ridge and the Central Ridge System, including the Lake Wales Ridge, which is the state's tourism and citrus spine. Scrub communities also wrap along the coast around the Gulf into the Panhandle.

Some scrub areas are impenetrably user-unfriendly, at least to humans, which perhaps makes them a refuge for such creatures as the Florida panther. Yet when the deerflies go away, other remnants beckon with charms of the sort I imagine to remain hard-wired into our primal psycho-circuits: open and savannalike with curious views around the next bend. The woody plants are on a human scale. The bright white sand can resemble dazzling snow; flowers are often isolated like museum pieces on display; and lichen ground covers suggest the flora on Mars.

The key to savoring scrub is appreciating its antiquity. The oldest direct evidence of Florida scrub goes back some 20 million years into the Miocene epoch. The scrubby interior ridges probably formed around the Pliocene epoch approximately 5–2 million years ago. In ancient times, scrub vegetation extended continuously from Florida to the more arid West. Today, Florida creatures with western affinities include scrub-jays, harvester ants, and gopher tortoises as well as several plants. Rising and falling seas intermittently covered most of Florida except the scrubby interior ridges during the early Pleistocene epoch (beginning almost 2 million years ago). During periods of high water the scrubby ridges were partially and variably exposed as island archipelagos; they were living laboratories of island evolution, speciation, intraspecific variations, and ancient endemism. The waters receded during the Wisconsin glacial period, allowing scrub to spread widely before retreating to the high dry dunes and ridges during the last 7,000 comparatively wet years. Thus, unlike other Florida biological communities, scrub "islands" along the southern Lake Wales Ridge have evolved relatively undisturbed for a very long time.

Antiquity and dynamic fragmentation make scrub the most diverse terrestrial community type in the state. Over 100 plant species are characteristic of scrub; about half of them are endemic, and a substantial portion of these are formally listed as threatened or endangered. About 45 arthropods, the Florida mouse, the scrub lizard, the blue-tailed mole skink, and the sand skink belong to the endemic fauna—whose poster child is the Florida scrub-jay. This charismatic creature poses willingly for endearing photo-ops prone to engender enthusiasm for preserving scrub as habitat for the bird. As positive as this may be, management oriented toward this single species favors a young successional stage at the expense of species and processes adapted to different conditions. A step down the charisma pecking order comes the lizards, as represented by the sand skink on the Lake Wales Ridge. This oddity is a candidate for "most scrub-adapted animal." Leaving serpentine tracks while swimming through the loose sand, sand skinks look more like eels than lizards—all tail. The streamlined

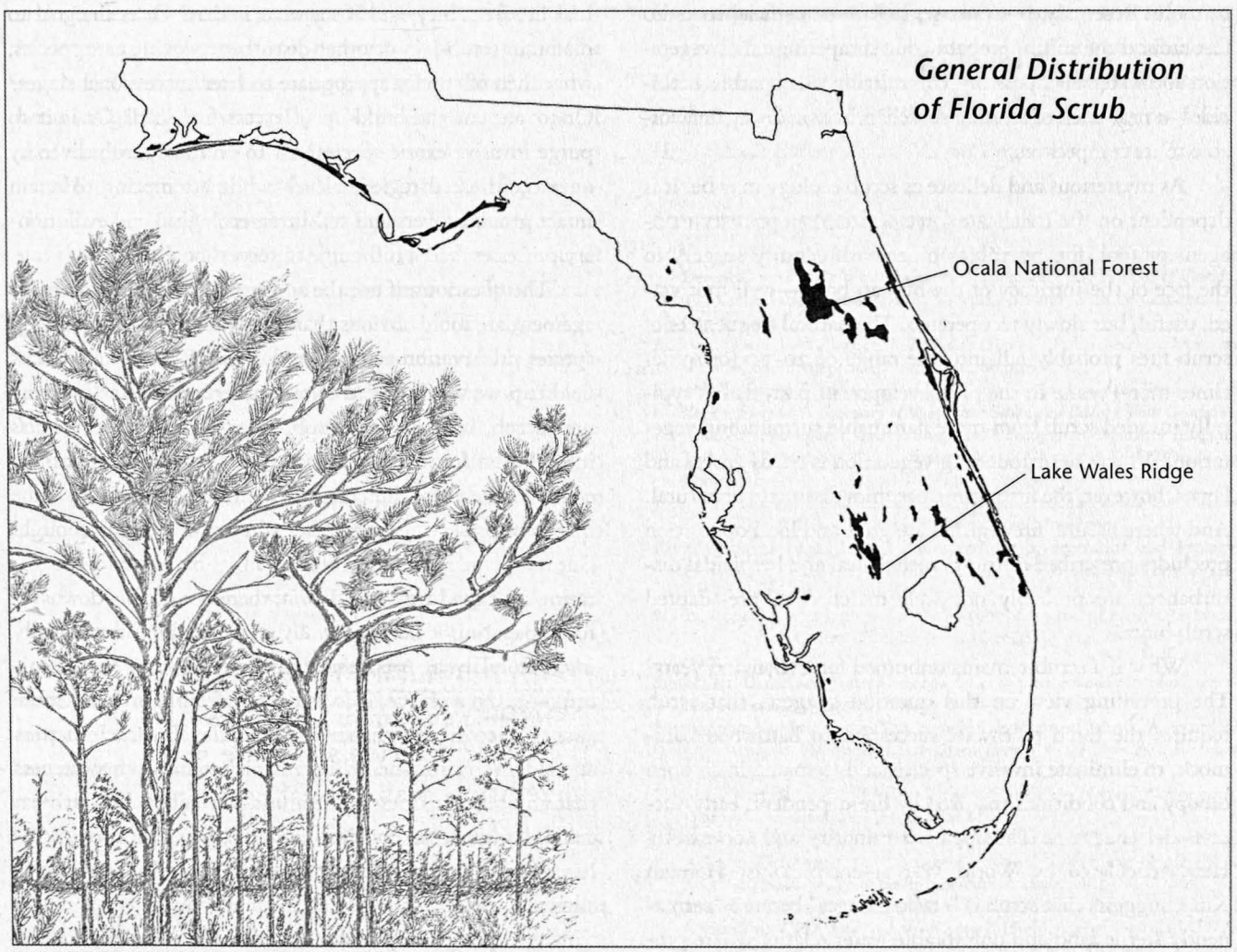
front end wedges through the sand with the lower jaw hidden into the upper. The reduced front legs fit into body recesses. Transparent lower eyelids serve as sandproof goggles.

Standing up for the uncharismatic minifauna, the red widow spider is kin to the infamous black widow and exemplifies the tangled and subtle eco-webs that must be accommodated in management strategies. Confined to scrub, reportedly dependent on fire, and nesting almost exclusively on saw palmetto leaves, the red widow appears to bounce through wide swings in population levels. A multiyear study at Archbold Biological Station watched the population plunge 100-fold and then begin an apparent uptick. Scrub-jays and at least two species of wasps prey on it, and a third wasp or cohort of related species probably consumes the eggs. The spider reluctantly shares its webs with other spiders, which steal the booty and perhaps attack their host directly.

The lovely fringetree (*Chionanthus virginicus*) is familiar to many readers. Florida botanist John Kunkel Small discovered the closely related scrub endemic—the pygmy fringetree (*Chionanthus pygmaeus*)—in April 1920, and said:

> Two species of *Chionanthus* have been known for a long time. One, a large shrub or small tree, is native in the southeastern United States, and is much cultivated for ornament. The other is a native of China and is also in cultivation. Our new kind grew in miniature forests, the little trees ranging mostly from a foot to a foot and a half tall. Fortunately, we found the plant in full flower. The leaves were only partly developed, so that the myriads of pure white flowers borne in large panicles on the upper parts of the stems were the most conspicuous floral feature on the hills.

Fringe trees, scrub-jays, lizard tracks, and spiders are all visible subjects for conservation. It is more of a trick to extend



MAP ADAPTED FROM RONALD L. MYERS AND JOHN J. EWEL, EDS., 1990, *ECOSYSTEMS OF FLORIDA* (ORLANDO: UNIVERSITY OF CENTRAL FLORIDA PRESS), 156. USED WITH PERMISSION OF THE UNIVERSITY PRESS OF FLORIDA.

the embrace of public appreciation, management concern, and educational initiatives to the three I's: the intangible, the intricate, and the invisible. In other words, how to conserve the ecological, evolutionary, and subterranean?

If all truth were known about the underground life of scrub, the story would surely be remarkable, given the challenges of life in a sun-baked sandbox. Theft is one way to acquire scarce resources, and the botanical parasites in scrub include root parasites such as hogplum, blacksenna, and indianpipes. Often mistaken for dodder, the above-ground parasite lovevine is festooned like spaghetti dropped from a helicopter over its hosts. This vine reveals its relationship with cinnamon and sassafras through a faintly spicy fragrance. A more honorable approach to acquiring water and nutrients is root specialization. At least in some localities, the small oaks and some shrubs have brushy root systems branching downward 4–5 feet. Saw palmetto roots plunge to depths of 15 feet or more. Rosemary, by contrast, radiates superficial roots 20 feet around the shrub, probably out-competing other vegetation for water and possibly committing allelopathic herbicide—a neat trick of altering soil chemistry in a way unfavorable to its competitors.

As mysterious and delicate as scrub ecology may be, it is dependent on the indelicate force of fire. As a primary management tool, fire resembles nineteenth century surgery in the face of the intricacy of the human body—well motivated, useful, but slowly recuperated. The natural frequencies of scrub fires probably fall into the range of 20–70 (or sometimes more) years. In the pre-development past, flames typically invaded scrub from more flammable surrounding vegetation. When the surrounding vegetation is citrus groves and lawns, however, the fire regime becomes distinctly unnatural. And where natural fire regimes are gone and local opposition precludes prescribed burning, mechanical and herbicidal disturbances are probably not well matched to fire-adapted scrub biota.

What if a scrub remains unburned for a thousand years? The prevailing view on this question suggests that scrub requires the torch to thwart succession to hardwood hammock, to eliminate invasive species, and to maintain an open canopy and conditions required by fire-dependent, early-successional endemics. The apparent minority and contrasting view, articulated by World War II–era biologist Herman Kurz, suggests that scrub is "static for ages" because "permanently sterile sand and unfavorable water relations...are prohibitive to a hammock or climax forest stage." Beyond flames and sand, forces helping to keep scrub scrubby include the ability of sand pine to reseed without burning coupled with a short life-span, storms, salt spray in places, and possibly allelopathy. There may be no single truth-point along the spectrum of outlooks on pyrogenicity because scrubs are diverse, humans have been altering habitats for millennia—and fires happen.

Even if scrub can persist in places free of fire, flames have long played a role in these habitats as evidenced by fire adaptations, such as the serotinous cones of some sand pines, which remain sealed until heating, or the germination boost that fire provides to Florida rosemary seeds. While acknowledging the naturalness and utility of burning, I personally suspect scrub has the ability to persist without such benefit, and harbor a little apprehension about the potential for fiery excess. The thresholds for prescribed burning and its objectives demand disciplined specificity. Is the goal to simulate a perceived natural fire frequency, and if so, what is that? Or is the goal to maintain scrub-jays or other disturbance-loving rare species; what then of species appropriate to later successional stages? Or to prevent the build-up of excess fuel load? Or is it to purge invasive exotic species? Or to promote scrub diversity on a coordinated regional level, while attempting to retain intact ground covers and soil litter, ecological and evolutionary processes, and a full range of successional stages?

