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WILD EARTH



The Journal of the
Wildlands Project
SPRING/SUMMER 2004

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Rod Nash on Wild Rivers
North of the 51st Parallel
The Joyful Terror of Oneness
What are Central America's Parks *For?*

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WILDLANDS PROJECT



reconnect restore rewind

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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watercolor by Serena Supplee

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NOTE TO READERS

For 13 years, Wild Earth has provided a quarterly forum for conservation—and we look forward to continuing this role for years to come. However, in 2004 we will produce only two issues: spring/summer and fall/winter. As the back cover of this edition makes clear, our budget is tight. Like many in the conservation community, we have not been immune from downturns in the economy and shifts of focus among environmental grantmakers. With growth in our newly launched Wild Earth Fund—and your ongoing belief in our mission—we look forward to bringing you four issues in 2005.



We are not simply trying to delay the inevitable taking over of all our wilderness lands by a fast moving civilization. We are trying...to fashion a policy and develop a program that, if successful, will persist in perpetuity so that we shall always have these areas of wilderness.

—HOWARD ZAHNISER, FROM A 1957 SPEECH TO
THE NEW YORK CONSERVATION COUNCIL



Looking Back, Looking Ahead

ON JULY 29, 1946, the Zahniser family's first full day of vacation in the Adirondack mountains, Howard Zahniser awoke before dawn to watch the sunrise. He built the morning campfire, did camp chores, went for a 12-mile hike (much of it bushwacking), got back to the cabin for a late dinner, put the kids to bed, and enjoyed graham crackers and peaches with his wife Alice next to the fire until well after midnight; they eventually retired to bed at 1:30 AM. He concluded in his journal, "I think I got as much out of this day as there was in it."¹

Every American who has ever visited a federal wilderness area, or hopes to someday, or who endorses the notion that some parts of the American landscape should remain untrammelled—forever wild, self-willed lands—should be grateful that Howard Zahniser showed the same tireless zeal for life during the work week as he did on vacation.

Zahnie (as his friends called him) was, of course, the principal architect and author of the Wilderness Act and served as executive secretary of The Wilderness Society from 1945–1964. During this year's celebration of the Wilderness Act's 40th anniversary, conservationists will certainly be looking back and celebrating Howard Zahniser's central role in enacting a national legislative framework for wilderness protection. Newly emboldened by an improbable victory over the dam builders at Echo Park in Dinosaur National Monument, the conservation community worked cooperatively for wilderness legislation from the bill's introduction in 1956 until its passage eight long years later.

Zahnie, as David Brower recalled to me in 1998, was "the principal glue" that held the coalition together. "He was my coach," said Brower. "Terribly good man."² But neither Zahnie nor his longtime Wilderness Society colleague Olaus

Murie would see President Johnson sign the Wilderness Act in September of 1964; both were dead, Zahniser that July, just days after a final hearing on the legislation. Their widows, Alice Zahniser and Mardy Murie,³ stood next to the president as he formally signed the bill into law, creating our National Wilderness Preservation System.

Howard Zahniser remains a useful role model—a strategist whose knowledge of conservation history informed his vision for the future. Due largely to the energy and intellectual firepower of Robert Marshall and Aldo Leopold, the nascent wilderness movement of the 1920s had pushed successfully for designated wilderness areas on national forests, but by the 1940s it had become clear to some conservationists that such administrative protections were inadequate. Inspired by the constitutional protections afforded to state public lands within the Adirondack and Catskill State Parks by Article 14

of the New York State Constitution (the "forever wild" clause), Zahniser and others began laying the groundwork for federal legislation. He clearly believed that a national wilderness system was vital to Americans' collective and individual identities, that we have "a fundamental need for...wilderness—a need that is not only recreational and spiritual but also educational and scientific, and withal essential to a true understanding of ourselves, our culture, our own natures, and our place in all nature."

Howard Zahniser was correct that an expansive wilderness system would be the best way to secure the nation's natural heritage for future generations, but his thinking was overly optimistic on one point. In a 1951 speech, he exhorted his fellow conservationists to "be done with a wilderness preservation program made up of a sequence of overlapping emergencies, threats, and defense campaigns! Let's make a concerted effort for a positive program that will establish an enduring system of areas where we can be at peace and not forever feel that the wilderness is a battleground."

Forty years later, an enduring system of federal wilderness areas comprising roughly 106 million acres does stretch from sea to shining sea, where visitors may find some peace from an ever-expanding technological civilization. But as every modern conservationist knows: the wilderness is still a battleground.⁴ Even while a proactive campaign to designate new wilderness areas is ongoing—from Vermont's Green Mountain National Forest, to the redrock canyonlands of Utah, to the coastal plain of the Arctic National Wildlife Refuge—the conservation movement is also engaged in defensive

campaigns, helping to fend off the overlapping emergencies of our day, an unprecedented series of attacks on public lands and environmental law.⁵ Defensive campaigns have absorbed the bulk of the conservation movement's energy since the Bush Administration took office, but they are not new; threats to wildlands and wildlife have been ongoing regardless of which party or president holds office, and likely will ever remain so.

Just as the challenges are increasing, an economic downturn and related reduction in foundation giving is causing many conservation groups to face tough times. The Wildlands Project and *Wild Earth* are not immune from this belt-tightening climate. Due to budget constraints, we have decreased staff and will produce only two issues of the journal this year. Reducing frequency was a painful decision to make, and we hope to resume a quarterly publishing schedule in 2005. Meanwhile, we have commenced a dialogue about *Wild Earth's* future, using this difficult time to think about the journal's past and future role in the wilderness movement.

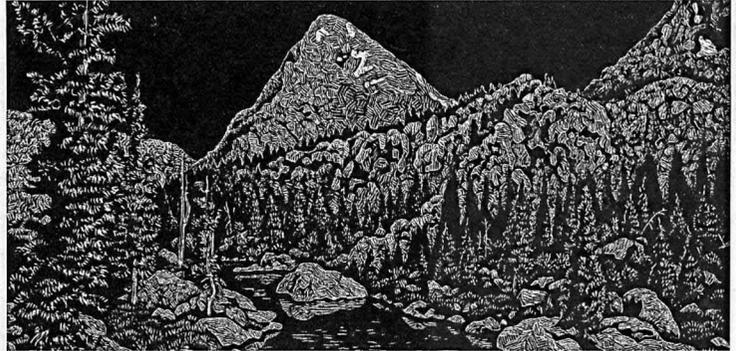
I firmly believe that through its first 13 years, *Wild Earth* has been an invaluable forum for discussion and debate, for strategizing—and for dreaming. We've looked back at some of the most compelling stories in conservation history, and looked ahead to a North American landscape where systems of conservation lands, anchored

by wilderness areas, form continental-scale wildlands networks. We've been willing to think boldly about the future, and in this way honor early wilderness visionaries like Howard Zahniser who wanted more than to "delay the inevitable," but hoped to change the world. Indeed, *Wild Earth* serves much the same role today as The Wilderness Society's periodical *The Living Wilderness* did in the middle twentieth century, under the editorship of Howard Zahniser: It's an idea seed-bank—the research and development wing of the wilderness movement—and vital to developing tomorrow's conservation strategies.

We invite you to help us keep those ideas flowing. In the coming months, many options are on the table for reinventing *Wild Earth*. We want your input—on format, content, funding sources, organizational structure—anything that might help the journal be better "glue" for the American wilderness movement, to borrow Brower's metaphor. Write, call, or e-mail⁶ with your good ideas. And we hope to see you at one of the events around the country that will mark the Wilderness Act's 40th anniversary.⁷ This could be a landmark year for the wilderness movement; as we look backward and forward, we can rededicate ourselves to work as hard "for eternity" as Howard Zahniser did, to get as much out of each day as there is in it.

≈ Tom Butler

1. Ed Zahniser, ed., 1992, *Where Wilderness Preservation Began: Adirondack Writings of Howard Zahniser* (Utica: North Country Books), 17.
2. Interview: David Brower, 1998, *Wild Earth* 8(1): 33–38.
3. After Olaus Murie's death, Mardy blossomed into a national wilderness leader in her own right. See tribute by Flo Shepard, 2003–2004, *Wild Earth* 13(4): 6–7.
4. Howie Wolke, 2003, National Wilderness System: Under Siege, *Wild Earth* 13(1): 15–19.
5. Robert F. Kennedy, Jr., 2001, Crimes Against Nature, *Rolling Stone* 937(Dec. 11).
6. E-mail editors Jennifer Esser (jennifer@wildlandsproject.org) or Josh Brown (josh@wildlandsproject.org).
7. See Announcements, page 80.



Protecting National Forest Wilderness After the Wilderness Act

WE CELEBRATE the 40th anniversary of the passage of the Wilderness Act this year. Today's wilderness conservationists generally know something about the history of the Wilderness Act. Fewer, however, know how conservationists shaped the National Wilderness Preservation System in the decade after the Wilderness Act. Making previously undesignated national forest roadless areas available for wilderness area designation was a heroic feat, though it is little acknowledged today.

The 1964 Wilderness Act immediately designated all national forest wilderness and wild areas as wilderness areas in a congressionally protected National Wilderness Preservation System. The Forest Service was required to finish studies on its remaining primitive areas and send recommendations to Congress by 1974. The Park Service and Fish and Wildlife Service were directed to study all roadless areas on their lands of 5,000 acres or more

(or "of a size practicable for management") and send designation recommendations to Congress by 1974. Under the Wilderness Act, only Congress could add or delete areas to or from the Wilderness System.

Conservation groups, notably The Wilderness Society and Sierra Club, organized around the nation to implement the Act. In particular, Clif Merritt, Ernie Dickerman, and Stewart Brandborg of TWS championed grass-roots organizing. It is through their foresight that a powerful wilderness movement emerged by the 1970s.

All agencies got off to a slow start in their studies. The Forest Service, despite overwhelming public support for large wilderness areas, continued their game of proposing pared-away primitive areas for protection. In general, areas with trees were excluded and protection was proposed for "rocks and ice."¹ In fact, the Forest Service deliberately located proposed timber sales

and access roads on the edges of primitive areas in order to prevent the addition of contiguous roadless lands (*de facto* wilderness, in the words of conservationists²). A case in point is East Meadow Creek next to the then Gore's Range-Eagle Nest Primitive Area north of Vail, Colorado. In the 1960s, the White River National Forest rolled out plans to log the virgin forest of East Meadow Creek. Conservationists in Vail opposed the timber sale and talked to Clif Merritt, Western Regional Director of The Wilderness Society in Denver. Clif, a bulldog defender of wilderness, far-sighted strategist, and peerless organizer, saw possibilities for protection and roped in young lawyer Tony Ruckel. In April of 1969, flying in the face of the legal orthodoxy that "the United States cannot be sued without its consent," Ruckel, with Merritt's guidance, sued on the grounds that the Forest Service's logging next to the primitive area

would violate the Wilderness Act's provision allowing the President to recommend "the addition of any contiguous area of national forest lands predominantly of wilderness value."

Federal Judge William E. Doyle first allowed the conservationists to sue the government and then enjoined the timber sale. Forest Service historian Dennis Roth writes that Doyle "interpreted the language of the Wilderness Act to mean that the Forest Service must refrain from developing a contiguous area which was potentially of wilderness value until the President and Congress had acted on the agency's recommendations."³ This so-called Parker Decision was the first judicial decision to protect wilderness, and is close in importance to the Wilderness Act as a wilderness conservation landmark.

Basing their recommendations on careful field studies, conservation groups proposed wilderness area designation for nearly all the acreage in existing primitive areas and for considerable amounts of adjacent roadless lands. Congress, in general, designated wilderness areas much closer to the conservationists' proposals than to the Forest Service's.

De facto wilderness

The Wilderness Act did not require the Forest Service to inventory all its roadless areas, as it did for the Park Service and Fish and Wildlife Service. Immediately placed under the protection of the Wilderness Act were 54 areas already designated by the USFS as wild, wilderness, or canoe areas, totaling 9.1 million acres. The Forest Service had only to finish up the studies on 34 remaining primitive areas, totaling 5.5 million acres, as originally called for in the U Regulations 25 years

earlier. Hunters, hikers, horse packers, and biologists, however, knew that there were many millions of acres of *de facto* wilderness in the national forests beyond the primitive areas. Based on the research Howie Wolke and I did for *The Big Outside*,⁴ I would estimate that in 1964, 100–120 million acres of the then 187-million-acre National Forest System qualified for wilderness area designation. But the Forest Service was bound and determined to keep the total amount of wilderness protected below 20 million acres—and to make sure that very little marketable timber was in that acreage.⁵

Between 1926 and 1961, the Forest Service had broken up most of the big roadless areas with administrative and logging roads, although a large total acreage of roadless and undeveloped areas remained. For example, in 1926 there were 74 roadless areas bigger than 230,400 acres (totaling 55 million acres); an independent study by the University of California in 1961 found only 19 areas of that size (totaling 17 million acres).⁶

Typical was the dismemberment of the 7,668,480-acre central Idaho roadless area.⁷ In 1935, retired Lolo NF Supervisor Elers Koch wrote:

Only a few years ago the great Clearwater wilderness stretched from the Bitterroot to the Kooskia; from the Cedar Creek mines to the Salmon River and beyond. No road and no permanent human habitation marred its primitive nature....

The Forest Service sounded the note of progress. It opened up the wilderness with roads and telephone lines, and airplane landing fields....

Has all this effort and expenditure of millions of dollars added anything to human good? Is it possible that it

was all a ghastly mistake like plowing up the good buffalo grass sod of the dry prairies?⁸

In the late 1960s when conservationists pushed the Forest Service to consider additional roadless areas for wilderness recommendation, they got the cold shoulder—Forest Service Director of Recreation Dick Costley sneered at "wildcat wilderness proposals."⁹ The first of the wildcats to claw the Forest Service was the Lincoln-Scapegoat area in Montana, adjacent to the Forest Service's flagship wilderness area—the Bob Marshall. The Lincoln-Scapegoat wasn't spectacular; it was just milk-and-honey country for pack trips, hiking, and big-game hunting. Local redneck shopkeeper Cecil Garland and Montana native Clif Merritt led a grassroots citizens' campaign against Forest Service plans to log the area. Montana's Republican congressman, "Big Jim" Battin, introduced a 240,500-acre Lincoln-Scapegoat Wilderness Area bill in 1965, which threw the brass of the Forest Service into a tizzy. Significantly, this was the first wilderness bill considered in Congress after the passage of the Wilderness Act.¹⁰ Lincoln-Scapegoat preceded legislation for any "mandate areas" (FS primitive areas, and NPS and FWS roadless areas).

Although the Lincoln-Scapegoat bill did not become law until 1972, it inspired other conservationists. For example, in 1969, New Mexico conservationists began to propose national forest areas for wilderness that were not primitive areas.¹¹ Conservationists in the East, where the Forest Service claimed no potential wilderness areas existed, also began to propose areas. By July 1971, wilderness bills had been

introduced in Congress for *de facto* national forest areas in Montana, Washington, Wyoming, Idaho, Oregon, Colorado, California, West Virginia, and North Carolina.¹² President Nixon's Council on Environmental Quality (CEQ), with his support, prepared an executive order to agencies to protect candidate wilderness areas until Congress could act, and ordering the Forest Service to inventory all *de facto* roadless areas and *to protect them from impairment* until Congress considered them for wilderness designation. Needless to say, the Forest Service did everything in its power to keep the executive order from being signed.¹³ I am sure anticonservation Secretary of Agriculture Earl Butz brought all of his influence to bear on Nixon. The order was not signed.

RARE

The Forest Service's professional haughtiness suffered three heavy blows between 1965 and 1971: 1) the Parker Decision; 2) conservationists proposing areas for wilderness that had not been primitive areas; and 3) Congress approving much larger wilderness areas than the Forest Service had proposed. As Chief Cliff said, "Every time we made a move into a roadless area we ran into opposition which generally materialized in the form of a lawsuit or a wilderness proposal by a congressman."¹⁴ These blows were also mighty ax swings at the timber program and at the Forest Service vision of establishing its managerial will over the entire National Forest System. The Forest Service reacted against them as the greatest threats it had encountered since the days of Pinchot.

Nonetheless, in 1971, the United States Forest Service dutifully agreed to

inventory all roadless areas on the national forests and evaluate them for suitability for wilderness designation. That was the official line, anyway. In reality, the Roadless Area Review and Evaluation (RARE) was a preemptive strike by the USFS brass against new wilderness areas—particularly those with trees. The inventory was inconsistent, capricious, sloppy, and dishonest; the evaluation was designed to recommend the fewest possible areas. The goal was to prevent "wildcat" wilderness area proposals from tying up the Forest Service's logging program.

Indeed, the Forest Service had quietly (secretly?) planned such a review as early as May 1969: "*New Study Areas*. By June 30, *-1972,* Regional Foresters will identify and submit a brief report on unclassified areas which seem to warrant further and more intensive study."¹⁵

On August 11, 1971, Forest Service Chief Cliff ordered all national forests "to inventory all roadless areas and to make recommendations by June 30, 1972 on areas that should later be studied intensively for possible wilderness designation." However, the Sierra Club reported, "Few conservationists even learned of the expanded scope of studies until mid-November 1971."¹⁶ This stealth inventory hampered conservationists from doing their own field studies. Jerry Mallett of The Wilderness Society wrote that "there is not time for [conservationists] to do groundwork of their own, and make good informed comments on the areas involved. They have only a matter of weeks in the dead of winter to study over a hundred areas in Colorado alone."¹⁷ In New Mexico, I organized dozens of University of New Mexico students during the spring of 1972 to

conduct whirlwind field studies of roadless areas, while scientists at Sandia and Los Alamos labs, organized as the New Mexico Wilderness Study Committee, did likewise.

The Forest Service studies were biased against wilderness. In the Southwest Region (New Mexico and Arizona), roadless areas had to be "truly unroaded." The regional forester ordered, "Exclude all areas where parallel wheel tracks or rut roads remain plainly visible the season following their occurrence."¹⁸ In other words, if an elk hunter drove into a wet meadow just before snowfall, and his tracks were visible in spring after the melt, an entire roadless area would be disqualified from the inventory. (Under more honest criteria, the Forest Service inventoried three times the roadless acreage in New Mexico and Arizona in 1977-79.)