The questions, if not the answers, surrounding fire management are more obvious than those around *ex situ* (off-site) species preservation and reintroduction. Recently on a class field trip we were thrilled to encounter a rare mint in a natural scrub, only to learn subsequently of the specimen's importation from another county as part of a "restoration" effort. When a rare rhinoceros faces imminent extinction, the merits of preserving germ plasm in a zoo are clear enough. But if a plant species is protected in its habitat and not teetering over the brink of oblivion, there is a double downside to propagating it horticulturally and spreading it artificially into natural areas. A relatively minor criticism is that of priority—given a choice, it is usually preferable to worry more about the ecosystem than a single species. But such matters are seldom so either-or. A bigger worry stems from awareness that any given species is not a uniform entity, but rather a complex mosaic of breeding patterns, distributional histories, and evolved genetic patchiness. DNA technology is just allowing effective glimpses into this evolutionary window, which is particularly interesting in the case of "island" species—like those found in Florida scrub. Human-mediat-

ed spread of garden-reared genotypes undoes the insularity at the heart of natural processes extending backward and perhaps forward into deep time.

Consider the odd little four-petal pawpaw, a shrub endemic to and scattered in a handful of geographically isolated scrub habitats in and near Jupiter. Little is known of its breeding system or its highly site-specific geographical-genetic evolutionary history. Yet the U.S. Fish and Wildlife Service's South Florida multi-species recovery plan calls for cultivation at a botanical garden as seed sources for reintroduction. If the shrub can be readily preserved from extinction in cultivation, why deliberately swamp the last semblance of its natural history in the name of preservation? No matter what technologies emerge 20, 100, or 10,000 years from now, it will never again be possible to study the cryptic intraspecific variation of this species or its symbionts. It will never be possible for a naturalist to come upon the pawpaw and wonder how or why it came to be there. From a scientific, deep-time, or reverence-for-nature perspective, there's not much difference between a species reintroduced from a botanical garden and one still in a botanical garden except for the interpretive sign.

High on the scrub vocabulary list is habitat fragmentation. Scrub islands bear witness to the truth of the equilibrium theory of island biogeography, which predicts that larger islands support more species. Larger reserves also embrace greater habitat diversity; are less vulnerable to edge effects and encroachment; and support the minimum viable populations of more species. Minimum viable population size is controlled in part by genetic diversity lost in small populations through inbreeding—and chance events. It relates further to the home ranges and resource needs of species. Eastern indigo snakes probably require over 124 acres; at least 55 acres are reportedly necessary to support a viable gopher tortoise population. Who knows how much acreage the pollinators of some scrub flowers need?

Clearly then, not all scrub residents live free of outside needs, such as migratory pathways, nesting sites, food sources, dispersal routes, symbionts, or genetic refreshment. Thus the increasingly unnatural context surrounding scrub patches is a serious matter. Corridors connecting scrub habitats may help. The Florida gopher frog, for instance, breeds in temporary grassy ponds and then disperses overland to live commensally with gopher tortoises. Frogs who hop to the golf course pond face herbicides, fungicides, and insecticides, and need a better pathway through life. Contrived corridors generate doubts, however; they may facilitate passage of pestilence, predators, exotics, and unnatural gene flow. Moreover, their effectiveness is largely untested, although some recent research is encouraging.

The question of corridors exemplifies the big headache—uncontrolled development running ahead of ecological understanding. In terms of scrub preservation, it is almost too little too late, but not quite. The good news is that throughout much of Florida it remains possible to experience the sensory combination of the hot Florida sun, blazing white sand, refreshing sea breezes, and acid-resinous fragrance of a scrubby ridge; to puzzle over bewildering oak diversity; and to come face-to-face with a Florida scrub-jay. Just direct your gaze away from the condominium towering above the next dune. ☾

George Rogers *studied the flora of the southeastern U.S. during a post-doctoral fellowship at the Arnold Arboretum of Harvard University and later indulged a special interest in grasses, sedges, and agaves while teaching at the University of the West Indies, Barbados. He now serves as department chair for environmental horticulture at Palm Beach Community College and as a guest teacher for Jupiter High School's Environmental Magnet Program in Jupiter, Florida.*

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GEORGE PERKINS MARSH AND THE

Over the century and a quarter since Marsh's death, we can see clearly how many benefits have already flowed from his astringent but constructive appraisal of humanity's legacy of land use and abuse.

OUR PATH TOWARD stewardship leads through a landscape shadowed by disasters. Ignorance and mistakes may become more than errors, though, when we find the courage to learn from them. On such occasions they open broader vistas on both the wholeness of Nature and culture and the historical implications of our immediate, local decisions. For the past thirty years I have lived with my family in the wounded and recovering terrain of Vermont, while teaching literature and environmental studies at Middlebury College. Over the course of these decades I have become more and more impressed by the power, within conservation thought, of what might be called creative grieving. By this term I mean the potential for new ecological insight and social resolve to grow out of catastrophe.

The environmental history of Vermont has fostered such growth. During the early decades of the nineteenth century, the Green Mountains were deforested with a rapaciousness equal to any on this continent. Zadock Thompson's 1853 *Natural History of Vermont* described a wasteland of stumps and gullies. Whole communities of farmers failed and emigrated, and large mammals became extinct in most of the state. Today, Vermont is more heavily forested than at any time in the past two centuries and also supports an increasing diversity of wildlife. Not just beaver and deer, but also viable populations of fishers, otters, bears, and bobcats have been reestablished here. The possibility for wolf and catamount recovery has even become a realistic topic for discussion among biologists and politicians. Such rewilding has been accompanied by a host of state and local conservation initiatives. Several of the most notable of these have been centered in Woodstock, the town where George Perkins Marsh was born in 1801; they can be related directly to his vision and accomplishments.

While growing up, Marsh saw the slopes of nearby Mt. Tom denuded. The resultant slash burned in a series of uncontrollable fires, from which the woods were long in recovering. Throughout his boyhood, he watched as unchecked erosion ruined fishing in the streams and drove many local farmers off their land. Marsh carried these images with him for the rest of his life. Years later, when he was sent first to Turkey and then to Italy as an American diplomat, he began to investigate the centuries of deforestation in the Mediterranean world. Generally considered the most gifted American linguist of his generation, he was able to carry out his research in the biblical and classical languages, as well as in most of the modern European tongues. His studies confirmed that many of the exposed, arid, and depopulated expanses he visited had once sustained rich civilizations. The pattern he observed and conveyed was one in which the incremental cutting of trees over generations eradicated a

HEADWATERS OF CONSERVATION

by John Elder

Adirondack landscape, acrylic by William Amadon

resource that had felt inexhaustible to people. He also noted that modern industrial society, around the world, was accelerating such destructiveness at an alarming rate.

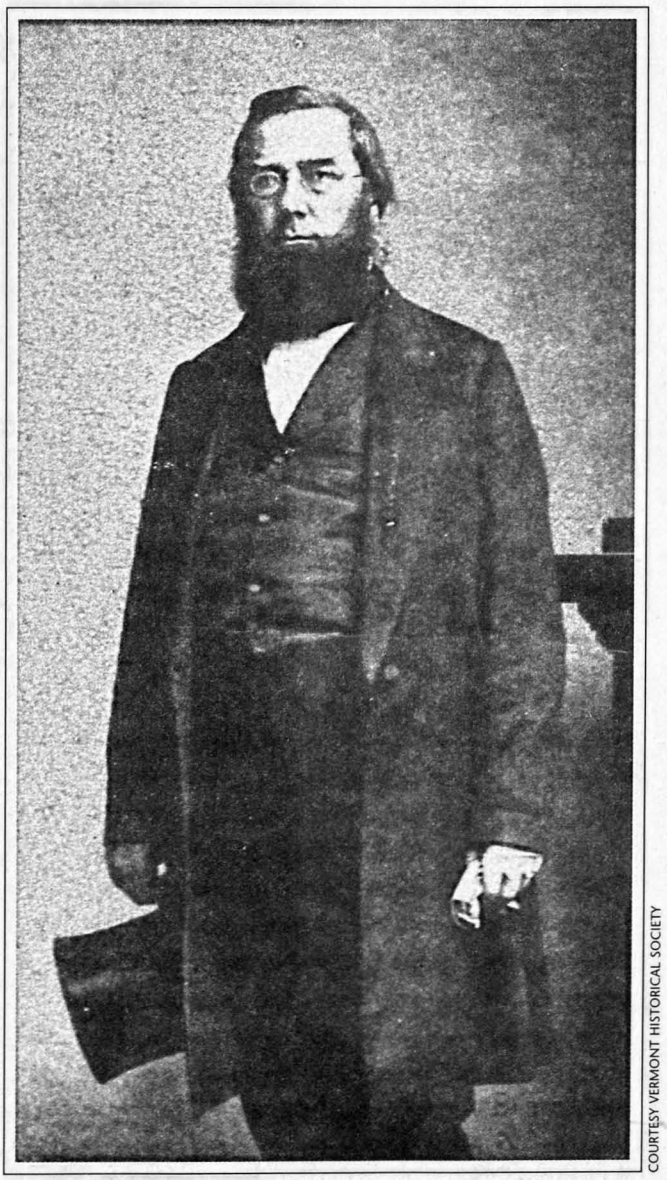
After his 1861 appointment as Lincoln's ambassador to the New Unified Kingdom of Italy, Marsh shifted his operations as the capital was relocated, first from Turin to Florence and then to Rome. But until his death in 1882 he always retained a home in Florence. The connections between the deforestation and recovery of Tuscany and Vermont intrigued him for the rest of his life. These two regions of a similar size were the landscapes Marsh loved above all others, and in relation to which his thinking about loss and recovery attained its fullest maturity. At Vallombrosa, one of the most ancient, beautiful, and culturally prestigious forests in Italy, his final letters reveled in the beauty of that landscape and in the local legacy of stewardship, both ancient and modern, on behalf of that forest.

Man and Nature, which Marsh published in 1864, has been described by Lewis Mumford as "the fountainhead" of conservation thought. In the book, Marsh demonstrated humanity's power for long-lasting damage to natural systems by focusing on deforestation, in particular. He cited instances in which people had already destroyed the fertility of immense regions for centuries to come, caused devastating erosion, altered climates, silted-in harbors, and unwittingly brought down their own proud civilizations. No scientifically oriented writer had ever described the results of human heedlessness in terms as dire as these:

> The earth is fast becoming an unfit home for its noblest inhabitant, and another era of equal human crime and human improvidence, and of like duration with that through which traces of that crime and that improvidence extend, would reduce it to such a condition of impoverished productiveness, of shattered surface, of climatic excess, as to threaten the depravation, barbarism, and perhaps even extinction of the species.

As William Cronon has noted, Marsh's book was a major force behind the 1873 Timber Culture Act, the 1885 founding of Adirondack State Park, and the 1891 Forest Reserve Act. Marsh's carefully documented examples and forceful writing had earlier played a crucial role in the development of our national parks, during the years between the protection of Yosemite Valley (originally as a state park) in 1864 and the establishment of Yellowstone in 1872 as the first national park in the world. Such achievements and their political context are chronicled in David Lowenthal's authoritative biography, *George Perkins Marsh, Prophet of Conservation*.

Another enduring aspect of Marsh's achievement is the chastened hopefulness of his voice, which remains a powerful model for mindfulness and reform. He looks steadfastly at the gravity of our collective errors over the centuries, and at the darkness of the prospect to which they have brought us, and he insists that we regard this terrifying spectacle along with him. Grounded, thus, in the dangers, he can also look forward (in the title of one of his book's subheadings) to a "Restoration of Disturbed Harmonies." He can envision humanity becoming "a coworker with nature in the reconstruction of the damaged



COURTESY VERMONT HISTORICAL SOCIETY

George Perkins Marsh, ca. 1860

fabric which the negligence or the wantonness of former lodgers has rendered untenantable. He must aid her in reclothing the mountain slopes with forests and vegetable mold, thereby restoring the fountains which she provided to water them...." If Marsh is, as Lowenthal's subtitle describes him, a prophet, he is one who echoes Jeremiah and Isaiah alike. He castigates the wasteful practices characterizing so much of our history and at the same time envisions a new era of balanced wisdom. His complex tone anticipates the ecological insight and rhetorical power of environmental prophecy in America.

AT THE CORE of Marsh's environmental vision is a yearning for patriotic and civic vocation. It wasn't that, as a Vermonter in Italy, he felt any sense of exile—far from it. Florence, in particular, agreed with him very well indeed. But both his scientific studies and his experience of living abroad seem to have intensified the democratic values which he imbibed in his small-town boyhood. Writing before Haeckl, Marsh nonetheless expressed the essence of ecology in a way that also evoked his egalitarian political vision: "Thus all nature is linked together by invisible bonds and every organic creature, however low, however feeble, however dependent is necessary to the well-being of some other among the myriad forms of life with which the Creator has peopled the earth." Natural history and politics were never separate for him.

Marsh was an early advocate of preserving the Adirondacks, both for the sake of nature lovers hungry for an experience of the continent's primeval forest and for the protection of the streams flowing into the Hudson River and the Erie Canal. This kind of dual argument, one side of which might be described as poetic or spiritual, the other as practical or economic, complicated Marsh's already dense writing. It has sometimes made it hard for twentieth century conservationists to know just where to place him. A similar complexity continues to challenge and enrich the identity of the Adirondack Park, the preserve that may express Marsh's influence and vision more directly than any other. In an article in *Sanctuary* magazine, Paul Bray wrote:

> When a "blue line" was drawn on a map around some millions of acres of land under mixed ownership in the Adirondack region in 1892, a very different idea of a park from the public estate model of Yellowstone was initiated. The challenge was not only how to reconcile nature preservation with the demand for recreational use but also how to meet the economic needs of the park's resident population in an ecologically compatible manner.

Marsh's broad comparative vision reminds us that conservation must now be pursued within an inclusive, evolutionary perspective. National parks and other protected lands must continue to allow for a higher level of protection than private stewards alone could manage. But they must do so increasingly within a context of global environmental awareness and offer their benefits, as Frederick Law Olmsted wrote, to visitors "from all parts of the world."

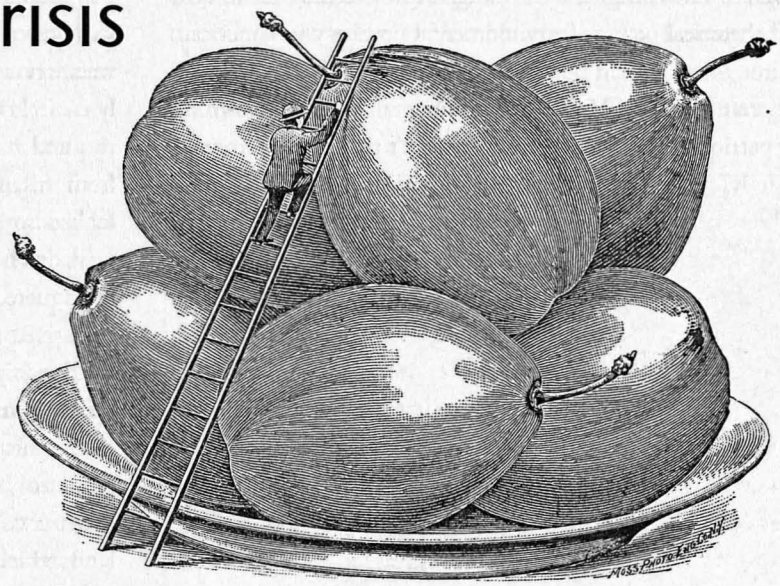
Under Marsh's influence, in 1892 a protective blue line was drawn around the "mixed-ownership" Adirondacks. But we are now beginning to realize that such a line must actually encircle the whole planet, its struggling human communities and its wildlife alike. Marsh's value to us today comes from his awareness that the beautiful world at which he looked so discerningly had already been damaged in grave ways by human heedlessness. From his own vision of the beleaguered heart of Nature grew his hope to promote a more inclusive, respectful, mutually protective, and progressive relationship between human communities and the living earth. Marsh aspired to become himself—and encouraged each of his readers to become—"a co-worker with nature."

SHADOWS HAVE marked out our path toward a more mature land ethic. Marsh documents the devastating aftermath of deforestation; Aldo Leopold shows the cultural as well as the biological impoverishment that follows from destruction of wild habitat and extinction of predators; Rachel Carson discloses how DDT and other pesticides circulate through our watersheds and through our own bodies; Bill McKibben, in the present day, relates our fossil-fuel-based mobility and consumerism to grave changes in the global climate. The upshot of such writing, finally, is not lamentation, though. It represents a balanced proposal for a more hopeful and sustainable way of life. As Leopold writes in *A Sand County Almanac,* an expanded land ethic has now become "an evolutionary possibility and an ecological necessity." Over the century and a quarter since Marsh's death, we can see clearly how many benefits have already flowed from his astringent but constructive appraisal of humanity's legacy of land use and abuse. His story encourages us to continue advancing along the path of chastened resolution. ☾

John Elder *is Stewart Professor of English and Environmental Studies at Middlebury College in Vermont. His recent books as author or editor include* The Frog Run, Reading the Mountains of Home, *and* The Return of the Wolf: Reflections on the Future of Wolves in the Northeast.

Limits-to-Growth and the Biodiversity Crisis

by Eileen Crist



engraving ca. 1900

If the world's air is clean for humans to breathe but supports no birds or butterflies, if the world's waters are pure for humans to drink but contain no fish or crustaceans or diatoms, have we solved our environmental problems? Well, I suppose so, at least as environmentalism is commonly construed. That clumsy, confused, and presumptuous formulation "the environment" implies viewing air, water, soil, forests, rivers, swamps, deserts, and oceans as merely a milieu within which something important is set: human life, human history. But what's at issue in fact is not an environment; it's a living world.

David Quammen

SINCE PAUL EHRLICH'S *Population Bomb* (1968) and the Club of Rome's *Limits to Growth* (Meadows et al. 1972), many environmental analysts have argued that the assumption of endless growth on a finite planet is irrational and dangerous. They contend that neither the human population nor world economic productivity can continue to increase without inviting scarcity—of energy sources, materials, water, and soil. And constraints are not imposed only through finite resources, but also by the planet's limited capacity to absorb the waste output of an enormous and growing population. Limits-to-growth proponents cannot predict exactly when, or how, industrial civilization—and with it all humanity—will become cornered by its obstinate commitment to endless growth, but ecological modeling makes clear that as limits are breached, overshoot and collapse are all but inevitable (Meadows et al. 1992).

As long as limits-to-growth arguments have been around, so have its detractors, known by the happy-go-lucky name of "cornucopians." The most famous among them is the late economist Julian Simon. For cornucopians, there are no finite limits to the Earth's resources or absorptive capacity. They argue that were "finite limits" a true category, then its parameters should be measurable. However, the argument continues, the quantity of any resource is not an absolute: we cannot be sure that there are no treasure-troves of the resource waiting to be found—a discovery that would alter its quantitative profile; the quantity of the resource is a function of the technologies that extract and process it—more efficient technologies change the "amount" of the resource; recycling can prolong the life of a resource, or make it last indefinitely; our interest in any resource involves the services and uses it provides, so if it can be replaced by another or by an invented substitute, then the question of the resource's finiteness is irrelevant; and finally, outer space "is the limit," offering such future prospects as hydroponic farming in spaceships and extraterrestrial mining (see Simon 1999; Kahn et al. 1976). Cornucopians—also understandably known as "technological optimists"—conclude that the idea of finite limits is a chimera. When it comes to resources, the real player is not a constraining set of natural materials or variables, but human ingenuity regarded as the "ultimate resource" (Simon 1996).

Limitations of the debate

In crucial ways, the debate between the limits-to-growth proponents and the cornucopians is extraneous to the ecological crisis, especially to the plight of nonhumans; and it constitutes a digression. The core issue is not the quandary of real-world limits but *what kind* of real world we desire to live in. I submit two points: (1) the biodiversity crisis is essentially sidestepped by the limits-to-growth framework; and (2) what is invidious about the cornucopian view is not that it is (necessarily) wrong-headed, but the dismal reality it envisions and would make of the Earth.

According to the Club of Rome's estimations in the early 1970s, the time available to avoid a "monumental crisis" was a matter of years not decades (Elichirigoity 1999). It is indeed possible (but far from definite) that at some future moment a keystone threshold of biophysical limits will be violated, backfiring unexpectedly, dramatically, and perhaps apocalyptically against humanity's unsustainable economic undertakings and population growth. But we can neither hope that Nature will come to the rescue nor dread the uncontrollable forces we may unleash. It is critical to focus on what is presently dead certain: that overproduction and overpopulation have been driving the dismantling of complex ecosystems and native life, and leaving in their widening wake constructed environments, simplified ecologies, and lost life forms.

A key problem, then, with how the debate is framed is that it refers to *future outcomes*—be they catastrophes or prospects. The (im)possibility of a growth-caused grand-scale ecological crisis is posited for an indeterminable morrow. Limits-to-growth environmental literature falls into this trap of future-oriented thinking—it is replete with portending allusions to what will come, such as "humanity is close to limits," "hazardous times are just ahead," or "we may/will soon see [such and such]." But from an ecological present-day vista such an approach is self-defeating, if only because tomorrow is a slippery idea. While appearing to be a referential concept—isomorphic with "today" and "yesterday"—"tomorrow" is a null set: it never comes, and so essentially refers to nothing. What always arrives is today, and in this madly accelerated world every today is ecologically poorer than yesterday. But directing attention toward future possible disaster(s) can subtly shape how the present moment is experienced and understood. As long as the litmus test for the reality of an ecological crisis is in the future, we become inured against seeing that we are immersed in it, here and now.

The environmental crisis is multidimensional but no facet is more urgent, nor more fundamental, than the biodiversity crisis. The idea of biodiversity has sometimes been regarded as vague and political—assessments that miss the point by a long shot. Far from being vague, "biodiversity" is

inclusive of all levels: from genes, through species (as well subspecies, varieties, and hybrids), populations, ecosystems, and biomes, to processes of ecological interconnectivity and evolutionary speciation. All are dimensions of biodiversity: a plurality of living states and processes, biological actuality and potential, that makes the concept exquisitely versatile, encompassing, and robust. The view, moreover, that "biodiversity" and "the biodiversity crisis" are political motifs—skillfully constructed with the aim of crystallizing problems in order to influence policy—is narrow-minded. Only those focused exclusively on human affairs, and conflicting interests therein, would mistake the intensity and mandate that infuse scientific discourse about biodiversity for *politics*.

The various components of biodiversity, presently being unraveled, required hundreds, thousands, millions, or billions of years to reach a breathtaking level of intricacy and dynamism. The ruination of life that conservation biologists call "the biodiversity crisis" refers to the global events of human-driven extinction, contraction of populations, constriction of organisms' natural ranges and movement, genetic erosion, ecosystem destruction and degradation, habitat fragmentation, the evolutionary standstill of complex life, and receding wilderness. Looking at the whole picture, we are—today—in the midst of inaugurating a *biogeological era* of a decimated biota. Yet there is time to mitigate the worst outcome of this global simplification.