The Forest Service's bias for classic scenery and horse-based recreation came through in the Quality Index used to numerically rate roadless areas. An area with "numerous lakes" got a 6, while an area with "no lakes and few streams" got a 1. An area with lots of campsites got a 4, while an area with limited campsites got a 1. "Numerous access points and trails" rated a 3, while only a few trails was slapped with zero.¹⁹

Roadless areas were to be given higher ratings for size. However, in many cases the Forest Service chopped large roadless areas up into several smaller inventory units—and based the unit ratings on their smaller size! For example, the Nez Perce National Forest in Idaho divided the 300,000-acre Gospel Hump roadless area into nine individual units and rated them separately.²⁰

A significant measure for selecting areas for wilderness area study was the “opportunity cost”—“the estimated dollar loss if the area was designated as Wilderness.” If, for example, the local forest supervisor made a high guess that an area could produce two million dollars of timber annually, then the opportunity cost would be two million dollars. But the Forest Service guesstimated only a high *gross* opportunity cost, not a *net*, which would have been “the values of the timber minus road construction and maintenance, construction and maintenance of developed campgrounds, fire protection, reforestation, etc.”²¹ Also not calculated in any way were the potential economic values of designating an area as wilderness—recreation, wildlife, watershed, and so on. Talk about juggling the books! But this was the way the Forest Service had operated since World War II.

Despite the short time to organize, conservationists turned out in droves at public hearings, although most were held in small rural towns in

the West, not in population centers. Conservationists also flooded the Forest Service with letters.

In October 1973, the Forest Service announced its “New Wilderness Study Areas”—274 areas totaling 12.3 million acres out of 1,449 roadless areas totaling 55.9 million acres. Even the 12.3-million-acre figure was fudged. Forty-six of the areas, totaling 4.4 million acres, were already under study for wilderness recommendation by the Forest Service because they were adjacent to primitive areas or “had already been officially committed to study by prior Forest Service decisions or Congressional action.”²² So really only 238 areas totaling 7.9 million acres were picked for new study. The areas dubbed as New Wilderness Study Areas were predominantly “rocks and ice.” Lots of alpine lakes and peaks above timberline. Damn little forest.

Despite the poor Forest Service wilderness study area recommendations, we conservationists had won a huge victory—one that underlies the

protection of nearly all national forest wilderness areas protected since then. Through love of favorite wild places, through the vision of conservation leaders, and through the hard work of organized grassroots conservationists, the Forest Service was forced to consider additional areas other than primitive areas for wilderness area recommendation. The Eastern Wilderness Areas Act in 1975, Endangered American Wilderness Act in 1978, the second Roadless Area Review and Evaluation (RARE II), a host of state-by-state national forest wilderness designation legislation from 1980 on, and the 2001 Clinton Roadless Area Conservation Rule all were made possible by the work of citizen conservationists from 1965 to 1972. We yet stand on their shoulders. ☺

≈ Dave Foreman

*Sandia Wilderness Area,
Cibola National Forest*

Dave Foreman is director of the Rewilding Institute and publisher emeritus of *Wild Earth*. The opinions expressed here are his own.

NOTES

1. I base this on my review of the original USFS Primitive Area reclassification studies in my library.
2. *De facto* means “in fact.” *De jure* wilderness is legally protected wilderness, or “Big W” wilderness. *De facto* wilderness is wilderness in fact, but not in law. It’s also called “little w” wilderness.
3. Dennis M. Roth, 1984, *The Wilderness Movement and the National Forests: 1964–1980* (Washington, D.C.: Forest Service History Series FS 391), 19–22.
4. Dave Foreman and Howie Wolke, 1992, *The Big Outside* (New York: Harmony Books, Crown Publishers).
5. Deputy Chief Art Greeley told the Regional Foresters in 1964, “It seems we have the choice—maybe 16–18 million acres of pure wilderness—or 2 or 3 times as much half-baked wilderness, all with an encumbrance on truly multiple-use management.” Multiple-use management meant logging. Roth, *The Wilderness Movement and the National Forests: 1964–1980*, 6.
6. Foreman and Wolke, *The Big Outside*, 4–5.

- Also see Michael Frome, 1984, *Battle for the Wilderness* (Boulder, CO: Westview Press), 20.
7. Foreman and Wolke, *The Big Outside*, 470.
 8. Elers Koch, February 1935, *Journal of Forestry*, quoted in *The Living Wilderness*, September 1935, 9.
 9. Roth, *The Wilderness Movement and the National Forests: 1964–1980*, 7.
 10. Montana’s Democratic Senators Lee Metcalf and Mike Mansfield had introduced a smaller Lincoln-Scapegoat bill before Battin’s, but endorsed his after it was introduced. Roth, *The Wilderness Movement and the National Forests: 1964–1980*, 24–35.
 11. Milo Conrad, “New Mexico Wilderness Fact Sheet” and letter “To Proponents of Wilderness in New Mexico,” September 24, 1969.
 12. Stewart M. Brandborg, “The Wilderness Society Memo to Conservation Cooperators,” July 2, 1971.
 13. Undated alert from the Montana Group of the Sierra Club and the Montana Wilderness Association.
 14. Roth, *The Wilderness Movement and the National Forests: 1964–1980*, 36.

15. Forest Service Manual, Amendment No. 35, May 1969 (odd punctuation in original).
16. *Sierra Club Bulletin*, March 1972.
17. Jerry Mallett, The Wilderness Society, undated alert.
18. Roadless Inventory procedure, 1971, Southwestern Region, Forest Service.
19. Scenic Quality Rating Criteria worksheets, U.S. Forest Service.
20. Roth, *The Wilderness Movement and the National Forests: 1964–1980*, 51–52.
21. Dick Gale, untitled memo on how to respond to USFS EIS on Roadless Area Inventory, in my files. Other conservationists also wrote detailed critiques of RARE. In my files, I have an anonymous memo “Analysis of Selection Methodology Used for Roadless Areas Inventory,” “A Short Review of RARE” by Colorado State University forestry student Henry Carey, and an analysis from Colorado wilderness outfitter Bill Mounsey.
22. CI Report No. 11, “New Wilderness Study Areas,” Forest Service USDA, October 1973.

HOW IRONIC THAT in arguing in favor of traps as a conservation tool in wildlife refuges [Wild Earth Forum, winter 2003–2004], U.S. Fish and Wildlife Service Director Steve Williams reflects back on Lewis and Clark and bids us to “not forget that it was trapping that helped open, discover, and map many of the wildest parts of the continent.” Besides the fact (as we all know by now) that Europeans “discovered” not one inch of this continent, one has to wonder what “open” means and why it is celebrated.

Clearly, in the 200 intervening years since Lewis and Clark’s expedition, the ignorant and incessant destruction, degradation, and consumption of the natural landscape has led us directly to the present need for emergency conservation measures. Frankly, Williams’s “opening” seems a bit like rape, and his celebration of the leghold trap in that process an obscene joke.

Rod Wilson

Cambridge, New York

AS IS CUSTOM, I arrive home with the new issue of *Wild Earth* [winter 2003–2004] and dive straight into reading it cover-to-cover. By chance, my wife has opted to cook reindeer chops and I am allowed to read uninterrupted. I am piqued by Dave Foreman’s extolling the virtues of northern Canada’s Thelon Game Sanctuary. I have often felt the tundra biome was somewhat under-represented in the journal’s pages. The relatively low number of species per unit area in terrestrial arctic ecosystems is offset by what Foreman referred to as “effective populations” of “highly interactive species.” While these terms are new, the concepts underlying them are old

and familiar to me and have long been major components of my appreciation of the Far North.

As the aromas of pine and birch smoke from our woodstove blend with those of the simmering onions and reindeer, I nod in agreement with the readers who have rated the “Facing the Serpent” issue the best so far. Although I have previously read the essays by Barry Lopez and Sarah James, which originally appeared in *Arctic Refuge: A Circle of Testimony*, I am both pleased and a little shamed to see two of the book’s finest pieces reproduced here, and gladly re-read them, just moments after I had been lamenting the journal’s dearth of tundra fodder.

By the time the chops hit the plate I am enjoying Paul Martin’s review of *Ice Age Mammals of North America*. I think, where else but *Wild Earth* can I not only hear about a book essential to my personal library that has managed to slip under my radar, but have it reviewed by one of the masters of the genre in an informal, engaging manner? (Admission: I am bored to tears these days by much of the material in academic journals I am required by profession to read and cite.)

While scraping the marrow out of the calf bones, as I have done in numerous tundra settings from Nunavut to Sapmi to Yamal, I cannot help but identify with the late Pleistocene Clovis people who hunted the ancestors of this rather tasty mammal (*Rangifer tarandus*), along with other megafauna, while the continental ice sheets were waxing and waning imperceptibly around them. Reindeer (a.k.a. caribou) had actually developed by the early Pleistocene (two million years ago), perhaps even earlier, in the forests of North America. Like horses

and camels, they entered Eurasia via the Bering land bridge before becoming extinct in the place of their origin. Presently, *Rangifer* spp. number more than five million and there have probably been “effective populations” of this “highly interactive species” for most of its existence. As large grazing and trampling herbivores, reindeer (and caribou) exert great influence over the structure and function of arctic and boreal ecosystems. In the context of my repast, and the ice age fauna, *Rangifer* serves as an important surviving link with the lost biome of Beringia: one of the few species we can dine on (albeit perhaps more adventurously spiced) to get a sense of what North America’s first human colonists reliably hunted as they moved into a new region.

I mop up the accumulated marrow while taking in Kathy Daly’s review of *Drafting a Conservation Blueprint* and note her desire to see more discussion of the challenges of conservation planning for relatively undeveloped areas “like the boreal forest or remote areas of Siberia.” After 13 years of reading *Wild Earth*, all of which I have spent living in Canada or Eurasia, this is about the only criticism of the journal I can muster. The quality and professionalism of *Wild Earth* have improved steadily, yet I cannot help but remain mildly chagrined by the ongoing focus on tropical and temperate America. Forget not the arctic!

Bruce Forbes

Rovaniemi, Finland

Bruce Forbes is senior scientist in environmental science and policy at the Arctic Centre, University of Lapland.

I READ WITH INTEREST the essay by Barry Lopez in the winter 2003–2004 issue [“Adolescence”]. It is

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clear that we are a society that does not seek out the guidance of our elders, that we are indeed an adolescent culture. The winter issue is full of references to wise elders in our past who helped create the National Wildlife Refuge System that we are blessed with today. We need to publicize this legacy at every opportunity.

Just as the founding fathers fought hard to create a democracy in this country, people like Roosevelt, Muir, Carson, Murie, and Darling fought hard to preserve the sacred lands that we now enjoy. In my mind the two are equally important parts of who we are as a nation and a people. We can take advantage of what appears to be a surge in pride in our country by working to make the heritage of our wild lands an integral part of the definition of who we are. This can also work to move the issue of preserving wild lands away from partisan politics and towards being an issue that all of us should share as a common goal.

In my state we are arguing over the history curriculum for our public schools, and it has been a very contentious debate. We need to be certain that our schools teach conservation history. The words of our elders can inspire current and future generations to carry on the tradition of stewardship they built for us. We should draw on this rich tradition to educate our citizens. We do not hesitate to quote the Declaration of Independence—the words of our great conservationists should be no different.

Bob Williams

Bloomington, Minnesota



We welcome your comments. Please send them to us at P.O. Box 455, Richmond, VT 05477 or e-mail to letters@wild-earth.org. Published letters may be edited for length and clarity.

I JUST WANTED to let you know that I thought the "Facing the Serpent" issue [summer/fall 2003] to be one of the best ever. It was great to feel Reed Noss's passion in his article, "Another Dead Diamondback." But "Snaketime," by Charles Bowden, may be the best article I've ever read in your publication. Keep up the good work!

Dave Swinehart

Pine, Colorado

THE ARTICLE BY John Elder, "George Perkins Marsh and the Headwaters of Conservation" [spring 2003], is a very interesting article for me, an Italian conservationist of many years. I do not know well the English language, and I hope you may excuse me for the errors in this letter.

It is very interesting for me to know that the American conservation vision has Italian roots too! What I wish to explain is that the Vallombrosa area in the Pratomagno Mountains, not far from the beautiful city of Florence—a place that George Perkins Marsh visited in 1861 and found "one of the most ancient, beautiful, and culturally prestigious forests in Italy"—today is no more an intact wild and natural place.

Marsh, in "his final letters revealed in the beauty of that landscape and in the local legacy of stewardship, both ancient and modern, on behalf of that forest," but the final works of that stewardship are no more a "legacy" for today's naturalists.

Vallombrosa is from 1977 a State Nature Reserve of 1,270 hectares, but

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*The Science
of Wonder*

Natural History in the Balance



by Thomas Eisner and Mary M. Woodsen

PRESSED FLOWERS. Bird nests, butterflies behind glass, shells. Hand lenses and tattered field guides. A child reaching for a feather in the grass. Natural history.

It's going extinct. And nowhere more quickly than where we need it the most—in our colleges and universities. These days, you don't need an understanding of—or even an interest in—natural history to get into a graduate program in ecology or any other branch of biology. Financial support for basic natural history research is all but gone. The close, scrupulous observation of nature has a long and illustrious history, but is now sliding into oblivion. Natural history has fallen out of favor in schools and universities, government agencies, and research foundations.

It's as if biology has split into two kinds: for-profit and not-for-profit. The for-profit biology: that's molecular biology, the "New Biology," much in vogue these days—understandably so. Discoveries at the molecular level have revealed layer upon layer, wonder after wonder, in a world of complexity none of us could have guessed at a half century ago when the revelation of the double helix set the genomic era in motion. Yet this has led to the reductionist point of view that everything in biology is explicable by molecular processes; that explaining biological events at the molecular level is the ultimate goal of biology. It is easy to get the false impression that "molecularization" is all there is to biology.

And the not-for-profit biology? That's natural history. Knowledge for its own sake. A field for the passionate amateur and the inspired schoolteacher—and until lately, the professional biologist. Biology departments are phasing out traditional courses in natural history. It's incipient at some universities and well underway at many others.

Why? As a field of inquiry—in this case, biology—matures it sharpens its focus, which makes it more unified. Naturally, those whose work follows and augments that vein are the ones who become the rising stars, get large research grants, and encourage their students to do the same. Indeed, what institution wouldn't want stars in its roster? It's a trend that any would be foolish to ignore. Administrators and professors who are uninterested in or even hostile to natural



history aren't likely to value it when judging candidates for junior faculty positions.

But a thorough grounding in natural history is needed if we are to grasp life in its interactive complexity. How, except through a fundamental knowledge of natural history, can we imagine creating a recovery plan for a threatened or endangered species, or for identifying the richest habitats for new protected areas, or for designing habitat linkages between conservation areas—indeed, for reclaiming, restoring, maintaining, and conserving any part of nature?

THIS IS WHY we offered “The Naturalist’s Way” this past year at Cornell University. It was a weekend notion, a spontaneous idea—to bring together top naturalists and biologists, storytellers all, colleagues of the most wide-ranging disciplines. We even had molecular biologists (or “molecular naturalists,” if you will): the visionary kind who realize that molecular biology enriches and amplifies natural history—indeed, lends itself to incorporation into natural history—and that the end of all biological reasoning is the spectacle of nature. We wanted to restore the glamor of classical natural history, let students know that it is still very much alive, and provide reassurance that the questions natural history asks are as vital as ever while demonstrating the new dimensions that its answers may inspire. By the same token, we strove to demonstrate how the extraordinary breakthroughs of molecular biology add shape, form, and depth to the inquiries that, so far, have been driven by the natural historian.

We aimed to foster a grand alliance of the biological sciences. For while the New Biology may look different, the questions at the heart of inquiry—How does it work? How did it get to be what it is? What makes it all fit together?—remain the same. It’s what you do with what you learn that may be different.

And so we brought in directors of institutes: the Paleontological Research Institution, the Cornell Laboratory of Ornithology, the Shoals Marine Laboratory, the Cornell Plantations, the Johnson Museum of Art. We brought in poets, herpetologists, zoologists, behaviorists, mycologists. We brought in a wheelbarrow full of our favorite books for a class just on booktalk.

We did the class the way they do it at the Collège de France, where since 1529, every lecture has been open to the public. “The Naturalist’s Way” is likewise open to whomever can find a seat. We taught the course on a “pass/pass” basis, yet even with no fear of a failing grade, the hundred-plus stu-

dents enrolled in the course had nearly perfect attendance. (Not that it occurred to us to check, but usually every seat was full; sometimes people stood in the back.) On a scale of 1 to 5, the undergrads rated the course at a virtually unheard-of 4.98. Their only complaint: they weren’t worked hard enough. The graduate students in the course rated it a 5.0.

The assignments were two short essays. Even the guest lecturers were asked to hand in the first, “What Nature Means to Me”; these were posted on the class website (www.nbb.cornell.edu/neurobio/bionb420/allessays.html). The second assignment offered a choice: rewrite the first, and make it shorter and more compelling, or discuss the role of natural history in the university, and offer suggestions for the future. We also assigned a lengthy list of readings—excellent material, by the way, for anyone who might want to design a similar course.

We learned three things from reading the essays.

- Many students are not good writers.
- Regardless, they express their passion and commitments with great persuasiveness.

Student Voices

I have always found it strange that gym classes were required, but no one felt it significant enough to demand that people graduating from this college understood something about natural history, about the world they were about to alter...just by existing.

I feel that it is impossible to appreciate the natural world without being its advocate.

No one would think of having open-heart surgery performed by someone who has never been to medical school. Why then do we feel we can cut wide open the heart of the world we know even less about?

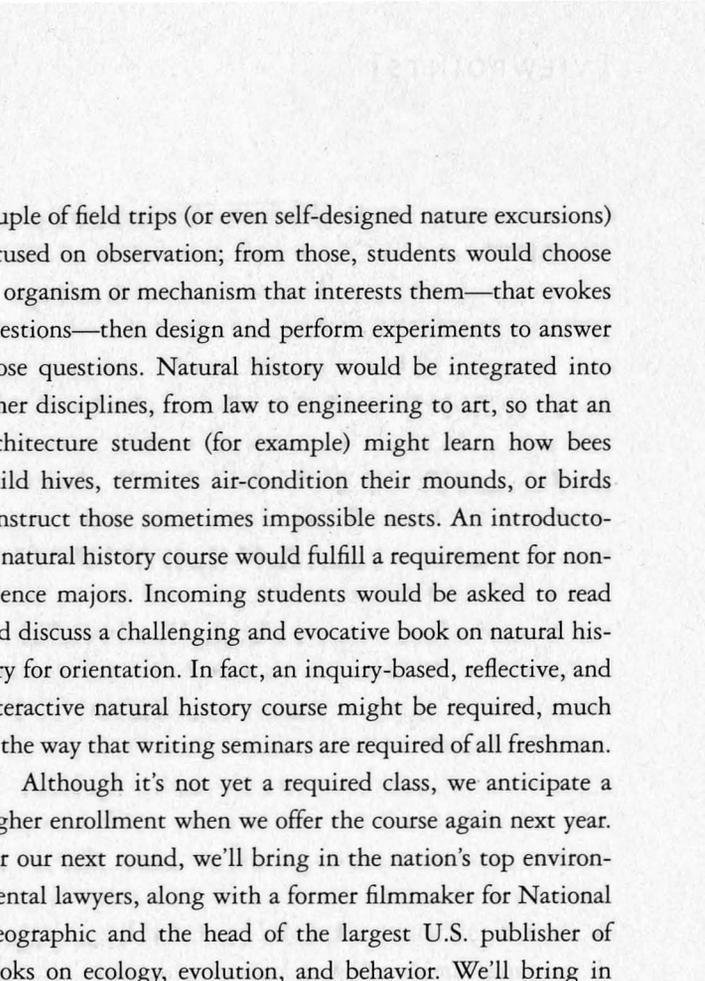
It’s only through the history of nature that biology, the study of dynamic and infinite complexity, can be fully and satisfyingly understood.