Does the framework of "breaching limits" address the momentous event of the biodiversity crisis? Arguably, it does not. It is perfectly possible that a mass extinction of 50%, 60%, or more of the Earth's species would not be pragmatically catastrophic for human beings. Such a destruction would forever eclipse possibilities for enhancing and prolonging human life through loss of uninvestigated medicines, unknown products, and novel food sources—not to say treasuries of knowledge and beauty. But loss of unexplored possibilities is quite different from breaching limits. And psychologically speaking, human beings experience loss poignantly only for what they become dispossessed of, not for something they never had nor knew. If mass extinction proceeds, human beings will indeed experience loss of a magnitude they do not yet fathom; that grief, however, will not be about having possibly lost the cure for the common cold.

If biodiversity continues to be whittled down daily on a global scale, the inevitable consequence will be the planet's large-scale transformation into a human satellite of technological, managed, and constructed landscapes. Again, the question of violating limits is potentially moot. The conversion and leveling of, for example, countless European, North American, and Asian ecosystems has not been catastrophic for their human citizens: on the contrary, the appropriation of wild Nature's wealth has been the (profoundly under-recognized) source of so-called "affluence." From the limits-to-growth perspective, time-delays in the penalties of destruction are precisely what can lead to inadvertent overshoot—so such delays should not be assumed to signify that extreme penalties for humans are not forthcoming. Even if this reasoning is correct, again it is problematic in defining ecological calamity as a potential future state. Focus on the future, however, may not only implicitly normalize the present, but also make the evaluation of the present state ultimately contingent on whether or not a future "monumental crisis" ensues. If no such big-time crisis emerges, are we to conclude that the comprehensive conversion of the biosphere to serve a human materialism gone rampant is benign?

It is realistically possible for the Earth to be colonized by *Homo sapiens* without infraction of basic life-support conditions for the human species. Consider some possibilities. Natural forests could be largely replaced with tree plantations—even genetically engineered to absorb more carbon dioxide or grow faster to maturity. Degraded agricultural fields might become arable if stocked with crops engineered to grow on them; and extensive co-optation of the rational methods of agroecology, such as composting, crop rotation, and inter-cropping, could breathe some life into depleted soils. Exhausted fisheries and extinct fish might be replaced with large-scale aquaculture operations providing protein for humans. Problems of water scarcity could be managed through rationing, more efficient technologies, or mammoth engineering projects such as converting salt water to fresh water.

In short, over the face of the Earth, wild Nature's original services might become massively tweaked—and substituted for—by life-support enterprises of engineered Nature. While the latter world would be a wasteland by any ecological standard of comparison to the former, it might be capable of *physically* sustaining human beings, perhaps even in very large numbers. And so, while the limits-to-growth debate keeps questions circling around the reality or chimera of an upcoming collision with biophysical limits, what can be lost from sight is an unfolding slow-motion avalanche that is "ending" the natural world, to quote the poet, not with a bang but a whimper.

The limits-to-growth entreaty to sustain the world's "natural capital" in order to provide for human needs by harvesting its "interest" also leaves the plight of biodiversity by the wayside. The function of capital is to generate wealth for its owners, stockholders, and customers; by analogy, the function of natural capital is to generate wealth for people. Even ignoring the anthropocentrism of identifying the natural world as capital, the characterization "natural capital" does not dictate or foreclose what the biological wealth to be sustained should, exactly, *look like.* Extensive tree cover (in lieu of ancient and/or mature forests) is clearly definable as natural or biological capital—not only is it a source of timber products, but it also generates oxygen and absorbs carbon dioxide, can counter erosion on sloping grounds if planted successfully, and might even function as a wildlife refuge and watershed of sorts. Salmon with growth hormone genes spliced into their DNA—fattened swiftly for slaughter—might also be regarded as biological capital: this engineered variety can be harvested in 18 months rather than three years (Turner 2001), thus generating "interest" faster than the wild and free varieties of salmon "natural capital."

To contend that we need to sustain "natural capital" for human well-being and survival is not an ecological argument, and bears no necessary connection to the conservation mission. At its deepest recesses, this way of conceptualizing the biological world can bolster—despite the best intentions—the cornucopian worldview for which Nature is nothing but raw material to be harnessed and milked for the production of wealth. If technological optimists start waving the banner of "conserving/creating natural capital," it should not come as a big surprise; the "capital-interest" idiom easily lends itself to appropriation by the ideology of free-market humanism.

Beyond limits

In conclusion, the limits-to-growth framework is inadequate to address the central crisis of our day: (1) because mass extinction could conceivably come to pass without jeopardizing the survival of the human species; and (2) because people might be materially sustained by a technologically managed biota made to yield services and products required for human life. The crucial question, then, is not whether a colonized world is viable but rather: Who (besides Simon and company) wants to live in such a world? Presented with a portrait of a planet largely divested of native ecosystems, wildlife, and big wilderness, people might awaken to the bleak world now taking shape.

If biophilia is inborn to the human soul, as E.O. Wilson has eloquently maintained, then devastating the biosphere is tantamount to the betrayal of love. Such is the treason at the heart of the biodiversity crisis. While this can be harped on in ways that quickly descend into sentimentality, there are other ways to point to it so that more people see it in the present. One is to be as clear and precise as possible about the consequences of the humanized order under construction: in this emerging reality it is not our survival and well-being that are primarily on the line, but *everybody else's.* ☾

Eileen Crist *is an assistant professor in Science and Technology Studies at Virginia Tech in Blacksburg, Virginia. She is the author of* Images of Animals: Anthropomorphism and Animal Mind *(2000). Her last article for* Wild Earth, *"Quantifying the Biodiversity Crisis," appeared in the spring 2002 issue.*

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Ray Dasmann: A Credit to His Species

by Stephanie Mills

Called by the Wild

The Autobiography of a Conservationist

by Raymond F. Dasmann
with a foreword by Paul R. Ehrlich
University of California Press, 2002
255 pages, $27.50

EARLY LAST YEAR Raymond Dasmann's autobiography appeared. Having known Ray a little in my California days, and been shaped by reading his books and hearing him speak, I read *Called by the Wild* eagerly. In the midst of reviewing his characteristically wry and laconic account of what was in fact a most original and illustrious career, I learned to my sadness that Ray, 83, had died.

Although he began and concluded his working life as a professor, Ray Dasmann would venture far from academe into the organizations where international conservation policy was shaped and implemented. He worked as a senior associate with the Conservation Foundation at a time when Frank Fraser Darling, Russell Train, Fairfield Osborn, and William Vogt (whose 1948 book *Road to Survival* had sounded an early warning on human overpopulation) were "part of the team." He also worked with UNESCO to create the Man and the Biosphere Program and was senior ecologist at the IUCN. He was elected a fellow of the American Association for the Advancement of Science and received the Distinguished Service Award from the Society for Conservation Biology.

To read his autobiography, then, was to learn in detail what the world has lost—in the wilderness Ray Dasmann knew and strove to save, and in the person of a great biologist.

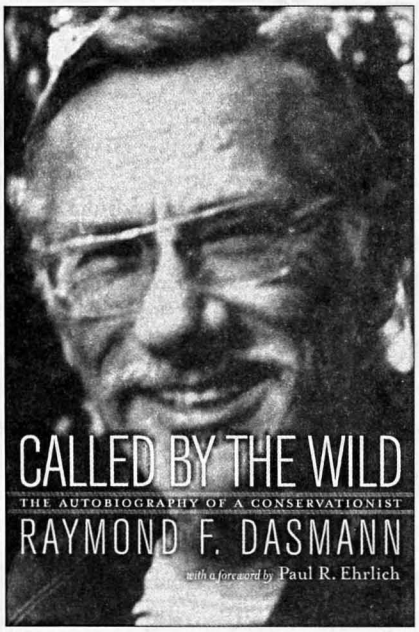
Dasmann was born and raised in San Francisco. The wild called and he responded, from boyhood days birding in Golden Gate Park to teenaged cowboying on an uncle's ranch in the southern Sierra Nevada, to becoming a fire lookout and field biologist and pioneering international conservationist.

RAY DASMANN covered all kinds of terrain in the course of his life, from the remote New Guinea highlands where he served in World War II to the European and American cities where his international conservation work required his residence. He also traveled the terrain of the human heart. On a blind date while he was on leave in Sydney, Australia, Ray fell in love with Elizabeth Sheldon. Elizabeth, an artist and newspaperwoman, requited Ray's love till she died, becoming his partner for life and the mother of their three daughters. A very human work, *Called by the Wild* is shot through with Ray's admiration for and gratitude to Elizabeth, with memories of their family life and travels together.

When the war was over, Ray brought Elizabeth back home with him to San Francisco. She went to work in the city as a newspaper librarian and he crossed the bay to study forestry at the University of California at Berkeley. He wound up as a graduate student under Starker Leopold, and earned his spurs by serious number-crunching for a prescient and controversial study of California's deer populations. One upshot of the research was that when Starker Leopold, like his father Aldo before him, recommended a doe hunt to trim the herd to fit the land's carrying capacity, he too was reviled and his recommendations ignored. Public opinion notwithstanding, the population crash that Dasmann had helped to predict came to pass.

The geographer Carl Sauer was another of Dasmann's august professors at the University of California. Dasmann describes Sauer as the "ultimate interdisciplinarian." Sauer's erudition and genius for articulating patterns of physiographic and cultural interplay surely enlarged Dasmann's own scope and understanding. Ray would become an ecologist in the fullest sense. He too would span and integrate existing scientific disciplines and help initiate new ones.

By the end of the 1950s, Ray Dasmann was teaching at Humboldt State University and had written the classic *Environmental Conservation,* which went through five editions before he retired it. His *Wildlife Biology* also became the standard text and was similarly long-lived. In addition to these, Dasmann wrote a slew of books for general readers. He credited Starker Leopold's beautiful English *and* Spanish prose as his inspiration to write well, and he did. What's more, the fieldwork under Leopold gave Dasmann "a rare opportunity to visit all the wild country in California." This experience would years later inform his most successful book, *The Destruction of California,* published in 1965.



Reading *The Destruction of California* in the early eighties really shook my world. An exemplary work of what has come to be called environmental history, the book detailed, among its other revelations, the biotic changes wrought by human action in the natural landscape of the San Francisco Bay region that I then called home. From Dasmann I learned that the winter green and summer beige hillslope palette of northern California's seasons was an artifact, a consequence of introduced grasses.

Raymond Dasmann had firsthand knowledge of just how tattered the remnants of what he once called the "old, wild world" were becoming. He was keenly aware of the multifarious human assaults on the wild, especially those mounted by industrial civilization. Yet he was no misanthrope. Historic and more recent evidence suggested that "primitive" human beings had fit in the wild world. Could our species find a way to belong again?

In 1959, a Fulbright grant took Dasmann to Rhodesia. There he met a young game ranger named Alan Savory in whose eye the Panglossian Holistic Resource Management concept may have been a gleam. Dasmann's work in Africa was on game ranching—getting meat from native ungulates—and led to a book on the subject. From the idea of a regional economy based on a wild harvest and hunt to the broad concept of ecodevelopment is but an intellectual leap, and it wasn't many years before Dasmann made it. His wildlife biologist's understanding of the stern reality of carrying capacity wouldn't admit of fantasies like sustainable growth.