> They are deeply moved by the plight of nature in the maw of materialism. Over and over, they asked: What can I do to better the world? And it seems they wish to turn to nature and natural history for inspiration in developing a way of looking at the world, of living.

They remind us of the quiet generation before the explosive '60s, a generation that never thought it might unite to jolt the system. They're ready for something, and that something is very different from drilling in Alaska.

If all classes were like this it could be chaotic. But regardless of how it's put together, building a course around a gamut of nature- and environment-oriented topics will certainly hold the attention of those students who seek answers.

And how has the university responded? "The Naturalist's Way" was received warmly by the department chair and colleagues, for there's a lot of talent here to unearth. But if there's a way to heed the students' suggestions, then the natural history of the biological molecule would be integrated into biochemistry and organic chemistry courses. A "natural history laboratory" would offer a



Nature is no longer simply a thing to enjoy and explore...it is something to protect....Indeed, the incredible complexity and multiple scales of nature do not lend themselves to reduction. It seems that nature is governed by chaos, chance, and rules so hard and fast even we cannot escape them. Instead, by simply observing the system—the ecosystem—in the organized manner that we call natural history, we learn volumes of truth.

Perhaps nature is what I, myself, wish to be: adaptive, practical, creative, strong, fascinating, refreshingly raw, and somehow ultimately genuine.

Nature cares not if we value it, whether we depend on it, whether we struggle to know it, or whether we carry on our tragedy of destroying our own home.

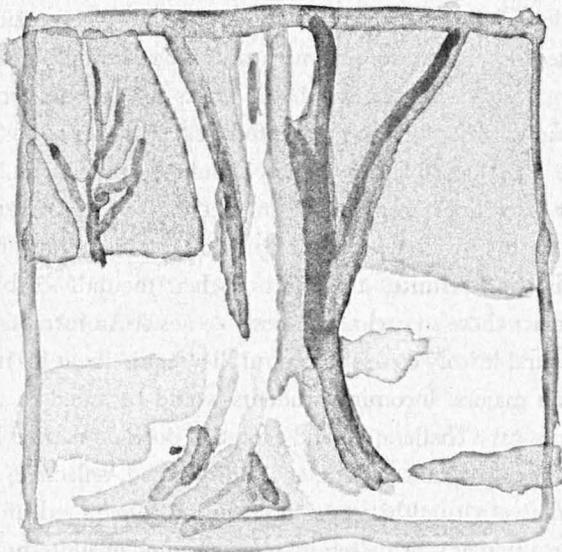
Natural history is important because we are not alone....

couple of field trips (or even self-designed nature excursions) focused on observation; from those, students would choose an organism or mechanism that interests them—that evokes questions—then design and perform experiments to answer those questions. Natural history would be integrated into other disciplines, from law to engineering to art, so that an architecture student (for example) might learn how bees build hives, termites air-condition their mounds, or birds construct those sometimes impossible nests. An introductory natural history course would fulfill a requirement for non-science majors. Incoming students would be asked to read and discuss a challenging and evocative book on natural history for orientation. In fact, an inquiry-based, reflective, and interactive natural history course might be required, much in the way that writing seminars are required of all freshman.

Although it's not yet a required class, we anticipate a higher enrollment when we offer the course again next year. For our next round, we'll bring in the nation's top environmental lawyers, along with a former filmmaker for National Geographic and the head of the largest U.S. publisher of books on ecology, evolution, and behavior. We'll bring in activists, conservationists, writers, artists. And of course, naturalists of all stripes, including some of the country's top biologists who have made groundbreaking discoveries in species as different as elephants and ostracods.

THE COURSE brought together new and old friends: student and teacher, the aspirant and the seasoned, from a host of disciplines and from all over the world. Their goals? To seek explanations at all levels of inquiry: exploring function through the molecule, origins and interaction through evolution and behavior, and impact and meaning through ecology and environmentalism. Their interests and concerns? As wide-ranging as the sciences themselves. They are the once and future artists, conservationists, biologists, activists. Together, these friends have as a common denominator the love of nature and hope for a better world—a common interest that can unify not only ideas, but people. ☺

Thomas Eisner, biologist, naturalist, conservationist, and raconteur, is the Jacob Gould Schurman Professor of Chemical Ecology at Cornell University in Ithaca, New York. His most recent book is *For Love of Insects* (2003). **Mary Woodsen** writes about nature, the environment, and land conservation from her home in the Finger Lakes region of upstate New York.



Intelligence Lost

Pitfall of a Tamed Planet

by Matthew Orr

WHAT DOES THE LEGACY of our animal heritage imply for the human future? Intelligence arose to guide animals through a Darwinian gauntlet. Consequently, animal minds are attuned to the environments they confront. Salmon locate their natal streams after a life at sea. The Clark's nutcracker depends on cached seeds to survive the winter, and has the memory of an avian Einstein compared to closely related species. After searching Saharan sands a hundred meters from its underground nest, the ant *Cataglyphis bicolor* employs patterns of polarized light in the sky to walk straight home. These instances of intelligence we call instinct.

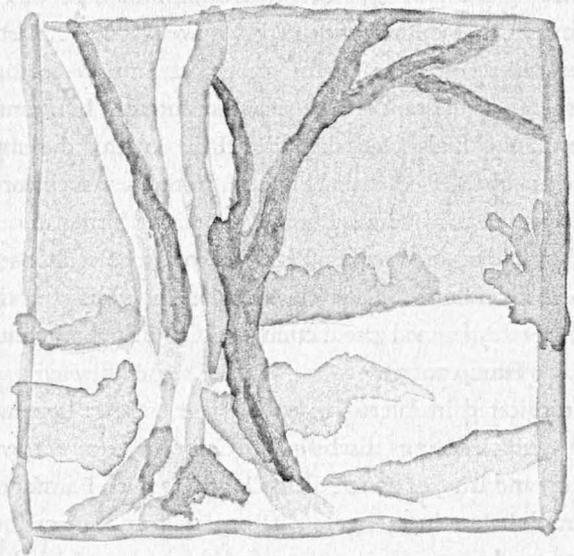
Humans have an innate capacity to create complex vocalizations that is absent even in chimpanzees. We manipulate objects with our fingers, and communicate discoveries in speech and writing. But do we, the most cognitively flexible species on the planet, function equally well in any environment? Clearly not. As an almost trivial example, humans evolved as a diurnal species and operate better in the light than in the dark. Bats, on the other hand, have a nocturnal ecology and can catch moths on the wing at night. A good argument can be made that, in the dark, a bat is smarter than a human.

Because animal intellect evolved in natural environments, environmental alterations carry consequences for animal behavior. One need not search far to find examples. A sparrow spent one week in spring on a valiant yet doomed attempt to expel rivals reflected from cars parked in front of our house. Another year, a junco assaulted my side-view mirror when I

parked beneath a tree in its territory. The African ground hornbill, considerably larger than a sparrow or junco, attacks its image in windows with the force to shatter glass. Farmers fatigued by the property damage have begun shooting the bird (Long 1999). Mirrors, windows, and reflective fenders were absent from the environments that shaped bird cognition, and cause birds to behave inappropriately. But are these birds stupid? Only in the wrong setting.

Birds share a tendency with sea turtles to ingest plastic debris dumped at sea. After observing a Laysan albatross unable to disgorge a plastic toothbrush it had eaten, biologist Carl Safina explains: "In the world in which albatrosses originated, the birds swallowed pieces of floating pumice for the fish eggs stuck to them. Albatrosses transferred this survival strategy to toothbrushes, bottle caps, nylon netting, toys and other floating junk" (Safina 2000). In an artificial world, the albatross's keenly-honed survival instinct can kill it.

Like altered physical environments, artificial social environments may also erode intelligence. The kittiwake, a type of gull, builds nests on narrow cliff ledges. It lays eggs that roll poorly, and young birds move little, since the only place they have to go is down. Parents returning from foraging trips at sea always encounter their chicks in the same spot, and thus need not recognize their own offspring by sight. When biologists replaced small, whitish kittiwake chicks with large, black, gangly cormorant chicks, kittiwake parents returning to their nests placidly fed the imposters (Cullen 1957).



Not all birds accept intruders this way. The herring gull nests not on ledges but in grassy dunes. Its offspring are mobile long before they are independent, and often wander into the vicinity of other nests. Adult herring gulls are quick to ostracize a neighbor's chicks and sometimes eat them (Tinbergen 1959). It is nonsensical to conclude that herring gulls make more discerning parents than kittiwakes. Each species is merely adapted to the landscape that made it.

Even a bird's sense of danger matches its environment. After arriving on the Galapagos Islands, Charles Darwin wrote: "There is not one [bird] which will not approach sufficiently near to be killed with a switch, and sometimes, as I have myself tried, with a cap or a hat. A gun is here almost superfluous; for with the muzzle of one I pushed a hawk off the branch of a tree. One day a mockingbird alighted on the edge of a pitcher...which I held in my hand whilst lying down. It began very quietly to sip the water, and allowed me to lift it with the vessel from the ground" (Darwin 1839). The birds of the Galapagos had lived long enough on predator-free islands to lose instinctive fears.

The term "bird brain" derides intelligence, yet, as with birds, we *Homo sapiens* share diminished cognition in altered settings. As Robert Ornstein and Paul Ehrlich say in their book *New World, New Mind*: "The world that made us is now gone, and the world we made is a new world, one that we have developed little capacity to comprehend" (1989). Humans evolved for generations with the threats of predators, poison-

ous snakes and insects, and toxic plants; and without television, computers, the internal combustion engine, synthetic chemicals, and synthetic life forms. Mismatches exist between our innate intelligence and today's synthetic settings. Novel threats from new technologies expose behavioral blind spots in our intellect. Consider, for instance, that when the chemist Thomas Midgley invented chlorofluorocarbons (CFCs) he demonstrated their safety, as *Fortune* magazine reported, by putting "a teaspoonful, furiously boiling at room temperature, under a bell jar with a guinea pig, while a physician watched earnestly for signs of the guinea pig's collapse. There were none" (Oppenheimer and Boyle 1990). At the 1930 convention of the American Chemical Society, Midgley tested CFCs by inhaling them and blowing through a rubber hose to extinguish a candle. By the standards of the world that made our minds, CFCs were safe: they did not suffocate small animals or ignite. Nothing in the innate wisdom or learned experience of *Homo sapiens* made it possible to predict that CFCs would deplete the ozone layer.

Cellular cormorants

Altered environments spare neither the highest minds nor the lowest cells. Consider one class of synthetic chemicals, polychlorinated biphenyls (PCBs), and their effects on animal cell receptors. PCBs entered existence only recently, in 1929, when chemists began adding combinations of chlorine atoms to two linked benzene rings, known as a biphenyl. During

the ensuing half-century, an estimated 3.4 billion pounds of different PCBs were manufactured to make wood and plastic inflammable, stucco weatherproof, and to improve paints, varnishes, inks, pesticides, electrical transformers, lubricants, and hydraulic fluids. Once discarded, PCBs entered the environment and the food chain. In 2003, in the first such comprehensive tests conducted, nine American citizens were found to harbor an average of 32 different kinds of PCBs in their blood and urine. The tests were done 27 years after the United States banned production of PCBs (Environmental Working Group 2003).

Implicated in infertility, miscarriage, cancer, hyperactivity, and learning disabilities (Colborn et al. 1997, Colborn and Thayer 2000), PCBs interfere with hormones, the molecular messengers of organ communication. Hormones depart cells in one part of the body and bind to cell receptors somewhere else, telling the target cell to replicate, produce a protein, or perform another essential function. This chemical communication network constitutes the endocrine system, whose diverse cell receptors are intelligently attuned to screen specific messages. But, like the kit-tiwake who can't discern a cormorant from kin, these same receptors welcome an array of unnatural imposters absent from their evolutionary past. Because hormones function at very low concentrations—the most potent form of the hormone estrogen works at concentrations equal to about one drop in 660 train tank cars of water (Colburn et al. 1997)—synthetic chemicals can have hormone-like activity in miniscule amounts.

When a PCB molecule perches on a cell receptor, a false message is delivered to the cell or needed messages from natural hormones are blocked. PCBs are one of many endocrine disrupters that “can result in morphologic abnormalities of the gonads, reproductive tract, brain, and other organs; functional and behavioral abnormalities; and certain malignancies... Functional abnormalities include decreased semen quality, reduced numbers of sperm, infertility, disrupted estrous or menstrual cycling, and premature menopause...” (Kavlock 1996). Humans are not alone in facing this threat; observed damage from endocrine disruption in wildlife includes:

reproductive problems in wood ducks from Bayou Meto, Arkansas, wasting and embryonic deformities in Great Lakes fish-eating birds, feminization and demasculinization of gulls, developmental effects in Great Lakes snapping turtles, embryonic mortality and developmental dys-

function in lake trout and other salmonids in the Great Lakes, abnormalities of sexual development in Lake Apopka alligators, reproductive failure in mink from the Great Lakes area, and reproductive impairment in the Florida panther. (Kavlock 1996)

No one knows how many synthetic chemicals act as endocrine disrupters. A partial list includes a variety of pesticides, products associated with plastics (including plastic drinking bottles), breakdown products of household detergents, cosmetics, and a number of common industrial chemicals (Center for Bioenvironmental Research 2002). Little is known about endocrine disrupters because previous tests for health effects focused on cancer. Endocrine disruption, like the earlier discovery of synthetic carcinogens, is a novel surprise.

Can we think our way out of this problem? Endocrine disruption is impossible to predict based on a molecule's structure, and effects may be difficult to evaluate experimentally because they include behavioral changes that often are less obvious than physical abnormalities. Moreover, endocrine disruption may occur during very brief windows of embryological exposure (as short as a few days), and may involve interactions among different chemicals (Colborn 1998, Colborn and Thayer 2000). How many interactions are possible among the 58 endocrine disrupters that the Environmental Working Group found in the blood and urine of its nine study subjects? Are we smart enough to understand and manage the cascade of possible effects?

In addition to endocrine disrupters, the nine study subjects had an average of 55 chemicals that cause birth defects and developmental delays, 53 that cause cancer, 62 with brain and nervous system effects, 53 that harm the immune system, and 44 that impair reproduction. This chemical concoction is called “body burden.” One of the study's subjects had lived for years with an unexplained hand tremor. He had a high body burden of mercury and arsenic, which cause tremors. Body burden reminds us that the instinct for invention often exceeds full cognizance of our creations, some of whose side effects literally come home to roost.

Synthetic social organisms

The pitfalls of artificial environments extend from cells to societies. Consider the kind of tribal environment that honed the human intellect. Humans are not leopards: we do not live largely solitary lives. We are not naked mole rats: we do not have an altruistic caste dedicated to the reproduction of a privileged few. Instead, we live more like lions, in social units that

behave cooperatively, but within which conflicts arise among individuals. In *The Forest People*, Colin Turnbull describes a hunt in a Congo pygmy tribe that illustrates the interplay between cooperation and conflict that characterizes human culture. During the hunt, one pygmy, Cephu, sneaked forward and put his net in front of a linked line of nets cooperatively erected by his male tribemates. He managed to capture an animal as it fled a group of women and children beating the bushes toward the nets, but he was caught cheating. Here is how Turnbull described the consequences:

Ekianga leaped to his feet and brandished his hairy fist across the fire. He said that he hoped Cephu would fall on his spear and kill himself like the animal he was. Who but an animal would steal meat from the others? There were cries of rage from everyone, and Cephu burst into tears....Alone, his band of four or five families was too small to make an efficient hunting unit. He apologized profusely, reiterated that he did not really know he had set his net up in front of the others, and said that in any case he would hand over all the meat. (Turnbull 1962)

Turnbull concludes: "I have never heard of anyone being completely ostracized, but the threat is always there, and is usually sufficient to insure good behavior."

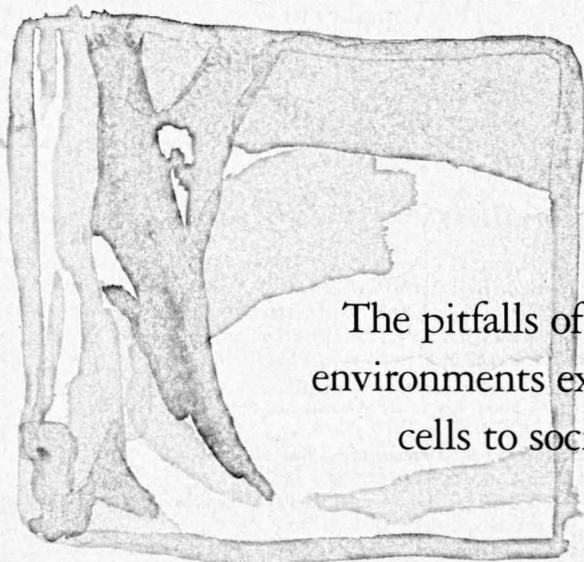
In the small social units where human behavior evolved, the prospect of ostracism helped to deter the temptation to cheat. But civilization proceeded, and the structure of human societies changed. The situation Cephu suffered stands in stark contrast to what is possible today, where prodigious quantities of financial capital can be brought to bear in far-flung regions

by absentee powers. In such a setting, the balance between selfish exploitation and mutual cooperation that shaped our instincts for right and wrong is erased. This release from social constraints has permitted a global free-for-all of theft, exploitation, impoverishment, and destruction.

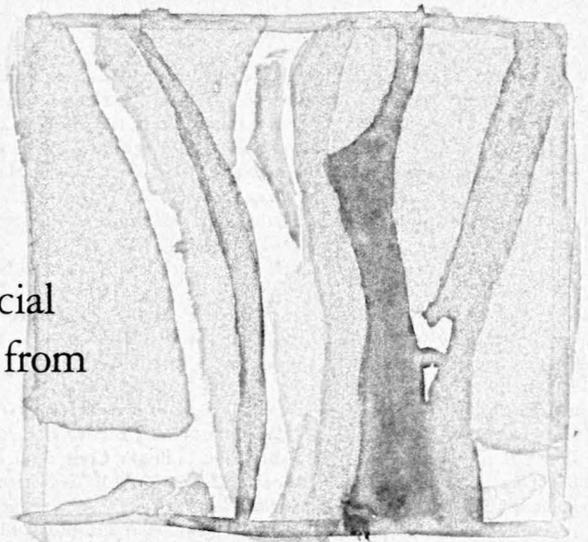
In *Triumph of the Mundane*, Hal Kane explains: "Investments held in Manhattan make it possible for companies to log forests in Cambodia. Boardrooms in Los Angeles are the site of choices that affect people and nature in Mexico and Argentina. But those transactions are anonymous. Most investors will not see the places where the companies that they own have facilities for mining, logging, fishing, shipping, or whatever work they do" (Kane 2001). Although corporate globalization affords manifold economic opportunities, without proper oversight it will obliterate the personal accountability and reciprocal altruism that traditionally kept human societies intact. Within the U.S., the granting of legal personhood to corporate entities elevates them to a sort of novel social organism whose depredations often evade our innate capacities of comprehension and control.

And now the news

Cephu took two calculated risks in cheating his tribemates: the risk of social ostracism was preceded by the risk of being caught in the first place. How will the Cephus of corporate culture be exposed to social accountability? In today's dispersed society, the news media serves as a surrogate sensory system. But in the United States, NBC is owned by General Electric, ABC by the Disney Corporation, CBS by Viacom,



The pitfalls of artificial environments extend from cells to societies.



Fox by Rupert Murdoch, and CNN by Time-Warner. People whom we don't know, and whose motivation to inform is influenced by convoluted financial priorities, control much of the information molding public awareness and opinion. What are the consequences for human intelligence when most of the knowledge needed to make large-scale social decisions is filtered by strangers? In the words of Maurice Murad, a producer at CBS News for over 20 years, "The manipulation of perceptions is replacing reality as the governing principle in human affairs" (2002). Manipulation of the media has generated a \$10-billion-a-year public relations industry in the United States alone. As one PR executive puts it, "The best PR ends up as looking like news. You never know when a PR agency is being effective. You'll just find your views slowly shifting" (Stauber and Rampton 1995).

Rats

A rat on a treadmill learns that if it runs when it hears a beep it can avoid an electric shock. The rat also can learn to turn to avoid a shock. But rats cannot learn to rear up on their hind legs to avoid being shocked (Bolles 1973). The explanation for a rat's learning pattern is simple: shocks are unpleasant, and running and turning are innate avoidance responses. In contrast, rearing occurs to satisfy curiosity and is an innately exploratory behavior. The rat's brain cannot learn to avoid danger using a naturally exploratory behavior. So even when rats frequently *happen* to avoid a shock by rearing, they never make the connection and *learn* to avoid the shock by rearing when the beep sounds. In fact, over a number of trials, a rat will rear

less and less even when rearing is the only way to avoid the shock. In an environment alien to its intelligence, the rat exhibits less, not more, of the behavior that could help it to avoid an unpleasant outcome.

Will we, on a wild earth under assault, express more or fewer of the behaviors needed to ensure our well-being? It is no stretch to assert that the global-scale ecological dangers of the twenty-first century—climate change, ecosystem decline, groundwater depletion, synthetic toxins, and overpopulation—exist because human cognition strains to keep pace with the synthetic world we have wrought. In the U.S., the social impetus to confront these challenges has been waylaid by those with the finances to control elections and to corrupt politicians.

This modern world challenges us to discern reality from increasingly realistic illusions; to think—and care—about people and places whom our actions affect but whom we do not know; to lobby leaders whom we will never meet; and to practice a precautionary approach toward new technologies. A successful response requires a system of ethics and taboo that harmonizes with our evolutionary heritage. One step forward is to humbly acknowledge how poorly our innate intelligence serves us on an altered planet. Another is to strive to restore and protect the natural environments where we thrive. ☾

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The Lowly, Exalted

In the slow discovery of your home
how completely you feel your way.

Working among epiphytes and fallen
leaves—deliberate, silent as a separated
tongue—you push between liverworts,

nudge the double-winged samara
of maple seeds aside, and so go
further, slowly, on.

Maples loom and lean across
this gorge, this lighted slot of sky,
single October leaves dropping

a hundred feet in silent spirals.
Can you feel their shadows spin
and bump down in the dim ravine?

Our slight creek pours incessantly
from cobble bowl to stilling pool.

The thin sun ricochets and squirms,
lighting the dead fern—on the far bank—

silver. Hermaphrodite, glistening one,
keeled and skirted, slick and textured

as the skins of fallen fruit:
when confronted—your tentacles retreat
into your forehead,

when abandoned—you extend, languid,
deliberate; stretching for dim odors

and dusk—anticipating lichens, club mosses,
the mucus of another like yourself—detecting

as you go, in millimeter ripples,
every muted forest pulse.

~ Bill Yake

Snail

To be lovely
and to be known
for loveliness
is not everything.
To move by rippling
the muscles
in the bottom of your foot
letting out a stream of mucous
to cushion you from uneven ground
is something.
To move like a wave with lungs
is also something.

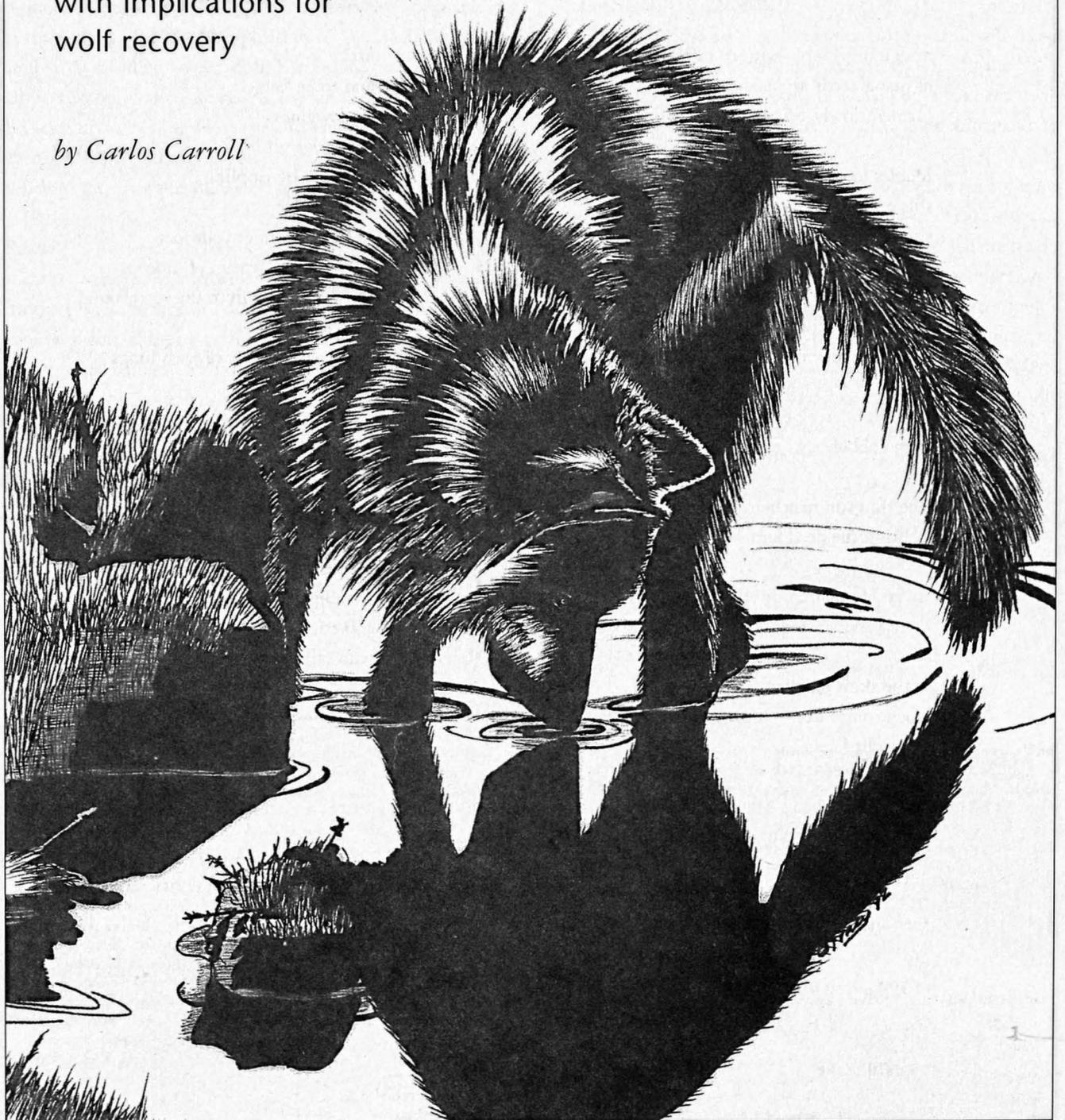
After rain
which he likes
Snail opens his door
and comes out with his house.
He sees his next meal
with his feet
and tries to avoid Toad
who calls him to dinner.

~ Elizabeth Caffrey

Wolf Viability in the Northeastern U.S. and Southeastern Canada

A summary of new research
with implications for
wolf recovery

by Carlos Carroll



EDITOR'S NOTE *The Wildlands Project is working with dozens of partners in both the United States and Canada to plan for the future of wolves and other species across northeastern North America. It's all part of the Northern Appalachian and Southern Canadian Shield Wildlands Network, a long-term, science-based vision for conservation in this region.*

As part of the focal species planning for the wildlands network, the Wildlands Project commissioned Dr. Carlos Carroll to conduct a multi-carnivore viability analysis that considers present and projected future landscape conditions. The first section of that analysis, summarized here, has been released as Wildlands Project Special Paper #5; the full paper, including an extended discussion

of methodology, tables, figures, and complete citation list, can be downloaded at www.wildlandsproject.org/library.

As this summary makes clear, the study confirms that there is enough suitable habitat for wolves to flourish in northern New York and Maine, raising the possibility that wolves from Canada could once again return home. But they can't do it alone.

Protecting existing natural linkages between the two countries, strengthening government protections for the species, increasing cross-border cooperation, careful planning for reintroduction, and strong community support will all be necessary for wolves to regain their place in the wildlands of New England and New York.

MAMMALIAN CARNIVORES are of conservation interest both in their own right and for what they may indicate about landscape characteristics such as connectivity. In the area of the northeastern United States and southeastern Canada known as the Northern Appalachian/Southern Canadian Shield region (see map next page), European settlement led to the loss of most of the larger carnivore species due to deforestation and direct persecution. More recent trends towards reforestation and increased regulation of hunting and trapping have created a potential for restoration of extirpated or threatened carnivore species. However, increased development of rural lands as well as lack of coordination across jurisdictions have hampered recovery efforts.

The research described here is the foundation for an analysis of recovery potential in the region for the eastern gray wolf. The second phase of this study will analyze viability for lynx and American marten. All three species are considered threatened in portions of the region but differ in their basic habitat requirements and the factors responsible for their decline. A comprehensive analysis of viability needs for the three species can result in a stronger and more efficient restoration strategy than would separate single-species recovery efforts.

Summary of findings

The major conclusions from this analysis* of wolf habitat and potential population viability in the Northern Appalachian region are:

MAINE. A wolf population of around 1000 animals could inhabit northern and central Maine and would have high viability in both current and future regional landscapes.

ADIRONDACKS. A smaller subpopulation of around 300–400 wolves could inhabit the Adirondacks but would have higher vulnerability to landscape change (specifically, increased development). Habitat outside the Adirondack Park's western boundary on the Tug Hill Plateau would be critical to this population's viability.

MARITIME PROVINCES. Wolves could potentially persist in areas of central New Brunswick and along the Quebec/Maine border, but would be dependent on dispersal from the Maine population. Smaller areas of potential habitat exist on Quebec's Gaspé peninsula and in southern Nova Scotia.

LANDSCAPE CONNECTIVITY. At least four potential routes currently exist for recolonization of the northeastern U.S. from north of the St. Lawrence River. However, the region appears to be at or near a threshold where potential dispersal may no longer be possible. Successful dispersal is unlikely under future landscape conditions unless wolf hunting and trapping pressure diminishes in eastern Canada. Connectivity between potential wolf populations in Maine and the Adirondacks is tenuous and at high risk due to landscape change in Vermont and New Hampshire.

REINTRODUCTION. Reintroducing wolves to either Maine or the Adirondacks has a high likelihood of initial

* The model used in this study, PATCH, is an example of a spatially explicit population model; these models are useful in assessing population viability in a landscape context because they combine information on the spatial arrangement of habitat patches with data on how a particular species responds to different types of habitat. The PATCH model is designed for studying territorial vertebrates, and links the survival and fecundity of individual animals to GIS data on mortality risk and habitat productivity measured at the location of the individual or pack territory.

success. However, a reintroduction to Maine would more rapidly reestablish wolf populations in neighboring states and provinces.

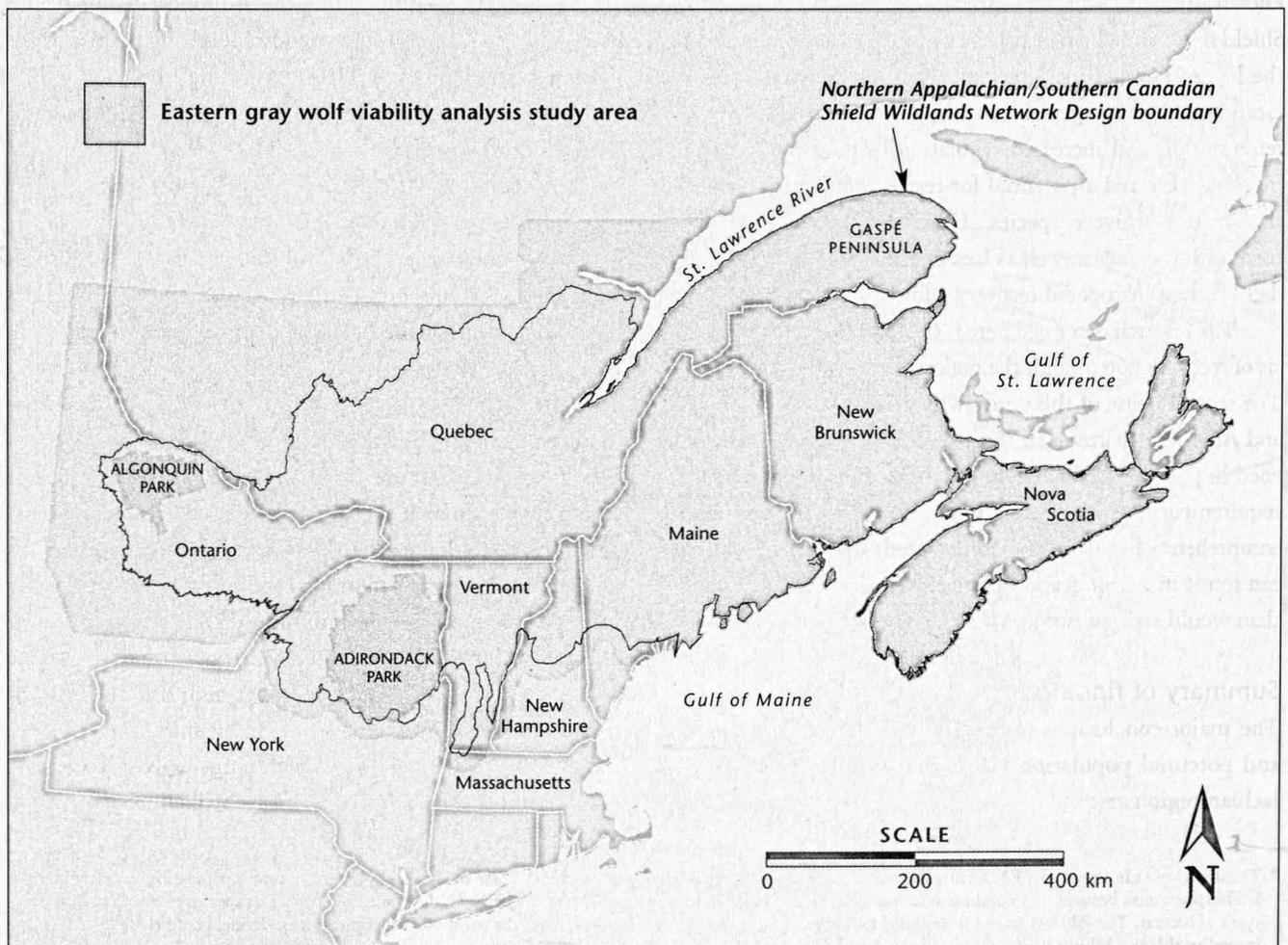
Conservation implications

My results suggest that the concerns over viability of an Adirondack wolf population are justified, but that proper management and land-use policy could likely sustain a population there. The effects of landscape change would be twice as severe in the Adirondacks as in northern Maine, due both to the landscape trends themselves and to the inherent vulnerability of a smaller wolf population. Habitat to the west of the park would be critical to this population's viability.

Restoring connectivity between Maine and the Adirondacks appears difficult due to the pace of landscape change in Vermont and New Hampshire. The few wolf packs that might inhabit the latter two states under current conditions would be even more vulnerable than those in New York

State, as they would be peripheral populations dependent on connectivity with the core population in Maine. However, preserving linkage habitat in Vermont and New Hampshire is important because of the necessity over the long term of maintaining genetic interchange between regional subpopulations. My results identify broad linkage zones of potential habitat rather than narrow corridors, which may permit travel but not residence by wolves. I believe that a focus on connectivity at this broader scale is key because wolves appear to be able to travel through a wide range of landscapes but may not readily settle in areas that lack other wolves. Preserving "stepping stone" areas that could support resident wolves may facilitate effective dispersal between disjunct populations whereas a narrow travel corridor would not.

The effects of landscape change in the northern Appalachians match patterns predicted over the same period in regions of the western U.S. The analysis showed that the potential core populations in Maine and the Adirondacks



The relatively low potential for natural recolonization of northern Maine—and the high potential for success of wolf reintroduction there—support exploration of active reintroduction as a tool for species recovery.



would face levels of threat similar to those of large core wolf populations in the West such as the Greater Yellowstone Ecosystem. Peripheral northeastern populations would face the higher threat levels characteristic of small core and peripheral populations in the West. Wolf recovery in Maine should be a facet of a larger multi-jurisdictional planning effort that would protect linkages between northern Maine and areas such as central New Brunswick. Because the principle of redundancy is important in species conservation, a secondary recovery effort in the Adirondacks could be worthwhile. Smaller potential recovery areas in the Gaspé peninsula and Nova Scotia that are unlikely to be recolonized by natural dispersal would be lower priorities for restoration.