"Ecodevelopment stresses that human use of planet earth must respect the ecological constraints imposed by the natural environment," he wrote in *Called by the Wild*. Nevertheless, Dasmann understood that management policies that didn't acknowledge some human claims to subsistence in the countryside around, or even within wild reserves would likely be unenforceable, to say nothing of being unjust: A second precept of ecodevelopment, he wrote, is that it "must be directed to meeting the basic *needs* of the poorest people before paying attention to the *wants* of the elite."

RAY DASMANN'S politics were ecological, therefore unconventional, and ahead of their time. I thought one of his most salient ideas was a distinction between "ecosystem" and "biosphere" peoples, advanced in the early 1970s:

> Traditional "primitive" societies... occur within a single ecosystem and are subject to the ecological controls within an ecosystem....Globally dominant cultures draw upon the resources of the entire biosphere.... This makes possible a much more complete disruption or destruction of the components of an ecosystem than is possible to an ecosystem-dependent society.

Dasmann later regretted the oversimplification inherent in this distinction. It suggested a symbiosis with the biosphere on the part of globally dominant cultures and seemed to overlook instances of overexploitation of resources by tribal people. To clarify, he added a further distinction between *invaders* and *natives*.

Naturally enough, Ray's thought placed him in the vanguard of bioregionalism, although he preferred this rose by other names. During his stint at the IUCN, Dasmann, with Miklos Udvardy, developed a map of the world's biotic provinces. Its primary purpose was to provide the basis for a strategic and representative program of ecosystems preservation. The map showed palpable territories, not geopolitical entities. It depicted a world not devoid of borders, exactly, but with natural and permeable boundaries. It was a first map of planetary bioregions.

With ur-bioregionalist Peter Berg, Dasmann co-authored "Reinhabiting California," which appeared in *The Ecologist* in 1976 and introduced a timely and radical program for Californians and other biosphere invader types to become native to their ecosystems: "Reinhabitation," they wrote,

> means learning to live-in-place in an area that has been disrupted and injured through past exploitation.... It involves applying for membership in a biotic community and ceasing to be its exploiter....Shifting to a reinhabitory society, however, requires basic changes in present-day social directions, economics, and politics.

In this era of globalization with its catastrophic technological hubris and extreme volatility, reinhabitation's good sense becomes increasingly obvious and urgent.

When we first met in the late 1970s I asked Ray Dasmann if he felt some sympathy with Prince Peter Kropotkin, the anarchist prince and Russian geographer who wrote *Mutual Aid*. Ray's response, as I recall, was a smile and a nod, yes. As affirmed in *Called by the Wild,* Ray Dasmann held freedom sacred: It was nothing abstract or ideological to him, but some *thing* immanent that required some *where* to live.

"When we chain and confine all our wild country, eliminate the free-roaming animal life," he wrote, "Then there will be no space left for that last wild thing, the free human spirit." ☾

Reviewed by writer and former Wild Earth *board member* **Stephanie Mills,** *who lives in Michigan. Her books include* Whatever Happened to Ecology? *(1989),* In Service of the Wild *(1995), and, most recently,* Epicurean Simplicity *(2002).*

Wilderness and Political Ecology

Aboriginal Influences and the Original State of Nature

edited by Charles E. Kay and Randy T. Simmons
University of Utah Press, 2002
342 pages, $45

DATA, INTERPRETATIONS of data, and policy recommendations constitute the pyramid of argument in most science-based advocacy work. Because Charles E. Kay is well known for his anti-wilderness leanings, the explicit anti-wilderness statements in his chapter and afterword to *Wilderness and Political Ecology* come as no surprise. (This anti-wilderness stance also colors a chapter written by Thomas W. Neumann, one of the other eight contributors.) A reader may nevertheless find value in the data presented—even the data interpretations—while coming to markedly different policy conclusions.

Such was my experience in reading this compendium of nine contributed papers. I now have a deeper understanding of current, historic, and prehistoric ecologies in North America; yet the importance I place on designated wilderness as a real and effective category of land "management" is at least as firm as before.

Learning that indigenous peoples of California may well have hunted elk, sturgeon, and land-birthing pinnipeds (e.g., elephant seals) down to "levels we might consider worthy of endangered species status today" (Jack M. Broughton in "Pre-Columbian Human Impact on California Vertebrates") actually strengthens my resolve that human influence be reduced to a minimum in large and diverse reserves of land. It is an ethical imperative.

What about chronological benchmarks for ecological restoration or standards of what is natural? At least two authors, Paul Martin and Gerald Williams, suggest that a benchmark of 13,000 years ago—that is, prior to any human entry onto this continent—merits consideration. A Pleistocene benchmark rises above the current academic scuffles about what America was truly like (in terms of human, bison, passenger pigeon, etc. population levels) pre- and post-1492. And it reconfigures on-the-ground management issues. To set fire or not to set fire, to hunt or not to hunt ungulates: each debate presumes some level of human manipulation as natural. A Pleistocene benchmark shifts the growing edge of management questions toward rewilding for evolution: that is, toward reintroduction of the key landscape shapers (or their surrogates) that were hunted to extinction by the early Clovis culture and restoration of ecological processes that shaped North America's natural diversity.

Paul Martin's lead chapter in the volume argues that early human invaders of this continent were the capstone cause of the end-Pleistocene "extinction of the massive" some 13,000 years ago. In his final chapter and afterword, Charles Kay refines this overkill theory in insightful and ecologically persuasive ways. For example, Kay's contention that herbivores in America's landscapes were traditionally regulated "top down" (by predators, including human predators), rather than "bottom up" (by food or resource limits), actually enhances the likelihood that spear- and atlatl-wielding humans could have caused extinctions. This is because top-down regulation by native canids, cats, and bears would have presented the early human invaders with a much smaller population of large herbivores than previously surmised.

Similarly, Kay suggests that it is actually quite easy to kill even a bull mammoth. Our Western standards of what constitutes a fair hunt have heretofore prevented us from seeing

the obvious: a wise PaleoIndian would aim for the gut, and then simply follow the wounded beast until it succumbed to internal infection. Cool marshes and bogs would have been sought by the fever-driven animals in their final days or hours.

Kay's argument that PaleoIndians need only have hunted to extinction the largest herbivores (say, the mammoths and mastodons and ground sloths) is likewise intriguing. The ensuing "trophic cascade"—as hunting pressure shifted onto the remaining smaller creatures—would have intensified predation by sabertooths and their ilk on the remaining herbivores, which in Kay's view might have driven those creatures over the edge.

Kay's interpretations, if not his polemics, would surely be more helpful if he would add a Pleistocene benchmark for what is natural to his early and late historic benchmarks. Scenarios that propose low numbers of passenger pigeons prior to 1492 may be interesting, but I also want to hear what those birds were doing prior to 13,000 B.P. Who was eating pigeon food (acorns and other nuts) back then, and who was eating whoever was eating acorns?

Similarly, I can in no way see how Kay concludes that, for plants, "10,000 years is more than enough time for evolution to work." Populations and communities of plants surely have shifted in that time, but maladaptive traits? Likely not. Indeed, today's problem of shrub "invasion" in the semiarid and arid lands of the American West owes to the influx of domestic grazers (cattle, sheep, and horses) without the commensurate return of predators who could hold those populations in check and reintroduction of browsers (camels, ground sloths, and mastodons) who would relish creosotebush, mesquite, and other native shrubs ignored by the grazers. ☾

Reviewed by **Connie Barlow,** *author of* The Ghosts of Evolution *and other science books, as well as a half-dozen essays in* Wild Earth *on deep time and evolutionary ecology.*

The Adirondacks

Wild Island of Hope

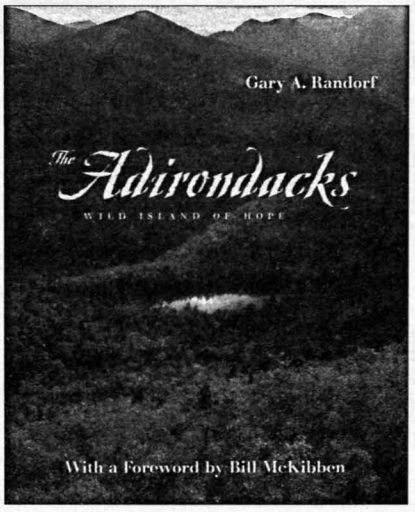
by Gary A. Randorf
with a foreword by Bill McKibben
Johns Hopkins University Press, 2002
202 pages, $22.95

GARY RANDORF has been married to New York's Adirondack Mountains for more than 30 years. As a naturalist, conservationist, photographer, and writer, this protean lover of the woods and rivers has probably hoofed and paddled more miles in the region than any man, woman, or beast alive, with the possible exception of legendary 97-year-old Adirondack guide Clarence Petty. Randorf's much-anticipated book of words and photographs, *The Adirondacks: Wild Island of Hope,* represents a true life's work—a life immersed in his subject matter.

Randorf is quick to say he had his share of luck. He arrived in the Adirondacks around the time Governor Nelson Rockefeller was creating the Adirondack Park Agency (APA). In 1972, the APA hired Randorf as a "natural resources planner." Soon he was exploring the wilderness in the company of the park's foremost naturalists and conservationists—including Petty, as well as Greenleaf Chase, George Davis, and others. Eventually he stood among them as an equal.

Where luck ended and genius began was the day Randorf first slipped a camera into his backpack. The Adirondack photos he bagged over three decades form the heart of this book. They're brilliant. Part of the reason is Randorf's eye—that of an artist. Moreover, this photographer travels swiftly and light. Whereas other great image-makers of the region have tended to lug heavy tripods and large-format cameras and lenses into the wilds, Randorf—a wiry man full of energy—has worked with light 35 mm equipment. This allowed him to bustle up and down mountains and around the shores of lakes at extraordinary speed. The upshot is that Randorf managed to be at the right place in the right light on an astounding number of occasions.

Among the hundred photographs in *The Adirondacks: Wild Island of Hope,* it's hard to pick favorites. I suppose mine, aside from the obligatory mouth-watering landscapes, are portraits that convey a sense of intimacy:

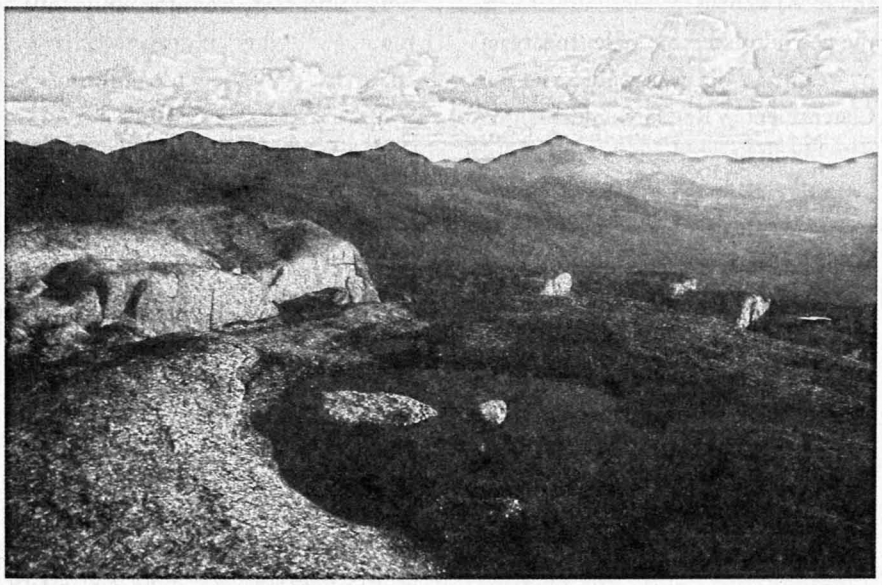


a solitary woman on a summer day, taking in a view of the Pharaoh Lake Wilderness; a swirling backwater of the Ausable; leaves afloat on Lake Lila; a young moose in tall grass; a red-jacketed hiker in a winter landscape of virtual black-and-white; cross-country skiers seen at long distance, making their way across a snow-covered lake. The Adirondacks shine in all seasons. Only two photographs, one showing the view from Crane Mountain and the other the summit of Cascade, were shot in black-and-white. They're stunners.