Protected areas currently form only about 6% of the study area, and de facto refugia on the northern edge of the ecoregion are likely to lose their value as logging roads fragment them. For wolf populations to persist in the region, a larger percentage of the landscape must provide low mortality risk as a result of low human access (road density) and/or low hunting and trapping pressure. This can be achieved by protected area

expansion, regulatory reform (e.g., trapping restrictions), or a combination of the two. Strategically placed buffer zones can greatly enhance the effectiveness of small protected areas for wolves, as seen by the relatively high viability of the Algonquin Park population in the model results. Because wolves, unlike mesocarnivores such as the marten, do not require mature forest structure, any regulatory changes would immediately benefit wolf population viability.

Several factors support exploration of active reintroduction as a tool for species recovery:

- the relatively low potential for natural recolonization of northern Maine
- the trend towards increasing isolation of the area from sources of dispersers in Canada
- the high potential for success of an active reintroduction in northern Maine
- the large effect of a reestablished Maine population on facilitating wolf recovery in neighboring jurisdictions.

Even though wolves may occasionally disperse across the St. Lawrence Valley, and possibly reach Maine, achievement of a large viable population there would likely be slow and uncertain due to factors known as Allee effects (e.g., scarcity of mates) that lower the growth rate of small founder populations. If active reintroduction is excluded as an option, successful natural recolonization may depend on the creation of strong transboundary initiatives for habitat protection and regulatory reform. These initiatives will be a necessary component of any long-term regional wolf conservation strategy since they would facilitate protection or restoration of landscape linkages between Maine and the Laurentides and Adirondacks.

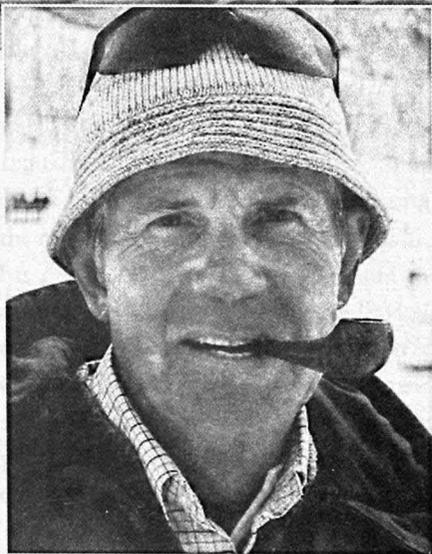
The completion of the three-species viability analysis in 2004 will allow comparisons between the needs of the gray wolf as outlined above and those of other carnivore species in the region. As was the case for the wolf, this second phase will build on past studies of regional habitat potential for the lynx and American marten, but add insights on viability from new modeling work. This will allow the design of wildlands networks that provide optimal combinations of habitat for ensuring the long-term viability of the region's native carnivore species. ☪

Carlos Carroll is a research ecologist with the Klamath Center for Conservation in Orleans, California. His research has focused on the conservation of mammalian carnivores throughout North America, including work to protect and restore wolves in the Rocky Mountains of Canada and the U.S., northern Mexico, and the Pacific states.



RODERICK FRAZIER NASH

*People in wilderness circles know historian **Roderick Nash** as the author of the seminal study *Wilderness and the American Mind* (now in its fourth edition) and of numerous other books on environmental history and ethics. Nash helped create the environmental studies program at the University of California at Santa Barbara, where he taught until his retirement in 1994. His writing and teaching have added greatly to the understanding of the history and culture of wilderness in America. For decades, he has sought to increase the American public's appreciation of wilderness through his work as an advocate and consultant to policy-makers. Many people know less about Nash's other career. For almost 50 years, he has passionately pursued his interest in river-running, becoming one of the most accomplished whitewater paddlers in the nation. His book *The Big Drops* draws upon firsthand experience to compare the 10 most challenging stretches of whitewater in the American West. **Andrew Wingfield**, who teaches writing and conservation studies at George Mason University's New Century College, spoke with Nash about wild rivers and wilderness in January of 2003.*



ANDREW WINGFIELD: How do rivers fit into the wilderness idea?

RODERICK NASH: Of course rivers very often go through wild country and are the arteries and veins holding that wild country together. The Wilderness Act that passed in 1964 was followed by the Wild and Scenic Rivers Act of 1968. People recognized that if you had a significant wilderness you were going to have a watershed. And at the heart of this watershed was going to be a river. In many ways the river was going to be the ecological and experiential core of that area.

And rivers are the essence of wildness. They can be managed, but not controlled. Water flowing downhill and reaching the ocean is something that cannot be controlled by human beings. If you have a reservoir, and it silts up, like they're doing now in the West, the river will just roll up and go over the top and will take out the dam—just like it's taken out all those layers of rock in a canyon.

River people have this very true saying: The river always wins. The river *always* wins. If people are still around in 500 years, they'll laugh at the fact that we tried to dam the Colorado River. You can modify it for a time, but you have to let water through it. That to me is a very interesting part of the river experience. It's wild and doing its own thing. When it comes down off the peaks, that water is trying to get to the ocean, and no matter what we do to it along the way, that basic process is going to continue and ultimately it will prevail.

How did you first get interested in running rivers?

I grew up in New York. I was a city kid living between brick walls, in concrete canyons. I had very little contact with nature, so I think the scarcity theory of value came into play. Nature was a big novelty in my life. You could flip that around and take a kid who lives up in the mountains somewhere. He's got wildlife all around, but maybe he yearns for malls. I had the malls, canyons of steel and concrete, but I yearned for the walls of rock and forest.

I had also been told about an ancestor of mine, the river explorer Simon Roderick Fraser. I had some journals and letters that he'd written. I remember as a kid being excited by the drama of his life, wondering if there would ever be a chance for me to explore wild rivers.

Were there specific formative experiences?

My parents were good about getting me out of the city. I had the chance to hike in the Grand Canyon when I was 11, a big challenge for me at that age. I remember standing on the bank of the Colorado, at the bottom of the canyon. I looked up to where the river disappeared around an upstream bend, down to where it disappeared around a downstream bend. Where did the river come from? Where it was going? I was hooked.

How did you learn whitewater boating?

I started out in college as a river guide in 1957 on the Snake River in Jackson Hole. I was paid—not very much—to do work for the lodge, and I worked on the river. That era really is the beginning of professional river-running in this country. This is when Georgie White, the legendary Grand Canyon woman of the river, was first starting out. I think in 1957 about 11 people ran the Grand Canyon the entire year. It's sobering to think about it, but this puts me back in the first tier, the absolute pioneers, base-level people doing this sport for recreational purposes.

Since then I have done most of the western rivers. In 1978, when I wrote the first edition of *The Big Drops*, I realized that no one else in the world had run all 10 of those rapids. There were a number of people who had run one river 50 times, and some had done three or four of the big drops, but I'd had the opportunity to travel around the West and run them all. So I thought I ought to write about it in a comparative context. That diversity of experience is what I really enjoy. I like small rivers, I like big rivers, I like all kinds. I've also run rivers in Alaska and Canada and South America. It's a pretty long list. Someone once calculated that I had run on rivers perhaps the circumference of the planet and another half. One-and-a-half times around the world.

Why run rivers—rather than, say, climb mountains?

With gravity-oriented sports like skydiving and river-running, there are no incompletes. You enter the top of a big rapid, you're going to come out, one way or the other, dead or alive. It's not a question of getting halfway down a rapid and saying, "Nahhh, I think I'd rather not." Mountain climbers can always rappel off. I love the commitment involved in the river experience, the whole idea of entering a place like Lee's Ferry in the Grand Canyon, shoving off and knowing that there is *absolutely* no support for two weeks and 300 miles. That's the kind of experience that's so rare in our time. We're used to the all-night corner quickmart, we're used to places where you can always call 911. But to go for two weeks and be dependent on what you carried in is a throwback to the pioneer experiences that intrigued me so much as a kid. In the early years of Grand Canyon river-running people had no contact at all, with anybody. When I started running in the mid-1960s, there were very few people down there. So I like that sense of self-reliance, of putting it on the line, of planning and preparation and then going out and having the satisfaction of being able to work your way through a big piece of wild country on your own.

You are an elite scholar as well as an elite river-runner.

Such a combination of pursuits is rare in this day and age. You've got to love that academic calendar! One reason I chose to go into academics was that there were four or five months a year available to do stuff. I had the opportunity to get out in the summer, start running rivers in late May or early June, and run right on through into almost October. That's what I did for many years. It gave me the chance to do all those trips and all those miles.

Also, as I was starting to write about wilderness and the environmental movement, I had a feeling that I needed a hands-on relationship with what I was writing about. Just as a scholar of the Italian Renaissance might want to go to Italy, for me, my Italian Renaissance, the sculptures I was studying, the paintings I was studying were the Painted Desert, the shape of the rocks. And the experience of being in wilderness—I didn't think you could write about the wilderness idea unless you'd spent quite a bit of time out there. Otherwise it was just a library type of approach to what others had said about it. I felt that I needed to go out and do the trips, experience the wild rivers and the wilderness, and then I could write about it more effectively.

And that's the way I taught a lot of classes. I took students from campus out into the wilderness. We walked the Grand Canyon, floated the great rivers of the West, and then I asked them to write about it and consider it.

How did you get involved with river advocacy?

I worked in the 1960s on resisting dams in the Grand Canyon. David Brower of the Sierra Club was the prime mover here. This was a huge resistance to something that was very real, and very narrowly averted—damming the Grand Canyon in two places. I was just coming out of graduate school, in my first teaching job, and I was writing about wilderness. People said I ought to come out and lend a hand and explain why a place like the Grand Canyon is important. And so I began to work on that. I began to see the relevance that scholarship could have for river advocacy. Scholarship gave you the ammunition, gave you the ideas to back up your assertions about the river's importance. So when people said, "Why save the Grand Canyon?" you could really answer the question. Otherwise you'd just say, "Well, I like it." That isn't going to get it done. But if you say, "Look, the Grand Canyon is vital to Americans' sense of character, culture, and nationality," if you begin to talk about its role in inspiring literature and art and photography, and spiritual matters, then you're into some stuff that has a little more power.

What significant changes have you seen in American rivers, and Americans' relationships with rivers, in the last 40 years?

Forty years ago our culture was just coming out of the heroic age of dam building. Early dams were the heroes of the conservation movement—a keystone in the gospel of efficiency of the early twentieth century. There was not the slightest ripple of public protest when Hoover Dam and Grand Coulee were built in the 1930s. The next generation, however, began to understand that attempting to control the most basic geographical process on the planet (flowing water) had serious ecological consequences. Dams proposed for the Grand Canyon were stopped in the late 1960s, and the idea of taking out big dams, like Glen Canyon on the Colorado and Hetch Hetchy in Yosemite National Park, is being seriously considered. Part of the motivation here is fueled by new conservation principles: rivers are the blood of the Earth, important corridors linking the wildness of the oceans with what remains on land.

How has the river runner's experience changed?

I talk about the old wilderness and the new wilderness. There were three things you could do in the old wilderness: you could cook over an open fire, you could drink the water right out of the stream, and you could pee anywhere you wanted. In the new wilderness, you can't do any of that. The permit thing has greatly compromised the freedom that has characteristically been associated with wilderness and rivers, and the fact that it now is an 18- to 20-year wait to run a river like the Grand Canyon is a travesty. As a result some of us are running the smaller rivers where permits are not required, and where you get on the flow and it's not the big dramatic Grand Canyon, but you're still on a river.

If the permit system is so onerous, what's the alternative?

Limiting recreational use is a basic restraint in the effort to preserve wilderness and the wilderness experience. But the ways our political system has done this, particularly on high-demand rivers like the Colorado in Grand Canyon, is to favor the commercial trip over the do-it-yourselfer. I believe that self-reliance is a basic component of a wilderness experience and that guided trips or safaris are not as pure in this sense. As it stands, anyone can buy their way onto a commercial trip almost immediately, but the person who wants to paddle their own canoe is facing a 20-year wait. This is absolutely contradictory to the historic traditions of wilderness travel in America.

I am not in favor of increasing the size of the user "pie" but there is a crying need for equity in dividing that use. Managing rivers for a wilderness experience seems to me to demand favoring the self-guided, self-reliant trip. One equitable solution to excess demand would be to require every potential user to go through a lottery and get a permit; they could then choose whether to do the river trip themselves or hire a guide.

Do you have a favorite river?

People ask that question a lot, usually on river trips. I always answer, "The one I'm on *right* now." Love the one you're with, and don't disrespect the one you're with. I really feel that's true, whether it be a small creek somewhere, or a mighty river—just to feel a part of the flow, to feel yourself picked up and moved by a part of the earth. Here's a part of the planet that's moving. When the medium is actually moving and carrying you, that's so special. And it can be any river.

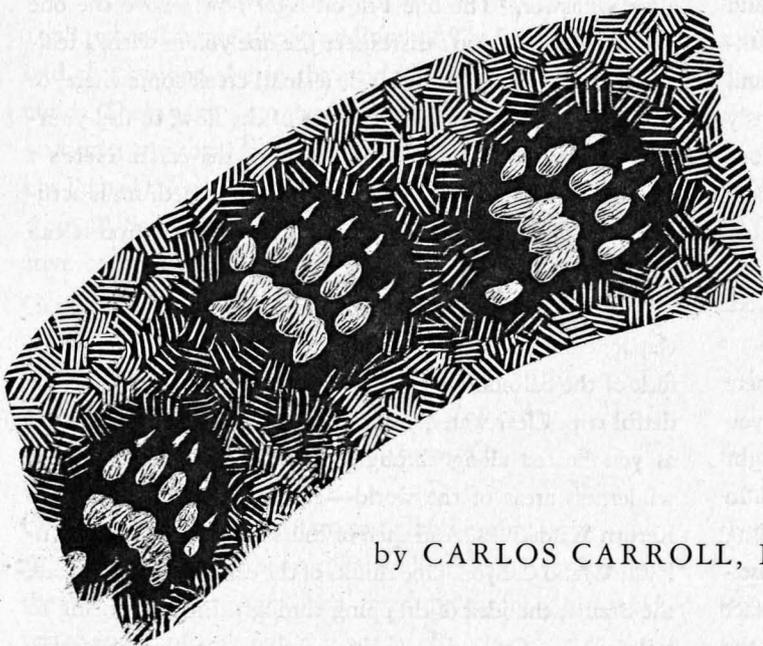
But of course I do have some favorites. I think the great, classic, clear-water mountain float in America is the middle fork of the Salmon River. In the early days, that was a wonderful trip. Clear water, you could see all the rocks and trout as you floated along through the heart of one of the big wilderness areas of the world—Frank Church River of No Return Wilderness. And then of course the Colorado, certainly the Grand Canyon. One thinks of the early days down there, the drama, the idea of dropping through time, and being so isolated. The Colorado and the Salmon—the big, heavy volume, brown river, and then the clear-water river dropping at a faster rate, the more technical water.

What do you like best about being on the river?

For me a lot of it goes back to self-reliance. I feel we're far too dependent on civilization. I like the idea of packing, of distinguishing between tools and toys, taking the tools, knowing how to use the tools. This is what we've done as a species through our evolution.

And I like the way a river enables me to relate to a place. I've always liked to think of rivers in terms of the continuity of the headwaters down to the mouth. When I'm running a river I like to pause at certain points, and in my mind's eye follow the river from the headwaters down to the place where I am at the present moment, then continue on down to where the water flows into the ocean. This gives me a deep sense of connection with the land. ☺

A PROPOSED WILDLANDS NETWORK FOR CARNIVORE CONSERVATION IN THE ROCKY MOUNTAINS



by CARLOS CARROLL, REED F. NOSS, and PAUL C. PAQUET

THE ROCKY MOUNTAINS from Yellowstone National Park to the Yukon—known as the Y2Y region—link larger, northern populations of grizzly bears, wolverines, lynx, wolves, and other carnivores with smaller and more isolated populations at what is now the southern margin of their range in the United States. Because of the key role of Y2Y as a continental wildlife linkage, conservation groups have focused attention on retaining habitat connections across the landscape in this region (Paquet and Hackman 1995, Chadwick 2000). At a 1993 meeting convened by World Wildlife Fund–Canada in Banff National Park, international carnivore biologists and ecologists called for a systematic assessment of carnivore viability in the area of the Rocky Mountains later called the Y2Y region. Despite the existence of several large and well-known parks such as Yellowstone and Banff, our

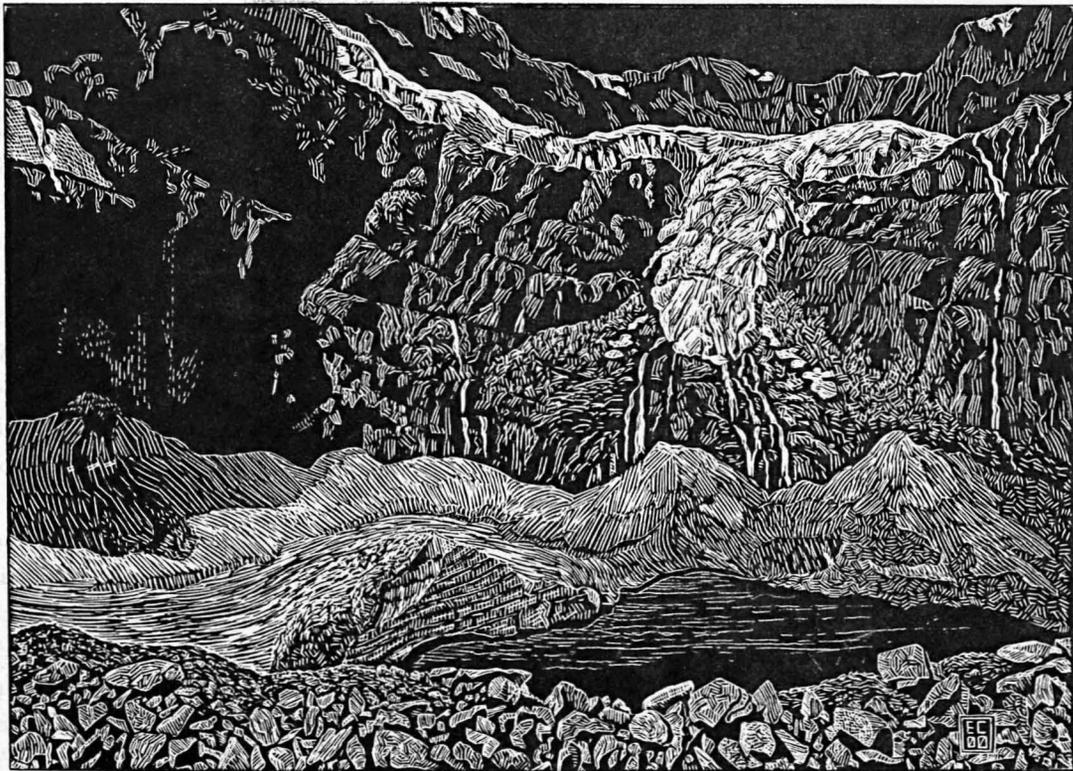
detailed modeling of carnivore populations—including wolves, grizzly bears, lynx, wolverine, and fisher—has shown that current protected areas are not large enough in themselves to conserve viable carnivore populations (Carroll et al. 2001, 2003, in press). This is especially the case in the boreal forest portion of Y2Y in northern British Columbia and Alberta. (Globally, there is a deficiency in boreal forest protected areas; only 5.3% of the land area lying between 50–60° North latitude is protected, as opposed to 9.4% of the tropics [UNEP-WCMC 2002]). In addition to being too small, current parks predominantly capture high-elevation habitats (“rock and ice”) and thus do not provide enough of the highly productive habitat necessary for carnivores and other species. Loss of uniquely adapted boreal populations is of concern even for widely distributed species, especially given projected effects of climate change.