Randorf's tome combines the visual pleasures of a coffee table book with a substantial text. About one-third consists of autobiography; another third celebrates the natural wonders of the region and surveys its history; and finally, because Randorf, now senior counselor to the Adirondack Council, is a dogged and devoted conservationist, a third of the book confronts the rampant development and chronic air pollution that threaten wildlife and people across the park's six-million-odd acres.

Faults? The book has few. More thorough examinations of the park's history can be found in the works of distinguished Adirondack historians such as Philip Terrie and Barbara McMartin. No doubt the author, in giving the broad view, has strayed into a sweeping generalization or two. As a lover of fine photography, I regret that the pages are not larger in size. Most of the images are squeezed into less than half a page. But these are minor concerns. Randorf's images are glorious, and their modest dimensions on the page make this book affordable. His text reads like a love letter—the best, most honest kind of love letter, one that glows with genuine affection while simultaneously addressing dark issues that beg to be resolved. ☾

Reviewed by **Edward Kanze,** *a naturalist, author, and photographer who lives in the Adirondacks along the Saranac River, near Bloomingdale.*



GARY RANDORF

Afternoon light flatters the High Peaks Wilderness, from *The Adirondacks: Wild Island of Hope*

Living in the Appalachian Forest

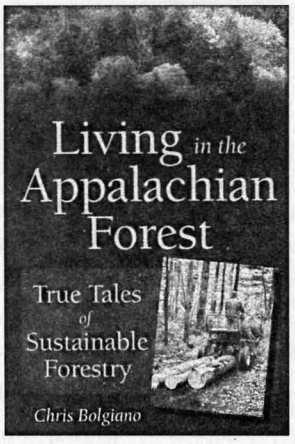
True Tales of Sustainable Forestry

by Chris Bolgiano
Stackpole Books, 2002
200 pages, $18.95

SUSTAINABILITY IS a tricky term, as Chris Bolgiano acknowledges: liable to a variety of definitions, or, worse, to being used with no definition at all. But the ambiguity of this "buzzword of the millennium," as she calls it, does not frighten her from seeking its embodiment in the forests of her chosen homeland, the southern Appalachians. Those forests need such attention. Having partially recovered from the early-twentieth-century ravages recounted in Bolgiano's 1998 book, *The Appalachian Forest: A Search for Roots and Renewal*, our fragile southeastern mountains are again the object of growing pressure from the timber, mining, and development industries. In my review of that earlier book (*Wild Earth*, winter 1998–1999), I noted that its discussion of land use was restricted to publicly owned national forests and national parks. *Living in the Appalachian Forest* may be seen as a pendant volume which redresses that imbalance by asking: Can people live and work sustainably on the private lands of the world's biologically richest temperate hardwood forests?

That the emphasis here is on people seems appropriate not only to Bolgiano's narrative and descriptive gifts, but also to the region that is her focus. Appalachia is a byword for rural poverty in America, and conservation here, as in another poor and ecologi-

cally sensitive zone, the tropics (see Michael Soulé, "Does Sustainable Development Help Nature?" *Wild Earth*, winter 2000–2001, with extensive bibliography), has traditionally been intertwined with social and economic issues. From her early chapter on "The Landless" of the region to her concluding vignette of Ukrainian immigrants collecting mushrooms on her Virginia property, Bolgiano never loses sight of Appalachians' dependence on the land for livelihood. At the same time, she makes clear her allegiance to the region's land and wildlife with expressions of love for her own Virginia property and a lengthy reversion to the topic of her first book, *Mountain Lion* (1995).



These deep sympathies for the human and non-human life of the mountains drive her to seek out explorers of "a new path, a middle route between preservation and exploitation." Through encounters with dozens of Appalachian forest-dwellers and forest-workers, she covers a wide spectrum of profitable forest uses, seldom judging them outright, and giving their ambiguities full play. Her examples include miners, landholders, consulting foresters, horse loggers, sawmill operators, a summer camp owner, and a ginseng grower. Three chapter titles, "Minimal Measures," "Just How Beautiful is Small?" and "Size Is as Size Does," indicate the importance of scale to sustainability. The smallest businesses described in Bolgiano's book tend to be the most plausibly sustainable. The largest and most lucrative, Addington Enterprises' infamous mountaintop-removal mining in eastern Kentucky (masquerading in places as an elk-restoration project), is the most destructive.

This pattern suggests a need to distinguish the ecological from the economic goal of sustainability. The ecological goal should be clear, in general terms: to prevent degradation of species diversity and habitat as defined by the best scientific evidence for pre-disturbance conditions. *Living in the Appalachian Forest* shows us some heartening attempts in this direction, but gives no assurance of their success. Hanging over them all is the verdict of the Reverend Dick Austin, conservation theologian, forest owner, and one of the most admirably thoughtful figures in the book. "It's unclear whether there can be such a thing as sustainable forestry," Austin notes. "Most of what's been done in its name has degraded the forest....No one has shown a sustainable forestry that I've seen, at least in this part of the country."

And what is the *economic* goal of sustainable forest use? If it is to enable conscientious individuals or families to earn some income from woodland while respecting its non-material values and preserving local folkways, Bolgiano shows it may be possible. But if sustainable forestry tries to compete with industrial logging, to make a significant contribution to the international supply of wood, it may be doomed to failure. And if it seeks to rival destructive non-timber uses of forests—as sites for mineral extraction or residential development—its success seems equally unlikely. Current demands upon forests are simply too great to be met sustainably; the present trend of population and consumption growth will only make sustainable forest use a more vexing problem. As Bolgiano tells us: "There is an intimate relationship between low impact and slow production." And elsewhere: "Scales of consumption drive scales of impact on the earth." The present scale of consumption, both of wood products and of land, is incompatible with slow production, and hence with sustainable forestry in any but small, experimental, or exceptional instances. But such instances are often the seeds of larger things, and *Living in the Appalachian Forest* performs a useful function in telling us where they stand. ☾

Reviewed by **Jay Kardan,** *a writer and conservation activist from Palmyra, Virginia.*

The Hidden Connections

Integrating the Biological, Cognitive, and Social Dimensions of Life Into a Science of Sustainability

by Fritjof Capra
Doubleday, 2002
300 pages, $24.95

IN *THE HIDDEN CONNECTIONS*, physicist and educational theorist Fritjof Capra calls on human communities to better mimic the natural systems in which we are embedded. His synthesis of leading thinkers and original insights illuminates our fundamental connection to the web of living sys-

Sometimes

The dogs catch a jackrabbit
that is slow and heavy with
dog-saliva now.
I leap across ground shouting
like a crazywoman growl and
six dogs drop the blinking
grey fur. The rabbit stares
at me and I don't know if she
is flying back to that other
place where rabbits run like
air.

Sometimes it takes me awhile
to become one with the land.

* * * *

Sometimes the sameness of my
days feels like dry wind over
brittle rabbit-bush and stiff
cacti.
Again sun rises hot and high
hungry for moisture from my
open mouth. Dry wind sucks
my wet insides out like a
jackrabbit running to dust
over miles of creaking earth.

I make footprints blown back
into formless dust almost be-
fore I pass.
I walk towards horizon getting
no closer to how bones lying
white and silent sing with
wind. I see change in mountains
riverbeds arroyos see the
crumbling beauty of time-nibbled
bones and I pause and know
change is eternity.

For fifty years I walk earth
this same way one foot at a
time this sameness quenching
thirst like wind drying a wet
mouth. There is nothing but
this thin shell of land over
my heart a heart like a tired
jackrabbit changing to wind
over bone.

Grace Deer

tems—while drawing on technical subjects from quantum mechanics, chemistry, and complexity theory, to the Santiago Theory of Cognition and biotechnology. (Those who relish this discussion will want to read his earlier book, *The Web of Life.*)

Capra's overview of the world economy as a tragic, single-minded trend toward globalization is concise—and is clearly exemplified in America's shifting emphasis from freedom to free trade. His explanation of ecological literacy and ecodesign as two key steps to the building of sustainable communities is pragmatic. By the end, *The Hidden Connections* accomplishes a bold goal: to develop a conceptual framework integrating the living systems of biology, cognition, and society.

Capra's wisdom puts flesh on the bones of this systemic approach (thinking in terms of relationships, context, patterns, and processes). Nature's networks, with their multiple feedback loops, rule. As we better understand them, we can let them do their glorious work. They serve all life, including humans. Three billion years of successful coevolution is an impressive streak. Nature displays unlimited development, diversification, innovation—and demonstrates creativity in emergent new orders. Human societies, too, can have that if we are ecologically smart.

The Hidden Connections makes a contribution to the greatest challenge of our time and of all time—the survival of life on Earth. The tasks required may appear overwhelming, but they are not impossible when approached with a science of ecological sustainability. ☾

Reviewed by **Randy Hayes,** *president of the Rainforest Action Network.*

➤ AROUND THE CAMPFIRE, FROM PAGE 3

Since the late 1970s, the ranks of the knobby tread crowd have mushroomed, the agencies remain accommodating to them, and the damage to wildlands and to peace and quiet snowballs. The invention of all-terrain vehicles (ATVs) and far more powerful snowmobiles allows motor-riders to penetrate even more rugged terrain. Perhaps the greatest defeat for conservationists in the 1970s was the failure of the agencies to do their duty in managing motorized recreation. Things will only get worse until conservationists are willing to go toe-to-toe with the exhaust-breathers.

It seems that if we could direct our evolution, most of us would opt for wheels instead of legs.

~ Dave Foreman

Sandia Mountains Wilderness Area

NOTES

1. Paul Sutter, 2002, *Driven Wild: How the Fight Against Automobiles Launched the Modern Wilderness Movement* (Seattle: University of Washington Press).
2. Susan L. Flader, 1979, Aldo Leopold and the Wilderness Idea, *The Living Wilderness* December: 4–8.
3. Richard Nixon, February 8, 1972, Executive Order 11644: Use of Off-Road Vehicles on the Public Lands, *Federal Register* 37 (27), Wednesday, February 9, 1972.
4. *National Forest System Off-Road Vehicle Management Issue Paper,* December 1974, U.S. Forest Service, Recreational Management Staff, 8.
5. David Sheridan, August 1978, *Off-Road Vehicles on Public Lands,* Draft Report to the Council on Environmental Quality, 97.
6. Sheridan, 89.
7. Sheridan, 90–93.
8. Sheridan, 103–105.
9. "Interior Secretary Says Off-Road Vehicle Use Will Continue," Department of the Interior News Release, May 26, 1977. Andrus also helped to weaken the BLM wilderness inventory and argued the timber industry's case during RARE II.
10. *Off-Road Vehicles on Public Land,* 110.