Area and connectivity

Loss of habitat due to human population growth and development is the primary threat to biological diversity. Parks and other protected areas are not immune to these threats and have been compared to islands within a sea of dissimilar habitat. If the diversity of life is to be sustained, conservation planners must not only consider the current distribution of biodiversity, but also the landscape's long-term capacity to support populations. Remnant populations of carnivores—such as grizzly bears—in the smaller parks, especially in the central Canadian Rockies, may be a kind of “living dead” that will slowly dwindle to zero on their habitat islands over the coming decades if more lands are not added to the protected areas system. To design a network of protected areas that has a good chance of conserving carnivores and other wide-ranging species over the long term, we used a new modeling tool, a population model called PATCH that combines habitat data with information on a species' social structure and variation in birth and death rates among different habitats (Schumaker 1998). We then incorporated this information within a site-selection algorithm known as SITES that can balance many goals—for example, the habitat needs of hundreds of species—to locate the areas that best fulfill all planning goals in the smallest overall area (Possingham

et al. 2000). The PATCH population model informed selection of protected areas by identifying the locations of population sources (where more animals are born than die), the degree of threat to those areas from human activities, the existence of thresholds to population viability as the size of the reserve network increased, and the effect of linkage areas on population persistence. Because the population model can incorporate changes in landscapes over time, we could use information on human population and development trends in the region to forecast how wildlife populations might respond to alternative scenarios where current trends continue or slow down or are reversed through habitat protection and restoration.

For the last 30 years, conservation biologists have based their strategy for building protected area or wildlands networks in part on the predictions of island biogeographic theory. This theory predicts that smaller and more isolated parks will lose more species than those that are big or connected. The validity of the analogy between a park and an oceanic island will obviously depend on the degree of difference between the park and the landscape matrix that surrounds it. At establishment, most parks in a generally wild region such as Y2Y are embedded within a relatively benign matrix, and become more island-like as humans transform the surround-



ing landscape. Populations of long-lived animals such as grizzly bears may persist for some time after habitat alteration and isolation has ensured their eventual demise. The number of still-extant species whose habitat needs are no longer met is called a landscape's "extinction debt."

It is usually true that protected areas that are bigger and more connected will lose fewer species than those that are smaller or more isolated. Nevertheless, our results suggest that this simple model misses critical factors that must be considered to protect the widest-ranging species from extinction and that a better understanding of these factors can help us build more effective wildlands networks. How landscape change, such as an increase in roads, affects a local carnivore population depends on the broader-scale dynamics of the metapopulation (i.e., the system of populations connected by occasional dispersal). In less-fragmented landscapes, the matrix (lands outside the protected areas) may still contain some suitable habitat that provides support to park populations. By moving from simple island models to an awareness of the broader landscape structure, we can identify critical matrix habitat before it is lost to development.

If we divide the Y2Y region into thirds, we find that in the southern third, parks most closely fit the analogy of isolated islands (Noss et al. 2002). In the middle third, parks are located on the margin of the northern area continuously inhabited by carnivores, so factors influencing whether carnivores persist are more complex. We found that the simple island model could predict losses of grizzly bears from parks in the most developed third (the U.S. northern Rockies) and the middle, semi-developed third (the central Canadian Rockies north through Jasper Park), but this model performed poorly in the least-developed third, in northern British Columbia, where the landscape matrix still contains much suitable habitat. In developed landscapes, a doubling of a park's *area* resulted in a roughly 47% increase in the chances that a grizzly bear population would persist for 200 years; in semi-developed landscapes, doubling park area resulted in a 57% increase. Nevertheless, the importance of a park's connectedness was much stronger in the semi-developed landscapes. A doubling of a park's *connectedness* generated an 81% increase in population persistence in developed landscapes, but a 350% increase in semi-developed landscapes.

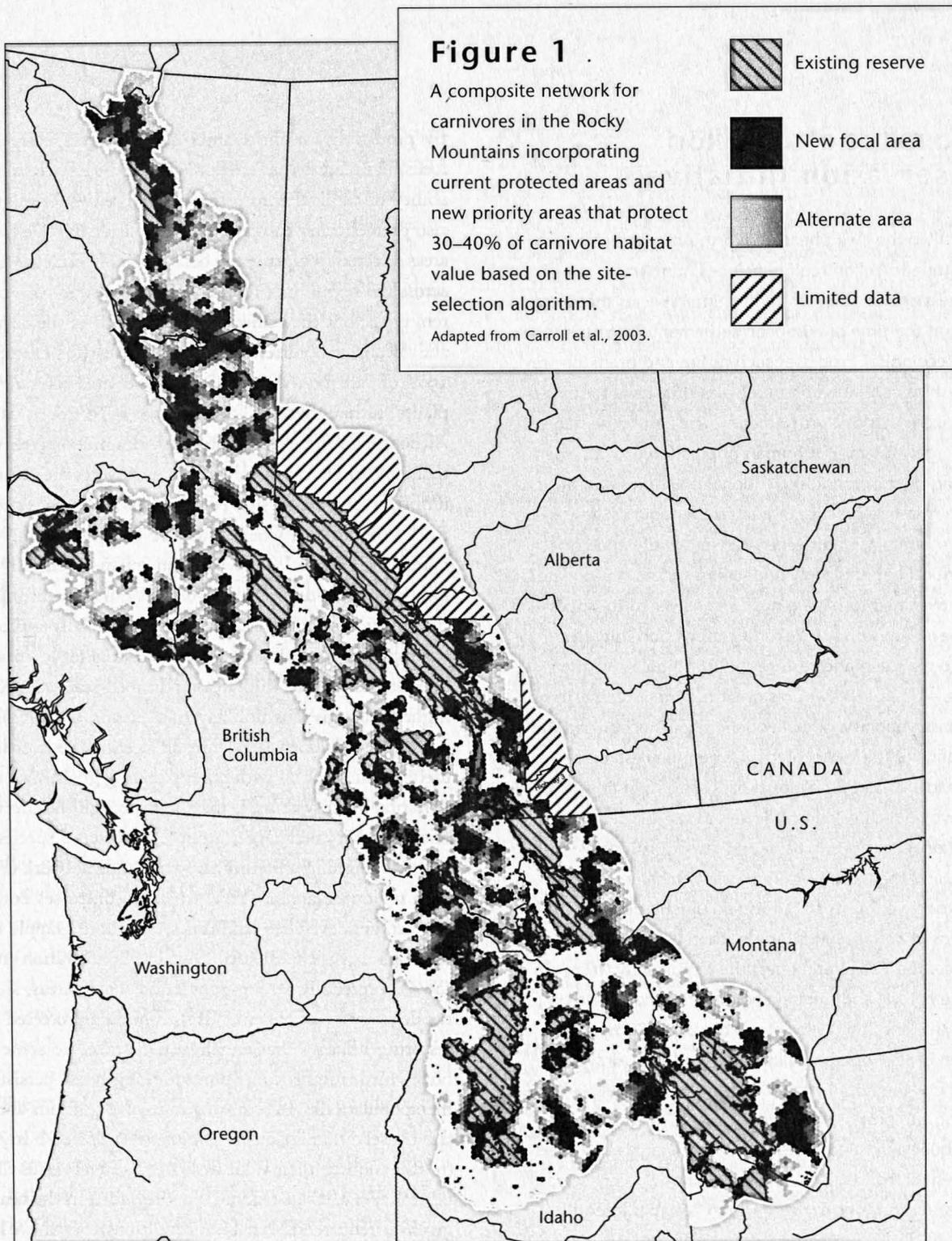
Parks in the developed landscape had to be larger and more connected than those in the semi-developed landscape to have the same chance of retaining grizzly bears. This implies that the relatively small combined area of parks in the boreal forest and

other undeveloped regions may fall below the threshold for species persistence if these parks become more island-like in the future. Loss of carnivores from boreal landscapes could cause a ripple effect, further reducing the viability of carnivore populations that occupy parks further to the south. Connectedness was also most important for wolves in semi-developed landscapes, suggesting that conservation planning to enhance connectivity may be most effective in the earliest stages of landscape degradation. A park's area was less important for predicting its ability to sustain wolves. This is likely due to the wolf's ability to disperse long distances and the fact that as a social carnivore, it has very large home ranges. Therefore, the forces that threaten wolves must be addressed at very broad scales.

We compared our population model's predictions with new field research on carnivores and found it quite accurate for large carnivores, but somewhat less so for mesocarnivores such as lynx and fisher. We found that designing a wildlands network that protects all of these species is challenging because of contrasting habitat needs between species. Some of the native Rocky Mountain carnivores, such as grizzly bear and wolverine, use rugged terrain, while others, such as wolves, tend to avoid such areas. Differences also exist between forest carnivores that are relatively tolerant of human activities such as lynx, fisher, and black bear, and species such as grizzly bear, wolverine, and wolves that are habitat generalists but less tolerant of human activity.

Preliminary wildlands network design

Our population model predicted that continuation of recent trends in development on both private and public lands in the Y2Y region will lead to the loss and fragmentation of carnivore habitat over the next several decades. Populations of most carnivore species can be expected to decline over time as the habitat surrounding reserves becomes less suitable and as populations within reserves become more isolated. Without the addition of new protected areas, as suggested by the areas shown in black in Figure 1, carrying capacity for large carnivores such as grizzly bear, wolf, and wolverine is predicted to decline by 15% in the Y2Y region within 25 years. Substantial conservation commitments will be needed to prevent the northward retreat of carnivore populations in the region and to sustain small populations near the U.S./Canada border. The model predicted that increasing network size would have the greatest effect on carnivore population viability, but this is no longer true after about 37% of the region is protected. Increasing the proportion of the region's protected



areas from the current 17.2% to 36.4% is predicted to result in a 1–4% increase over current carrying capacity despite the effects of landscape change. This implies that, if we wish to preserve viable populations of wolves and bears throughout Y2Y, a large increase in the protected areas system will be necessary to offset the increasing loss of matrix lands to development. Current protected areas, which are concentrated in the

most rugged portions of the study region, need to be augmented by new protected areas that are less rugged and more biologically productive.

A central question in conservation planning is whether areas selected to serve one set of goals, such as conserving carnivores, will also serve other goals, such as capturing locations of rare species or representing a broad range of habitat types.

Yellowstone to Yukon Conservation Initiative

Often called the "wild heart of North America," the Yellowstone to Yukon region includes huge tracts of wilderness and all the plant and animal species that were present at the time of European settlement. In parts of the region, ecological processes such as fire and predator-prey relationships continue unfettered—as they have for millennia. Unlike much of North America, the natural heritage of Y2Y is largely intact. But human population growth, roads, sprawling development, recreational pressures, and unsustainable resource practices threaten the region's life-sustaining mountains and rivers. Will we identify and conserve critical habitats and connections before it's too late?

Determined to have a positive answer to this question, the Yellowstone to Yukon Conservation Initiative works to maintain and restore this 2000-mile swath of wilderness—one of the world's great mountain ecosystems.

Conservationists of earlier generations recognized the importance of the Y2Y ecoregion when they established the Canadian and U.S. national park systems in this area; they gave us such wilderness jewels as the Glacier-Waterton International Peace Park, Banff and Jasper National Parks in Alberta, and the Northwest Territories' Nahanni National Park. Expansive forests still provide a unique quality of life to dozens of communities. Approached with wisdom and prudence, the Y2Y region offers the opportunity to sustain both the natural and human communities that thrive here.

To this end, the Yellowstone to Yukon Conservation Initiative is developing a wildlife network that draws on the work of the Rocky Mountain Carnivore Project—including the proposal by Carlos Carroll, Reed Noss, and Paul Paquet described here—as well as analysis by other prominent scientists. It includes a region-wide conservation area design for grizzly bears, an aquatics integrity analysis to determine conservation priorities by watershed, and two habitat suitability models that will determine hotspots for birds across the region.

But science is only part of the equation. Yellowstone to Yukon is developing new and innovative ways to involve people in the future of this spectacular region. Visit the Y2Y website (www.y2y.net) or call our office in Alberta (403-609-2666) to learn more.

—Jeff Gailus, Y2Y Outreach Coordinator

By protecting an entire suite of carnivore species and thus focusing on areas that are not "rock and ice," we improve the ability of carnivores to serve as "umbrella species" that will also protect other components of biodiversity. We found that areas selected to capture the best 35% of habitat for carnivores across the region met representation goals for 76% of ecosystem types, but they failed to protect many of the documented and localized occurrences of rare species (for example, only 19% of rare non-vascular plants and 26% of rare vascular plants, although these species have been poorly surveyed). Although a suite of carnivores provides much better coverage than any single carnivore species, carnivores are an imperfect umbrella for biodiversity. Nevertheless, in regions such as the Rocky Mountains, where intensive biodiversity surveys have not been conducted, but where endemism is generally low, the focal-species-as-umbrella approach is quite useful in defining conservation priorities. Carnivores are especially appropriate as focal species in regions where the potential for maintaining or restoring large core wild areas and broad-scale connectivity is high. Although it is unlikely that planning for focal species requirements alone will capture all facets of biodiversity, when used in combination with other planning goals, such as representation of ecosystems, it may help forestall the effects of loss of connectivity on a larger group of threatened species.

In designing a preliminary wildlands network (Figure 1) for a region as large as Y2Y, which encompasses both developed and undeveloped landscapes, we had to grapple with the tradeoffs between allocating scarce conservation resources toward protecting strong population source areas, stemming the degradation of buffer lands surrounding protected areas, or restoring linkages that are already degraded to some degree, but which might contribute to long-term persistence of metapopulations. A useful way to resolve tradeoffs and prioritize conservation actions is to plot the irreplaceability of sites (in this context, their value as source habitat) versus their vulnerability (i.e., their risk of being degraded in the near future given current trends in habitat conditions). When we map the Y2Y region in this way, the two highest-priority areas for habitat conservation to enhance populations of carnivores are 1) the region including the Hart Ranges and neighboring wildlands, which lies midway between the Muskwa Kechika conservation areas and Jasper National Park (in northern British Columbia and Alberta), and 2) north-central Idaho. Both of these regions combine high biological productivity and relatively low human influence, yet both are threatened by ongoing development and resource extraction. New protected

areas and linkages are also needed to connect the Muskwa-Kechika area to Jasper National Park and to connect protected areas in central Idaho northeastward to the Northern Continental Divide Ecosystem and eastward to the Greater Yellowstone Ecosystem.

A third priority area for conservation is the transboundary region, from the North Fork of the Flathead River, adjacent to Waterton Lakes and Glacier National Parks (the Northern Continental Divide Ecosystem), north across Highway 3 (in the vicinity of Crowsnest Pass) to Banff National Park. This area is already a strong filter, if not absolute barrier, to several carnivore species, and will significantly isolate carnivore populations to the north and south unless conservation actions are implemented quickly.* Our population model was very useful for predicting the effects of landscape changes, such as degradation by development or restoration by road closures, on the viability of carnivore species. Thus we assessed the effects of restoring linkages in the Crowsnest Pass area, and found complex responses that varied with species. For example, the corridor became more valuable with time for grizzly bear but not necessarily for other species. Our results suggest that adding reserves in the transboundary region would prevent the loss of connectivity between the Northern Continental Divide Ecosystem and the Canadian Rocky Mountain parks and sustain smaller grizzly bear populations in southeastern British Columbia and the northern U.S.

The site-selection model helped us determine *where the best habitat is*, including high-priority core areas and potential linkage and buffer areas. The population model helped us assess *how much habitat is enough* to insure carnivore population viability and how protected area design considerations might differ between species regarding connectivity and patterns of threat. The overall wildlands network design builds on the "best" solutions from the site-selection model by adding linkages between core areas based on both alternate areas highlighted in the selection process (shown in gray in Figure 1) and on functioning or potential linkages apparent in the population model results. Because our results do not yet incorporate ecosystem representation and rare species, and have not yet mapped all necessary linkage areas, we present only a preliminary wildlands network design.

It was challenging to try to gather habitat information from across such a large region spanning two countries, and

then try to understand how humans are changing the ways that animals such as grizzly bears could move and survive on the land. Yet it is even more challenging to make this type of broad-scale plan relevant to those making the thousands of local planning decisions at the county or regional level that incrementally destroy or (more rarely) restore habitat. Our results imply that protecting connectivity across the Y2Y region will require not just safeguarding a few wildlife crossing areas, but protecting ecological integrity across the entire landscape, an effort that will require a broader vision of sustainable land use than our species has shown to date. ☺

Carlos Carroll is a consulting ecologist with the Klamath Center for Ecological Research. **Reed Noss** is chief scientist for the Wildlands Project and a professor of conservation biology at the University of Central Florida. **Carnivore biologist Paul Paquet** is co-director of the Central Rockies Wolf Project, an adjunct professor at the University of Calgary, and a member of the Wildlands Project's board of directors. ☞ To view the Rocky Mountain Carnivore Project Final Report (June 2002), visit www.wwf.ca/newsandfacts/resources.asp?type=resources.

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* As part of the Room to Roam campaign launched in 2003, the Wildlands Project highlighted Crowsnest Pass as one of five Endangered Linkages along the Rocky Mountains from Mexico to the Yukon. To learn more about this campaign to reconnect wildlife habitat along the spine of the continent, visit www.wildlandsproject.org/roomtoroom.

IN RECENT YEARS, the seven Central American states (Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, Panama) have gotten in the habit of doing land management planning together, as a united group. This is due in large part to the advent of the Mesoamerican Biological Corridor (MBC). Happily, Mexico is joining this process.

From a conservation biology point of view, the MBC is a method to link together small protected areas in small neighboring countries, creating a network of mutually supporting reservoirs of biodiversity. In the most optimistic projection, this regional corridor system would become an unbroken greenway from Mexico to the South American continent. The MBC program enjoys core funding from the Global Environmental Facility, with vigorous leadership from the World Bank. Establishing the corridor has become the very context, the framework, for park planning in Central America, and so it was only natural that the MBC coordinating office, located in



What are Central America's parks *for*?

by Archie Carr III

Nicaragua, took the lead in organizing and hosting the First Mesoamerican Congress for Protected Areas.*

This historic meeting—in preparation for the Fifth IUCN World Parks Congress to be held in Durban, South Africa, in September of 2003—brought park advocates from throughout Mesoamerica together in Managua. Similar sessions were happening all over the world as people organized themselves for the once-in-a-decade Durban gathering.

Held over a period of five days in March, the Central American meeting was a brilliant logistical success. There were 800 participants, the largest park meeting ever in Central America. I attended the gathering in Managua hoping to be reassured that there was a conventional park “movement” still flourishing in Central America. I had come to question the integrity of the Central American movement at an event in Paris in December of 2000. At that time, the World Bank had called a meeting to review the progress of the MBC—a regular check-up carried out at biennial intervals.

The Mesoamerican Biological Corridor program is a project of the CCAD, the Spanish initials for the Central American Commission for Environment and Development. The CCAD is peopled by the ministers of natural resources from the Central American states. All seven of these ministers made it to Paris for the review of the corridor project.

The review sessions in the World Bank building just off the Champs Elysées lasted two days. The presentations were upbeat; the PowerPoint shows and matching brochures were colorful, with images of the attractive landscapes and wild plants and animals of Central America. Pictures of chubby-cheeked children popped up frequently in these media, conveying a sense of harmony and well-being in the region. The review was two days of pleasantries, but no talk of parks, biological corridors, or other *in situ* initiatives to save nature. This was the second World Bank review. Funds had been flowing from this source alone for five years. I expected to see data on new parks acquired; new guards hired and trained; patrol vehicles purchased; visitor centers built; and, most of all, corridors surveyed and implemented to connect nearby parks together.

I did not hear much about those themes. At one point, the Costa Rican minister, Carlos Manuel Rodriguez, a veteran in the conservation movement, said he felt “nostalgic” for conventional park talk. Nostalgic! He knew something was

slipping away. I was feeling uneasy, too, but the participants, the bank personnel, the bilateral donor representatives, the handful of big NGOs, and the CCAD ministers all remained very happy, even enthusiastic. Knowing that the trees were falling at a deafening rate back in Central America, my area of specialization, I was perplexed by the jovial mood. I asked the senior World Bank officer at the meeting what she made of the cheery attitude. She said the Europeans admired the cross-border, plurinational cooperation of the Central American states. The countries in the Balkan Mountains were particularly impressed, she said. I asked, Why? Were they planning some conservation projects in the Balkans? She said this wasn't about conservation. It was about war and peace...and reconstruction. I was stunned by this revelation, but there was more to come.

On the second day, the delegate from Germany made an intervention. She was young, blond, good looking, and in her eyes there glowed a messianic ember. The government of Germany, she said, applauded the progress of the Mesoamerican Biological Corridor. (*What progress? What did she know that I didn't?*) Continued funding by Germany, she went on emphatically, would be contingent upon poverty alleviation in the region. The Scandinavians, French and British bobbed their heads in concurrence with the German statement. I began to understand. The corridor was a euphemism.

The term “donor driven” seemed to be pertinent to the scenario. CCAD decision-making was being heavily influenced by those able to grant or refuse assistance. Cynics might argue that this has always been the case, but that would be unfair. The CCAD was founded on the conviction of real leaders, a Nobel laureate among them, that through collaborative efforts the pan-Isthmian tragedy of the 1980s (the “lost decade” for Central America) could be relegated to history, and a promising future achieved. One of the early decisions of this group was a commitment by treaty to implement the biological corridor. But now, encouraged by perhaps myopic, naive international donors, the promise of an exciting conservation project—the Mesoamerican Biological Corridor—was being redefined. Physically, it would include the entire isthmus—the whole skinny landmass of Central America. And, thematically, the project would include assistance for practically every component of cultural and economic development: gover-

* The term “Mesoamerican” was used in the title, instead of “Central American,” to convey the news that Mexico was a contributor to the planning session. I heard one speaker comment that Mexico had “given permission” to the organizers to call it a Mesoamerican congress. With sensibilities regarding geographical nomenclature overcome, the extensive forests of southern Mexico, ecosystems that join with those of Guatemala and Belize, could be included in the planning process—very important for conservation in this region.

nance, public health, rural electrification, indigenous rights, agricultural extension, and gender equity.

I sat at the long table in Paris and witnessed “mission drift” descend like a cloud of ash from a Central American volcano. I heard the donors set biodiversity conservation aside, and insist upon a program for economic development for Central America.

I had proprietary feelings about the Mesoamerican Biological Corridor because I helped invent it. In the early 1990s, with funds from USAID, I managed a project called the *Paseo Pantera* (Path of the Panther). Back then it was offered as an innovation in wildlife conservation—one uniquely suited to these parks and the elongate geography of the region. Now it appeared the Mesoamerican Biological Corridor had become a rural development plan. So be it. It would have been unseemly to gripe too loudly. Any and all assistance for the needy people of Central America should be welcomed. But, in the fervor to restore social order in the region, would any of the Global Environmental Facility money trickle down to the parks and protected areas of Central America? Would the opportunity to make a world-class system of internationally integrated parks and protected areas vanish? I could not find an answer.

Still, I thought, maybe the Managua meetings would be more focused, more on-task. The First Protected Area Congress in Managua would be carried out under the auspices of the CCAD, but there would be park directors there, and other NGO and governmental professionals whose traditions were solidly based in park management.

MY OPTIMISM was unfounded. At Managua, the deliberations of the assembled 800 also gravitated away from parks as wildlife refuges, and toward something like welfare nuclei: designated spaces, perhaps with trees, where the needs of humans would be attended to. Utopian bubbles of peace and tranquility, each bubble centered on a protected area. The concept made me edgy.

Here's a simple analysis. Of the nine symposia during the congress, four had the following titles: Social Participation and Equitability; The Contribution of Protected Areas to the Alleviation of Poverty in Mesoamerica; Biological Corridors and Regional Integration; and Ethnic Perspectives on Management of Protected Areas.

Thus, almost half addressed sociological—not biological—issues, albeit issues of grave social import in the Central American region. There were numerous interventions

addressing the plight of poor people in the other symposia, as well. As in Paris, the park meeting in Nicaragua was distracted by poverty—held hostage, one might say. The message was plain and came from many sectors: If you want parks, you must save the people.

In this expansive mood, the advocates moved toward a utopian model for protected areas. It was conceded without much debate that there would be people inside the parks; plenty of them inside the buffer zone. And, the argument went, it was the responsibility of park “management” to take care of these people—to see that they were fed and clothed, had schools, sanitation, pre-natal care and agricultural extension services. My uncertainty about this model came into sharp focus when a woman took the podium in one of the plenary sessions and dropped a perfect non sequitur. Within the protected area, she said, gender equity would be assured.

She wasn't talking about the male-female ratio among the park rangers. She was talking about fair treatment for women in the villages and homes found within the conservation area. And the unstated component to her remark was that women were, and would remain, mistreated in the hinterland, outside the park. The park would become a refuge from the misery of the host country. Inside the protected area, inside the bubble, social welfare would be assured. Outside, it was hell. And, by this model, it would stay that way. The social refugia, these little states within states, would be strung out along the length of the Central American isthmus, tracing the Mesoamerican Biological Corridor, bringing hope—at last—to the *campesinos* of the countryside.

This model is dissatisfying for several reasons. The first is pragmatic. I cannot see how to do it. What sort of management agency can provide for all the social needs of poor people in and among parks? It is assumed that the ministries back in the capital cities cannot do it—that is a given in this argument. The relevant ministries are corrupt, incompetent, or uncaring. Hence, creation of the bubble-of-goodness in the first place. So, then, who will care for the people? The park director? Where will he or she get the authority to enforce gender equity for women in the villages in the buffer zone? Can a managerial czar be created—a leader with powers garnered from all ministries, allowing him to build schools, pave roads, dig latrines, and pass out condoms? And run the park? Governance of such a utopian entity is a murky subject.

And, suppose it succeeds. Won't the rest of the impoverished masses want to come under the nurturing embrace of the utopian bubble? What then? Will the bubble burst? There are

over 20 million people living in poverty in Central America. Can park management make a significant difference for all those tragic souls?

Be that as it may, I think these utopian islands are ethically challenged, as well. I cannot stomach granting the state the luxury of not attending to its people; the conservation community declaring, in effect, that *we* will provide for human welfare, here in the park, among the trees. It is appalling to suggest that the park director must resolve land tenure issues for agrarian people, or settle four-century-old disputes over indigenous autonomy in a given area. I think the global park movement must not give in to the venality of national governments, but must hold them noisily responsible for public welfare. Parks are a public service, not a public bailout.

And, while we're letting the host governments off the hook by attempting to establish little green enclaves of social justice and opportunity, we are also making life artificially pleasant for the industrial nations. The budget to save nature is far greater than salaries for park rangers. The budget to save nature is the cost of reversing poverty in the world. Parks cannot alleviate poverty. Only family planning, massive macro-economic adjustments, and probably a good measure of sacrifice of living standards in the first world can alleviate poverty—and allow park advocates to return to their mission of saving nature.

I have fretted about the direction of the parks movement ever since the World Conservation Strategy was published in 1980 by IUCN. It was there, it seems to me, that conservationists publicly assumed the mantle of saviors. Afraid of resistance from poor, rural people to the declaration of seemingly exclusive conservation areas, the conservationists capitulated, and claimed they could do it all: save the poor *and* save nature. It is both a deceptive and risky declaration. The relationship between poverty and parks is clear. It's a desperate thing. But the solution is not in the hands and budgets of the conservationist. The solution is in a political and economic matrix far grander than the world parks movement.

Returning to the States, I thought of the utopian bubbles, the green safe-havens envisioned by my Central American friends and colleagues. I concluded they were impractical. And then it dawned on me that perhaps the CCAD ministers back in Paris had had it right all along. They, too, used a conserva-

tion framework to articulate social and economic development programs. They talked scarcely at all about parks, but they did conjure up utopian settings. But, in their case, by defining the Mesoamerican Biological Corridor as the whole shebang, the entire isthmus, all seven countries (plus the southern states of Mexico) and all the people in them, they were at least making their bubble big enough. It encompassed entire countries. Their thinking, their scale of planning, included all sectors and all ministries. The CCAD was, in effect, arguing that if the general standard of living of all the people could be improved, then perhaps there would be time and energy for parks in the years ahead.

It's a wild race: prosperity first, then parks. Sounds familiar. It's how it happened in my own country, the United States. But when the race is run in the developing world, what scraps of nature will there be left to work with? Can the jaguars wait for all the region's social ills to be healed?

I WENT TO THE World Parks Congress in Durban to look for answers. There were close to 3,000 delegates there. Queen Noor and Nelson Mandela opened the proceedings. It was a heady event, not at all disagreeable in most respects. With park people from all over the world attending, it was fun and stimulating to be among friends and new acquaintances, most bound by common sentiments about nature and the urgency to save it.

Yet when I got to South Africa, with Central America very much on my mind, I stumbled over a double standard in large-scale land management. I got snared by a contortion of logic. I went to an early workshop in the 10-day event, a panel discussion about corridor initiatives around the world. I wanted to glean any news about the Mesoamerican Biological Corridor that I could. Sure enough, a World Bank representative was there, and she reaffirmed that the MBC project was one of the most exciting programs the Bank is involved with anywhere. Because, she said, the Central Americans were using the corridor project to address their economic development concerns.

I experienced that familiar contrast of emotions: satisfaction with the MBC as an important initiative, but disillusionment with where it was going. In due course a gentleman from the European Commission took the mike and told us



*The park would
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it was hell.*

about Natura 2000. It was news to me—the existence of the Natura 2000 initiative had escaped me entirely. I listened in something approaching disbelief as the European Union man told of a European corridor system already well advanced, including every state in the EU, and scheduled to pick up 10 more states from Eastern Europe as soon as they join the Union. Natura 2000 already encompasses 15% of the land surface of Europe. The speaker said it was probably the largest, most complicated corridor system in the world. He described forceful measures used by the member states to achieve their respective commitments to the international corridor. He told of field studies to determine the needs of fauna and flora in the landscape, and of careful surveys to plot just the right linkages to help those organisms survive in the utterly altered agriscap that is Europe. He said implementation of some corridors and parks in the network were proceeding more slowly than others owing to legal actions being taken. The EU states were invoking something close to eminent domain to help recover a little of the natural integrity of the continent. Private landowners would be compensated for committing their property to conservation, but the corridor *would* go through. It was in the interest of the people and the states of the EU that this be so, he said.

I applauded loudly, being genuinely thrilled by the thought of even more lovely, wilder vistas in the European countryside. I was also impressed by the forceful character of the Natura 2000 campaign. That's the way conservation should be done! Go ahead and use eminent domain if the situation calls for it. The goal of restoring nature is in the greater societal interest. It is a planetary good. Aggressive conservation has its place. Natura 2000, I learned, "is based essentially on two main, mutually supporting pillars, species protection and habitat protection." It made sense to me. I applauded the Europeans.

Then I recalled the Paris meeting where the Europeans ganged up on the Central Americans, noisily insisting that they take the donors' \$100 million for a seven-nation corridor and use it for economic development. Set the parks and corridors aside, they said in effect, and work on rural development. What warped set of values and priorities could generate the bold Natura 2000, on the one hand, and encourage an abandonment of the protected area movement in Central America on the other?

I fumed about this dichotomy in corridor development for a couple of days. It verged on hypocrisy, to my mind: good conservation practice is okay for the well-to-do Europeans, but

Sisters

There is a solution to the plight of the Mesoamerican Biological Corridor (MBC), Central America's primary conservation initiative. The European countries are among the most generous and passionate supporters of the MBC today, both through bilateral giving to Central American countries, and through their substantial contributions to the World Bank and the Global Environmental Facility, the principle donor to the MBC program. The Europeans are vested in the MBC, one might say. That being the case, perhaps European Union member states could be persuaded to transfer to the MBC process something of the highly focused, aggressive Natura 2000 initiative (www.iucn-ce.org.pl/natura2000/en/), the plurinational conservation initiative for the continent of Europe. Let some of the ideas from Europe follow the money to Central America. Seek to transfer approaches to corridor design, park strengthening, and ecological monitoring

that are being applied to the European landscape (a transfer of technology, as it were). Relative to the many millions of dollars already spent, or already in the pipeline, this transfer would not be expensive. Nor would it mean dropping such rural development schemes as are presently promoted by the MBC. For a few dollars more, some specific and extremely urgent conservation goals could be superimposed on the other programs. In some areas—for example, most of El Salvador, the eroded mountain slopes of Guatemala, and the abused land in Honduras—the experience of the Europeans with restoration ecology would be of great value to the Central American situation. *Sistering* the European Natura 2000 with the Central American Mesoamerican Biological Corridor in this technical way would be a timely, feasible, and productive extension to the financial generosity already demonstrated by the European Community. —**Archie Carr**

it's not suited to the Central American setting? I must have made a remark along these lines in yet another panel discussion, because when it closed, a woman pinned me with a steady gaze and set a course to intercept me before I left the room. She was from a German research institute, she said, and had worked recently in remote parts of Guatemala.

"So," she said, "I take it you do not think that rural development and conservation are the same thing."

I looked down into brown intelligent eyes and saw not an ounce of malice there. She was just waiting patiently for me to respond. I took a deep breath and set down my bundle of congress documents.

"No ma'am. They are not the same. They might be related, often negatively, but they are not the same. With rural development, you try to help poor people. With conservation, you try to help wildlife. Success with rural development is measured by reduced infant mortality, access to clean drinking water, improved incomes for households, availability of schools and medical services. Conservation is measured by the status of species of plants and animals and the habitats in which they live."

A slight frown crossed her face.

She asked if I thought conservation could take place in the presence of poverty.

I said I took her point about rural poverty in the third world tending to overwhelm valuable habitats *and* our efforts to save them. But, I said, conservation is, at best, a rinky-dink way to address the poverty of Central America. To say otherwise is to deceive the people and their governments. The resolution to the poverty crisis requires something much bigger than the world's conservation movement. If you ask young men and women from rural areas in Central America what they most urgently want, it is not wildlife movement linkages for jaguars or preservation of biotic hotspots—it is wages. That's why they risk their bodies and lives to get to the States. They remain agrarian in the US, but they get paid hard cash for their labors. There's no work in their own countries. No wages. No hope. The young ones risk their necks to get out.

I was losing confidence. This argument had a tendency to become circular. Parks, people, poverty: a juggling act to keep them straight. Then I had an insight. The woman in front of me was from Europe, the Old World. I said to her, "If we postpone conservation in Central America until the standard of living has risen significantly, we will have nothing but a



*Conservation is
falling woefully
behind development
as a regional and
global priority.*

Euroscape to work with. We can't wait like you did. It's the Tropics. The biological rules are different."

She blanched, knowing better than I the implications of a "Euroscape." It seemed a bleak vision to her.

I tried to soften the moment by inviting her to our field site in the Peten of Guatemala. We struggle there with people, poverty, and parks, year after year. We measure success by the survivorship of scarlet macaws. She said she'd think about dropping in, but I don't think she meant it. I might have been wearing on her.

Progress with conservation in Central America cannot await full economic and social development. The two agendas can advance simultaneously, but at present, the one, conservation, is falling woefully behind the other, development, as a regional and global priority. In Durban, at the final plenary session of the World Parks Congress, where once again the entire 3,000 delegates had convened to close out the meeting, Minister Carlos Manuel

Rodriguez of Costa Rica took the floor and electrified the crowd. This was the same Minister Rodriguez who, at the World Bank meetings in Paris, had felt "nostalgic" for old-time park advocacy. In Durban, he pulled no punches and said the parks of the Central American region were in urgent need of attention—even though the Mesoamerican Biological Corridor program has gobbled up \$100,000,000. The Minister spoke of "paper parks," gazetted but unstaffed parcels throughout Central America; neglected sites that once had champions, once had vital purposes in the mosaic of protected areas in the region. These ghosts make up about half of the declared parks in the area. At one time, they were to be crucial components of the Mesoamerican Biological Corridor.