The opinions expressed in Campfire are my own, and do not necessarily reflect official policy of the Wildlands Project. —DF

➤ A WILDERNESS VIEW, FROM PAGE 5

wilderness system to millions of bikers will bring them into the wilderness fold as a potent political force, but this expanded group of potential wilderness users will have no negative effects on specific wilderness areas? I don't buy it. Unless this magically expanded wilderness movement can leverage Congress to dramatically and quickly build out the Wilderness System, and the pertinent agencies (U.S. Forest Service, National Park Service, Bureau of Land Management, Fish & Wildlife Service) can efficiently disperse and manage the increased recreational traffic, the ecological effects of mountain biking in wilderness areas are likely to be significant. Large numbers of new wilderness users, whether hikers, bikers, or butterfly watchers, cannot help but nick away at the integrity and diversity of America's last best wild places.

Yes, some research suggests that bikes probably cause little more erosion and soil compaction than hikers, and likely less than horses, which are allowed in wilderness. Yes, some studies suggest no discernible difference in the way hikers and bikers disturb wildlife in individual encounters. Approaching afoot or apedal, people will cause animals to flush. But extrapolating those data points into an assumption of no harm ignores the way technology can amplify human effects on the natural world.

Which brings me back to my encounter with the wilderness biker. My gripe was not because he had funny looking shorts or rippling muscles or even that he lied (I think) about not knowing his mode of transportation was illegal. *It was because his bike made the wilderness smaller.* The bike's mechanical advantage allowed him to move farther and faster into wild country. In this case, the roadless area was relatively small to begin with, providing only modest habitat security for wildlife. Welcoming more people on machines would shrink it further.

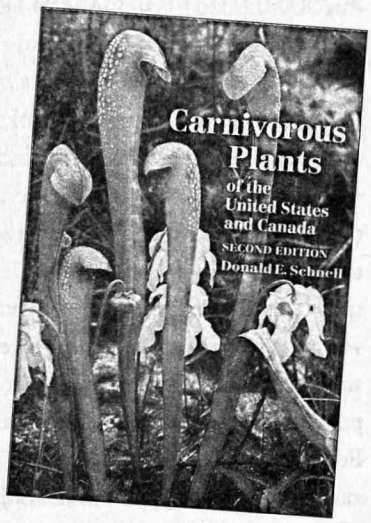
As conservationists wrestle with these questions, it's well to remind ourselves that backcountry recreation, a foundational and still valuable argument for wilderness protection, is no longer preeminent. The overarching rationale for preserving wilderness is to protect Nature's diversity. Specifically, that translates to saving the last refugia for wild creatures like grizzly bears and wolverines that need secure, remote areas to thrive. It means helping restore and connect high-quality natural habitats where martens and otters and other sensitive species can flourish—and opposing extractive or recreational uses that may degrade those habitats.

Certainly everyone can agree that internecine bickering among muscle-powered recreationists is counterproductive. We can and should avoid it. There are ways to accommodate appropriate recreational use of public lands and maintain the integrity of the National Wilderness Preservation System. In thinking about how best to do that, every recreationist—whether hiker, biker, horsepacker, or posey sniffer—should not begin by asking, "What's best for *ME?*" but rather "What's best for the bears?"

~ Tom Butler

A Few New Field Guides

From Aristotle to Roger Tory Peterson, naturalists have made lists, notes, and drawings of the flowers, birds, and beasts encountered in their wanderings. Along the way the field guide was born. Botanists and hikers, land managers and hunters, schoolchildren and artists—the roster is long of people who turn to a field guide, asking, "What is this?" Here's a sampling of new natural history handbooks to add to your bookshelf or, better, your backpack.



The Wild Orchids of North America, North of Mexico
by Paul Martin Brown, drawings by Stan Folsom, 2003, University Press of Florida, 236 pages, $27.95
From the red helleborine, growing at a single serpentine outcropping in Vermont, to the two-keeled galeandra recently discovered in a few remote Everglades sites, orchids represent the elegance and rarity of the plant kingdom. *The Wild Orchids* gives the botanist an annotated checklist and key to the 223 species in North America—the first such volume since 1924.

Birds of the Lahontan Valley: A Guide to Nevada's Wetland Oasis *by Graham Chisholm and Larry A. Neel, illustrations by Mimi Hoppe Wolf, 2002, University of Nevada Press, 256 pages, $21.95*
Deep in the arid Great Basin, the remnants of a vast Pleistocene lake form a wetland refuge, home to more than 290 resident and migratory birds. This, the Lahontan Valley, makes a critical stopover on the Pacific Flyway—and is precariously vulnerable to scarce rainfall and agricultural water competition. Combining species accounts, land-use history, and maps, this guide to the valley's avian diversity is both a call for conservation and useful resource for the birder heading afield.

Fish of Alberta *by Michael Sullivan and Amanda Joynt, illustrated by Ian Sheldon, 2003, Lone Pine Publishing, 176 pages, $14.95*
This slim volume includes full-color illustrations, a range map, and information on feeding, spawning, and population status for 56 species of fish found in Alberta's lakes, rivers, and streams. Includes best sites for viewing.

Introduction to Horned Lizards of North America *by Wade C. Sherbrooke, 2003, University of California Press, 192 pages, $16.95*
"[This is] the horned lizard bible deluxe," wrote one reviewer of the original version of this book (*Coevolution*). Though it seems hard to improve from there, the new edition features revised, detailed species accounts as well as fascinating information on how these much-mythologized "toads" make a living—whether specializing on ants for food or arching their bodies to collect rain.

Butterflies of North America
by Jim P. Brock and Kenn Kaufman, 2003, Houghton Mifflin, 384 pages, $22
Part of the Kaufman Focus Guide Series, this book joins a large stack of butterfly guides to North America (which only seems small next to the mountain-high collection of bird guides). *Butterflies of North America* provides more than 2,300 images with a convenient index that doubles as a life list. Similar species are arranged side-by-side for comparison along with range maps.

Marine Life of the North Atlantic: Canada to New England *by Andrew J. Martinez and Candace Storm Martinez, 2003, Aqua Quest, 272 pages, $30*
Drawn from the authors' many years of diving, this book identifies over 200 species of fishes, invertebrates, and plants with more than 350 color photographs. Chapters focus on sponges, anemones, corals, gastropods, bivalves, lobsters, urchins, and other

North Atlantic sea life. Natural history, habitat descriptions, and range information make this a valuable guide, especially for scuba divers.

Carnivorous Plants of the United States and Canada

by Donald E. Schnell, 2002, Timber Press, 468 pages, $39.95

No minerals? Eat flies. Such is the biological genius of pitcher plants, Venus flytraps, sundews, and other carnivorous plants that make a living in acidic bogs, savannas, and wetlands across the continent. This second edition of *Carnivorous Plants* provides color photographs, extensive descriptions, and distribution maps for all 45 North American species.

The Jepson Desert Manual: Vascular Plants of Southeastern California

edited by Bruce Baldwin et al., 2002, University of California Press, 626 pages, 128 color photographs, $35

In the spirit of the great desert botanist Willis Linn Jepson, this manual provides excellent photographs and an exhaustive botanical key for the native and naturalized vascular plants of California's southeastern deserts. Based on the original *Jepson Manual,* this updated and streamlined version is a true handbook for the field.

Raptors of the World

by James Ferguson-Lees and David A. Christie, illustrated by Kim Franklin, David Mead, and Philip Burton, 2001, Houghton Mifflin, 992 pages, $60

While you may not want to include this book in your balloon trip around the world (it tips the scale at a ballast-like five and a half pounds), it is the definitive identification guide to all the birds of prey in the world. Each of 313 species is described thoroughly, and every plumage and variation is shown in more than 2,000 color illustrations plus hundreds of black-and-white drawings and range maps.

Complete North American Wildlife: A Photo Field Guide

by Gerard A. Bertrand, HarperCollins, 2003, 352 pages, $23.95

Too general for the taxonomist, this guide should prove handy for the hiker or casual naturalist when it is published this summer. Over 1500 color photographs cover woodland, meadow, mountain, and shoreline encounters with birds, mammals, fish, reptiles, amphibians, insects, spiders, mollusks, wildflowers, trees, and shrubs.

Snakes of North America: Eastern and Central Regions

by Alan Tennant, 2003, Lone Star Books, 614 pages, $29.95

This new edition provides photographs and descriptions of all species and subspecies of snakes of eastern and central North America from Texas to Manitoba and the eastern seaboard of the continent.

Birdwatching in Vermont

by Ted Murin and Bryan Pfeiffer, 2002, University Press of New England, 192 pages, $19.95

Knowing where to go is half the game in birdwatching. When in the Green Mountain State, this compact guide gives the birder detailed descriptions and maps for 120 hot spots for birds, whether watching glittering snow geese traveling north through the Lake Champlain valley or searching for Bicknell's thrush in an alpine fir forest.

Native Plants of Southern Nevada: An Ethnobotany

by David Rhode, 2002, University of Utah Press, 188 pages, $24.95

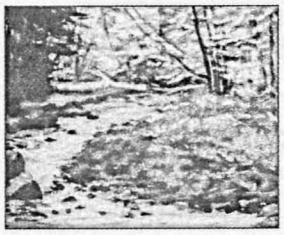
Paiute and Shoshone peoples of the Mojave Desert and southern Great Basin are some of the continent's original botanists. Their historical way of life was based on harvesting wild plants as they moved across the dry landscapes, shifting with the seasons. *Native Plants of Southern Nevada* arranges that botanical knowledge into a photo field guide that provides descriptions, habitats, and native uses—plus a list of Paiute and Shoshone plant names.

Mushrooms of Cape Cod and the National Seashore

by Arleen Raines Bessette, William J. Neill, and Alan E. Bessette, 2001, Syracuse University Press, 174 pages, $26.95

Beyond the breakers and sandy beaches, Cape Cod is home to a remarkable mycoflora. This identification guide features 250 indigenous mushroom species with color photographs and descriptions. An introduction covers habitats—from pine and oak barrens, to bogs, kettle ponds, and cedar swamps—as well as basic mycology and fungal anatomy.

[ARTISTS THIS ISSUE]



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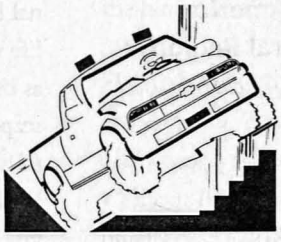

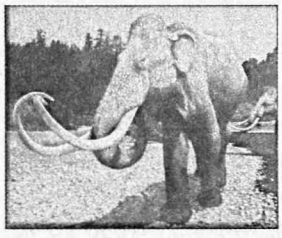

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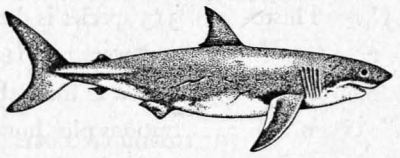

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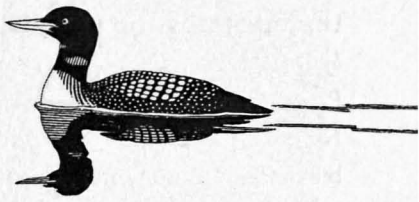

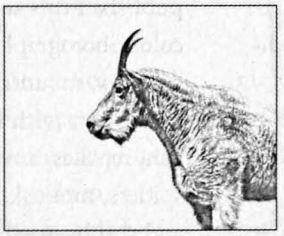

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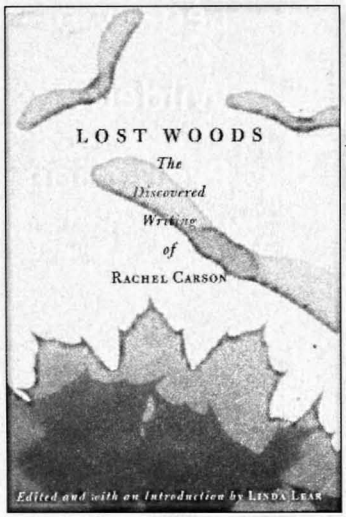

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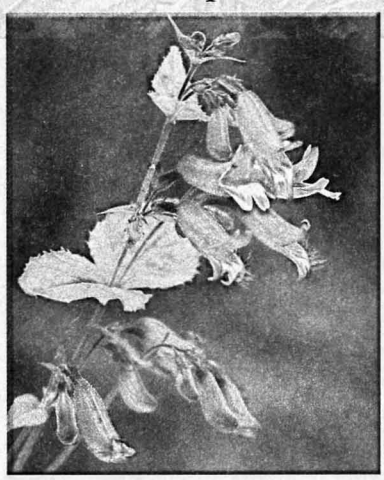

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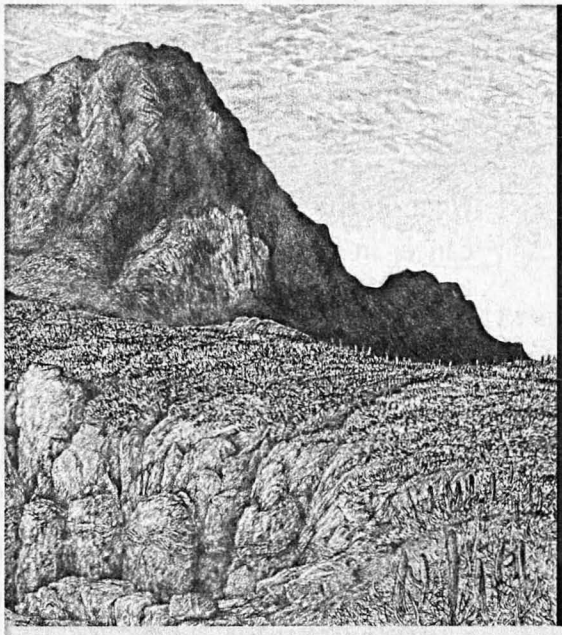

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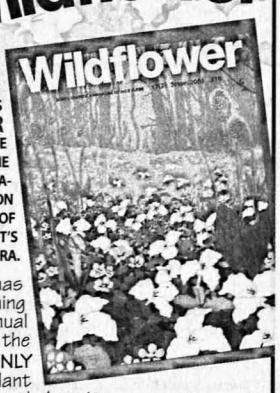

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BACK ISSUES

Thirty-one 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.

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

Spring 2002 • ***Extinction or Recovery?*** Causes and Processes of Extinction by Dave Foreman, A Fleet of Arks by Scott Russell Sanders, Quantifying the Biodiversity Crisis, Learning from the Rocky Mountain Locust, Passenger Pigeon Lice Rediscovered, Wolves & the Ecological Recovery of Yellowstone, Canebrakes, Threats to the Black-Tailed Prairie Dog and A Plan for Conservation, California Condors in Arizona, Moral Meaning of & Today's Fight for the Endangered Species Act, Wildlife Amendment Protects Private Lands

Fall/Winter 2001–2002 (combined issue) • ***Citizen Science*** Thomas Fleischner on natural history, Reed Noss considers whether citizen scientists are amateur naturalists, Rick Bonney suggests citizens collecting data help science, profiles of projects that monitor birds, mammals, fish, butterflies and more; Foreman on Early Awareness of Extinction, Biological Crusts, Sonoran Jaguars, Restoring Scotland's Caledonian Forest, Doug Scott examines words of the Wilderness Act, a lament for Florida, Pedaling Conservation Biology Across America, Saving School Trust Lands

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PUBLICATIONS

Androscoggin Atlas The Appalachian Mountain Club recently released *An Ecological Atlas of the Upper Androscoggin River Watershed.* The document presents 35 maps that cover geology, soils, vegetation, wetlands, lakes, rivers, and wildlife—as well as human impacts and land conservation needs—in the watershed upstream of the confluence of the Androscoggin and Webb Rivers in Maine. The atlas is available for free on CD-ROM; printed copies may also be requested from the author, David Publicover, 603-466-2721, ext. 200, dpublicover@amcinfo.org.

Waterbird Plan A collaboration among numerous governmental agencies and NGOs, *Waterbird Conservation for the Americas: North American Waterbird Conservation Plan, Version 1,* has been released. The document provides a continental framework for protecting species in North America, Central America, and the Caribbean. It sets goals and priorities for monitoring and regional actions related to conservation of nesting, wintering, and migration habitats. To obtain a free copy of the plan, visit www.waterbirdconservation.org or write to waterbirds@fws.org.

Bird Lists Partners in Flight has released a new version of its "watch list" tallying U.S. landbird species of conservation concern. Excluding waterfowl and shorebirds, 94 birds have been included on the list, which can be viewed at the American Bird Conservancy's website: www.abcbirds.org/pif/pif_watch_list.htm. National Audubon Society has also released its "WatchList 2002"; see www.audubon.org/bird/watchlist.

GATHERINGS

Forest Protection Week Activists will gather in Washington, D.C., June 1–6, 2003, to brief and lobby members of Congress about the degradation of national forests and to alert officials to current legislative assaults on our federal public lands. On June 4, the National Forest Protection Campaign will launch its *Ten Most Endangered Forests* report at a press event with biologist E.O. Wilson. Anyone interested in forest protection issues is welcome to attend; travel scholarships are available. For more information contact National Field Director Anne Martin at 509-624-5657 or annem@americanlands.org.

Religion Conference How can we build an economy that is just and honors all of God's creation? This question is at the heart of "Enough For All: Sustainable Living in a Global World," June 20–23, 2003, Seattle, Washington. This biannual conference is open to anyone interested in how Christian communities can take a leadership role in combining efforts for social justice and Nature protection. Speakers include Sally McFague, Damu Smith, Michael Oleska, and David Korten. For more information, visit www.webofcreation.org/ncc/conference or email cassandra@toad.net.

SCB Annual Meeting The 17th Annual Meeting of the Society for Conservation Biology will be held June 28–July 2, 2003, in Duluth, Minnesota, on the shores of Lake Superior. The meeting's theme, "Conservation of Land and Water Interactions," will focus attention on water, forests, wetlands, the Great Lakes and other large lakes and rivers of the world, marine and coastal systems, and associated biodiversity issues. The scientific program will include plenary sessions, invited symposia, workshops, organized discussions, poster sessions, and concurrent sessions of contributed oral presentations. Visit www.d.umn.edu/ce/conferences/scb2003/ for information.

Transportation and Ecology Conference The International Conference on Ecology and Transportation, to be held in Lake Placid, New York, from August 24–29, 2003, will explore how ecosystems and transportation infrastructure interact, how to restore habitat connectivity, and ways to reduce animal-vehicle collisions. Numerous sponsors range from the Federal Highway Administration to Defenders of Wildlife. For more information, visit www.itre.ncsu.edu/cte/icoet/index.html.

Wolves Fall Prey to Politics

I WAS HOPING to not talk about wolves in this column again for some time, but two recent and pivotal findings—one based on politics, the other based on conservation science—warrant urgent discussion.

In mid-March the U.S. Fish and Wildlife Service (FWS) announced its reclassification scheme for gray wolves under the Endangered Species Act (ESA). Under the new rule, federal protections for the wolf have been removed altogether in some states and reduced in most others. Much of the country has been broken down into three separate "Distinct Population Segments" (DPS), a bureaucratic term used to delineate planning areas for endangered species protection. Because each DPS is made large enough to include states with at least some wolves, the FWS can claim victory for its gray wolf recovery program, even though the species has been restored to less than two percent of its historic range in the lower 48 states.

The most absurd example of how the new rule undermines wolf recovery efforts is the new Eastern DPS, comprised of no fewer than 21 midwestern and northeastern states. By lumping the wolf-free Northeast together with the wolf-inhabited Great Lakes region, the Fish and Wildlife Service now considers wolf recovery complete in the East—despite the fact that not a single gray wolf pack exists east of Michigan. As a result, the agency will no longer consider reintroducing wolves into additional portions of their historic range, such as northern New England.

Yet preliminary findings from a new study commissioned by the Wildlands Project suggest that natural recolonization of the wolf in the Northeast is highly unlikely. This study, conducted by Dr. Carlos Carroll, an ecologist with the Klamath Center for Conservation Research, evaluates the long-term potential for wolf recovery in northern New York, Vermont, New Hampshire, and Maine.

Dr. Carroll's findings confirm what scientists have long known: the forests of northern New England and New York contain enough suitable habitat to support roughly 2,000 wolves. Because of high wolf mortality rates in Canada, however, the probability of wolves dispersing into the U.S. is extremely low. (Occasional individuals might make it, but not enough to form packs and avoid interbreeding with coyotes.) Moreover, Dr. Carroll finds that even if Canadian wolf mortality rates were to be reduced in the future, natural recolonization remains unlikely because habitat connectivity between the two countries is increasingly compromised by human development.

The bottom line is that without an active gray wolf reintroduction program—and full ESA protections for the species once it's here—ecologically effective populations of wolves will not be reestablished in the northeastern United States in the forseeable future. Wolf recovery will be limited to a few token, geographically isolated populations in a small handful of states.

The national debate on the future of wolves is far from over. Already a number of groups, including the Wildlands Project, have formally petitioned the Fish and Wildlife Service to establish a northeastern Distinct Population Segment for wolf recovery, and plans are unfolding to challenge the new rule in the courts. To be sure, much of this current battle will be won based on an intimate knowledge of obscure government regulations and fluency in legalese. To win the war, however, conservationists must work to shift the debate away from abstract legal questions towards more fundamental ones. Collectively, we must ask: What is needed to create a society in which the wolf and other imperiled creatures gain the respect that they deserve?

~ **Leanne Klyza Linck**

For a variety of viewpoints on the new wolf rule, visit the International Wolf Center at www.wolf.org/wolves/news/final_rule.asp

Species Spotlight

Natural Cryogenics

Wood Frog

KINGDOM	Animalia
PHYLUM	Chordata
CLASS	Amphibia
ORDER	Anura
FAMILY	Ranidae
GENUS	Rana
SPECIES	sylvatica

IN EARLY VERNAL POOLS, sometimes still framed with ice, wood frogs congregate in an explosive frenzy of breeding. To many, calling males suggest the quacking of mallard ducks as they advertise their availability. Males, in their ardor, will attempt to clasp anything in proximity—including other males, other species of frogs, and floating debris. Females lay egg clusters of a thousand or more, then immediately disperse to terrestrial habitats. Males follow within a week or two.

This sylvan species is usually found in moist woodlands. Sporting a characteristic robber's mask, a wood frog's body color otherwise can vary from tan to nearly black, providing good camouflage in forest duff.

Unlike their Ranid (true frog) cousins that bury themselves in pond-bottom muck, wood frogs typically overwinter in shallow burrows of leaf litter. The ability to derive glucose from stored glycogen allows them to freeze solid and slowly defrost in spring to begin another breeding cycle. A few other North American amphibian species have developed this strategy, but *Rana sylvatica* is the only one to range north of the Arctic Circle. ☾

Text by **Kevin Cross,** Wild Earth*'s art director.* **Matt Bohan** *is a freelance medical illustrator, wildlife artist, and photographer. His wildlife paintings have been displayed in the Adirondacks National Exhibition of American Watercolors, Watercolor U.S.A. 2000, and the Colorado Bird Observatory's Annual Songbird Show. The May 2001 issue of* American Artist *featured an article on his watercolor technique.*

illustration by Matt Bohan

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