Minister Rodriguez was unambiguous about the *conservation* priorities for Central America. The global conservation movement is more muddled. The persistent ambiguity of the message, crossed up as it is between poverty alleviation and biodiversity conservation, is dangerous—and a disservice to the public and to nature. ☾

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The End of Counting Critters?

by Jamey Fidel

ENCOMPASSING APPROXIMATELY one-tenth of the land base in the United States, national forests provide habitat for more than 10,000 plant species and at least 3,000 fish and wildlife species (USDA 2003, Zaber 1998). Of the nation's remaining old-growth forests, 73% are found on national forests (Zaber 1998). Approximately 400 species listed as threatened or endangered under the Endangered Species Act are considered forest-dependent, and at least 2,900 sensitive species are located on one or more of the publicly owned national forests (USDA 2003, Zaber 1998). The protection of this remarkable biological legacy lies, to a large degree, with the U.S. Forest Service.

How the Forest Service interprets its statutes and engages in wildlife policy is of paramount importance to the maintenance of biodiversity on the national forests. Under the 1976 National Forest Management Act (NFMA), biodiversity is protected through the development of land management plans that "provide for diversity of plant and animal communities based on the suitability and capability of the specific land area to meet overall multiple-use objectives" (Section 1604(g)(3)(B)). The Forest Service's interpretation of this so-called diversity provision has been the subject of much debate; this is not surprising, considering, as one commentator has noted, "it is difficult to discern any concrete legal standards on the face of the provision" (Wilkinson and Anderson 1987).

As mandated by NFMA, the Secretary of Agriculture adopted comprehensive forest planning regulations with the aid of an independent group of scientists appointed to advise the Secretary. In its final 1979 report, this scientific committee acknowledged that the "translation of Congressional poli-

cy into reasonable regulations has proved a formidable task." Faced with the belief that it would be "impossible to write regulations which are specific" as to how to provide for diversity, the committee nonetheless stated that the intent of Congress is clear:

(1) Diversity is to be considered throughout the planning process, (2) steps are to be taken to maintain or increase diversity of plant and animal species and communities by management, and (3) management measures which tend to reduce diversity are to be used only when shown to be necessary to achieve overall multiple use objectives. (Committee of Scientists 1979)

In 1982, these concepts were translated into regulations that became the benchmark for the Forest Service's management of biodiversity. The 1982 regulations provided specific instruction as to how the Forest Service would conduct planning activities to preserve diversity. For example, they instructed that "fish and wildlife habitat *shall* be managed to maintain viable populations of existing native and desired non-native vertebrate species in the planning area." Furthermore, they required the Forest Service to select management indicator species that would be monitored to estimate the effects of forest management activities on fish and wildlife populations. Planning alternatives would need to be evaluated and stated "in terms of both amount and quality of habitat and of animal population trends of the management indicator species" (USDA 1982).

In November of 2000, the Forest Service adopted an updated set of forest planning regulations that incorporated two decades of new scientific understanding in the fields of con-

ervation biology and ecosystem management. The 2000 regulations boldly stated that the "first priority for stewardship of the national forests and grasslands is to maintain or restore ecological sustainability." The regulations eased the mandate to collect data on population trends of species, but extended the requirement for maintaining viable populations to both plant and animal species. Instead of focusing on the use of management indicator species, the Forest Service would be required to evaluate ecosystem diversity by collecting information on focal species that would "provide insights to the integrity of the larger ecological system to which they belong." The regulations would also require the agency to consider monitoring actual populations of species at risk (USDA 2000).

However, just months after the 2000 regulations were adopted, the Bush Administration made the determination that the Forest Service was not "sufficiently prepared to implement the new planning rule" (USDA 2001a). The Bush Administration decided that it would revamp the planning rules to fit a new mold. Simply put, the new principle would be Forest Service discretion at every turn.

Now, the Forest Service wishes to test the boundaries of the diversity provision of the National Forest Management Act. New planning regulations that are being drafted will significantly alter the way the Forest Service manages for biodiversity.

The final format of the regulations is still being considered (including two options for biodiversity management), but it is clear that a great amount of flexibility will be built into the diversity provision—including removing the burden of complying with past regulatory constraints. As explained by the Biodiversity Option Development Team, "A key element of the charge of [this team] was to avoid being constrained by specific language or elements contained in the 1982 or the 2000 planning rule" (USDA 2001b).

The anticipated result of these new planning regulations is that the Forest Service will minimize its longstanding duty to ensure species viability and collect quantitative data regarding population trends of species. For example, the draft rule allows the Forest Service to manage national forests for ecological conditions that would merely provide for a high *likelihood* of species viability over time (USDA 2002). The focus of species management will move from quantitative monitoring that verifies that viable populations of species are being maintained on the ground, to a more qualitative assessment of whether forest conditions are capable of supporting species viability. One scientist has described this as the "if you build it, they will come"

strategy, without any requirement to see if species are actually inhabiting the conditions prepared for them.

Furthermore, duties regarding population trend analysis will no longer be mandatory. For example, language in one of the proposed draft regulations suggests that the Forest Service *should, where feasible*, compile information on species abundance and population status in evaluating species diversity (USDA 2002). This standard highlights the amount of discretion the Forest Service wishes to capture in its reworking of the diversity requirement. The Forest Service has eliminated the mandatory language of past forest planning regulations. "Shalls" have been replaced by more legally nebulous "shoulds," creating a model of suggested management with few enforceable standards.

The level of desired discretion is no surprise in light of conservationists' repeated success in forcing the Forest Service to comply with its mandate to manage for biodiversity—especially the duty to monitor the population trends of management indicator species on the forests. The Forest Service has repeatedly tried to defend itself by claiming that it does not have the resources to implement species monitoring to satisfy the 1982 regulations. But this may simply be an excuse for the Forest Service's lackluster attempt at compliance with species monitoring in the first place.

Before a new chapter is written in forest biodiversity management, the Forest Service should demonstrate that it has attempted in good faith to carry out its mandate to monitor and quantify population trends of indicator species on the national forests. Has the old paradigm for diversity management failed because of a set of circumstances that could be corrected, such as a lack of funding or agency attention?

To be effective, a new paradigm for biodiversity management will need to balance both coarse- and fine-filter levels of assessment for maintaining species viability on the forests. However, on-the-ground monitoring, including species abundance and population trend analysis, should remain an obligation of the Forest Service, especially for species that are at risk or that would function as focal species (Noon et al. 2003).

With no requirements for population trend data collection in the forest planning regulations, the Forest Service can sidestep its responsibility to verify that species are actually thriving at healthy population levels across the forest. The Forest Service will be required to demonstrate that adequate habitat is being maintained, but the burden will shift to scientists and conservation advocates to demonstrate whether planning activities are affecting species numbers and popula-

tions. The scientific community will now bear the brunt of conducting on-the-ground species monitoring to determine whether viable populations of species are being represented across national forests.

When the Forest Service releases its final version of the new forest planning rules, there will have to be some acceptance of the latitude the Forest Service enjoys when it comes to its requirements under the National Forest Management Act. After all, the manner in which the diversity provision has been interpreted by the Forest Service has prompted at least one federal judge to declare that the "National Forest Management Act breathes discretion at every pore" (*Griffen v. Yuetter* 1991).

However, when the diversity requirement is stripped to the core, there is still an affirmative duty to maintain species diversity on the forests. The proposition that this can be done with little or no required monitoring and population data collection by the Forest Service deserves serious scrutiny. ☺

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Convolvulus

No one invented the wheel; a flower
unveiled it. And unrolled, in paling violets,
a third dimension, to open and close:
fall in and fall out,
within, without, withal.

People gave it names
representing transition, *morning-glory*, *moonflower*, plantspeech.

Like the roving
of wishful sleeping. Indecision in the manner
of royalty's hired botany:

name for me and name for you,
the crown, corolla, almost petunia.

One petal, a wheel.

One expectant as the tender-centered, trumpet-throated
evensong.

Five matins by the losing hour:
king and queen,
offspring, manor, moat,
reign of old soil
before the next coming.

Let me in, turnstile-vine, let me.

~ Julie Choffel

THE NONPROFIT conservation movement needs to follow examples in the for-profit world and do some serious merging, acquiring, consolidating, upsizing, downsizing, bankrupting, resizing, and reinventing.

The most compelling reason that should force the conservation movement to consider such radical changes is a general lack of success. Yes, we have small victories, sometimes even major ones. However, by almost any measure, the health of Earth's natural and human communities continues to worsen.¹

It may be that restructuring the conservation movement to become more efficient² will not be enough to overcome the greed, ignorance, stupidity, and genetics that seemingly make a critical mass of humans behave in ways that are destructive to the health of themselves, their families, their heirs, their watersheds, their bioregions, and their planet. Given that the outcome is so important, the conservation movement must consider all options.³

The bursting of the latest stock market bubble in 2002, and the subsequent decline in foundation funding, provides the opportunity—if not the necessity—for conservation organizations to consider restructuring. Some will merge, some acquire, some diversify, some restructure, and some will die. Those who think the fundraising will improve in the near future should heed the words of Denise Joines, a program officer for the Wilburforce Foundation in Seattle:

Foundation dollars for the environment are at the lowest level in the past ten years, and current projections for most foundations indicate funding amounts are likely to stay at this level or may even be lower in 2004. If you've been hoping for foundation funding to improve next year, please rethink your fundraising strategies now.⁴

Below are 18 issues for organizations (board members, chief executive officers, and staff) and funders (foundations, large donors, and members) to consider as they ponder their place in these challenging times. A discussion of mergers and acquisitions follows.

1. Optimum size for an organization

The rule of thumb for an optimal size of a nonprofit organization is that there is no rule of thumb. Just as in business, there is no simple cookbook answer; the right size depends on the group's mission, goals, culture, and other factors.

When it had annual revenues of approximately \$100 million, owned its own calendar printing company, tried to self-

insure for employee health care (and found out how expensive one heart transplant and one brain tumor could be), and had a building it could not afford, the behemoth National Wildlife Federation was neither sustainable nor efficient.

Conversely, an organization with a budget of less than \$100,000 that relies on employees who will work for below a living wage (or nothing) and without health insurance, that maybe pays "gas" but certainly not the IRS mileage rate, is an organization far too small to be efficient or sustainable.

A one-person organization never has staff meetings. Add employees to get more work done and staff meetings become inevitable. Though staff meetings take staff time, they can make the staff more efficient in their remaining time. However, add too many employees and too much time may be wasted in staff meetings.

Mergers, Acquisitions, Diversifications,



by Andy Kerr

An organization of adequate size allows for specialization among the staff that begets greater efficiency. Shortly after its founding, the organization that became the Oregon Natural Resources Council was simply four zealots who needed stationery. They dealt with financial challenges by severely lowering their income and only stopping their program work to raise money when the money was gone. Eventually, they figured out they needed someone (and not one of them) to be in charge of raising money. By adding 25% to their staff, they raised 60% more money in the first year.

An organization can evolve into a stable institution without becoming a large bureaucracy. Of course, while attention must be given to minimizing bureaucracy, it must be remembered that some level of "bureaucratic" organization means that money is raised, paychecks are cut, telephones ring, and

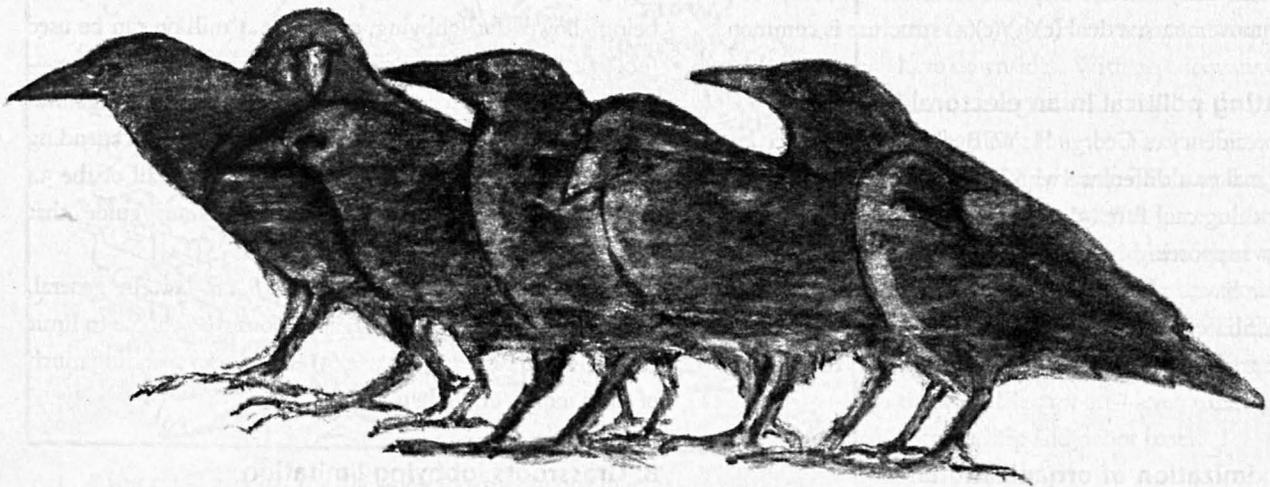
computers work. The question of optimum size should always be on the table for an organization to consider. The correct answer is not always "larger than it is now."

2. It is easier to create than sustain

It's too easy for an organization to be created and obtain non-profit tax-exempt status from the Internal Revenue Service. One of the results is that the conservation movement has too many small nonprofit organizations that are not sustainable.

Ironically, while it is relatively easy to create a nonprofit, tax-exempt organization, it requires going to a special level of hell to fill out the organization's annual tax return (IRS Form 990). In general, there is a high administrative burden that is disproportionate to revenue and expenses for small organizations.

Restructurings, and/or Die-Offs



in the Conservation Movement

3. Founders aren't necessarily managers

The creative energy of a founder is vital to start an organization. However, it is often the case that the person who starts an organization is not the one to run it after it reaches a certain size. Often, the personality traits (independence, fortitude, determination, dreaminess, stubbornness, etc.) that are vital to start something are not the same as those (leadership, teamship, practicality, flexibility, etc.) necessary to manage an organization. A few founders adapt, most do not.

4. Diversification of organizational structure

Organizations that seek to affect public policy by legislative means should first question whether they should exclusively retain their 501(c)(3) status (nonprofit tax-exempt charitable organization) or whether they should also establish a 501(c)(4) (nonprofit social welfare organization). While both kinds of organizations are exempt from federal income tax, only contributions to a (c)(3) are tax-deductible by the giver. Unlike a (c)(3), a (c)(4) has no lobbying limits.

If an organization receives a significant portion of its funds from individual memberships and small contributions, those funds should be plowed into a (c)(4). There is no rational reason to have those funds subject to the absurd lobbying limits of a (c)(3). While foundation money almost always must go to a (c)(3), and most large donors want their contributions to be tax-deductible, most small contributors don't care if their \$50 goes to a (c)(3) or (c)(4).

Of large national conservation organizations, only the Sierra Club fully utilizes this dual structure.⁵ In other social change movements, a dual (c)(3)/(c)(4) structure is common.⁶

5. Getting political in an electoral kind of way

If the presidency of George H. W. Bush hasn't convinced you that it makes a difference who is in the White House, perhaps nothing can. A (c)(3) organization cannot engage in *any* activity supporting or opposing an candidate for office. A (c)(4) can have an affiliated political action committee (PAC). An unaffiliated PAC can be established that happens to have similar goals and staff and/or board, as long as the money is kept separate.

6. Maximization of organizational "lobbying" resources

Many social change organizations have goals that are best—or only—met by changing law to favor their cause. The law currently limits the amount of lobbying (attempting to influence

legislation) that a 501(c)(3) can do. A small (less than \$500,000 in annual expenditures) (c)(3) can spend up to 20% of its expenditures lobbying. Under the law, as overall expenditures increase, the allowable lobbying percentages decrease. Organizations with \$3 million, \$5 million, and \$10 million of expenditures can spend a maximum of \$300,000, \$400,000, and \$650,000 respectively (10%, 8%, and 6.5% of their respective expenditures).

If an organizational goal is to maximize lobbying expenditures within their (c)(3) limitations, the largest an organization should be is \$17 million of annual expenditures. The law has an absolute limit of \$1 million being spent annually by (c)(3) organizations on lobbying. At \$17 million in expenditures, this \$1 million equates to 5.8% of organizational resources. If you are the National Wildlife Federation with expenditures of \$110,750,496 million in 2002, the limit is still \$1 million (0.9% of actual expenditures). If that nearly \$111 million were spread among seven organizations, the total amount of money that could be spent on lobbying would be nearly \$7 million.

Congress imposes no limits on the amount of money a for-profit corporation may spend lobbying.

7. Maximization of movement "lobbying" resources

If a goal of the conservation movement is to maximize the money that can go to lobbying, then that same \$17 million should be spread among 34 organizations with expenditures of \$500,000 each. In this case, rather than a total of \$1 million being allowed for lobbying, a total \$3.4 million can be used (20% of \$500,000 times 34). The question naturally arises—is there more bang for the buck (efficiency) with 34 organizations spending \$100,000 each, or one organization spending \$1 million? The answer depends on if some or all of the 34 organizations pool their funds. If history is any guide, that won't happen.

Such is the perversity of the IRS tax law. In general, Congress limits those large organizations who choose to limit themselves to be solely a 501(c)(3) entity from spending much of their money on lobbying.

8. Grassroots lobbying limitation

An additional IRS limitation is that no more than 25% of whatever amount is spent on "lobbying" can be spent for "grassroots" (encouraging the public—but *not* an organization's members—to contact elected officials) lobbying. So, in

the case of the National Wildlife Federation, assuming it reaches its maximum allowable lobbying expenditure at \$1 million, not more than \$250,000 can be spent urging the public to take action on a legislative issue. In fact, in 2002, NWF did not reach the allowable lobbying threshold, spending \$371,314, of which only \$55,518 was "grassroots" lobbying (urging non-members to support or oppose legislation).⁷

Congress doesn't really want nonprofit, tax-exempt organizations informing the public, especially about legislation. Apparently, neither do 501(c)(3) conservation organiza-

tions, as few achieve their annual lobbying limit. NWF is not unique in this regard. No wonder the conservation movement is often accused of talking mostly to itself.

9. Organizational sustainability

While sustainability in running an economy or a planet is paramount, it may not be the case in running an organization, whether for-profit or nonprofit. If the goal of the organization is to provide long-term social service, then sustainability is necessary. However, a nonprofit organization with a specific social

change goal may choose to go out of business when the goal is met. The Wolf Fund, for instance, after working for a decade to have wolves reintroduced to Yellowstone, shut down when that milestone was reached. Such examples are rare though. More typical is the March of Dimes, which, after polio was eradicated, converted itself to oppose birth defects, a plethora of maladies that will probably never be completely eradicated.

10. Endowments may not be a good thing

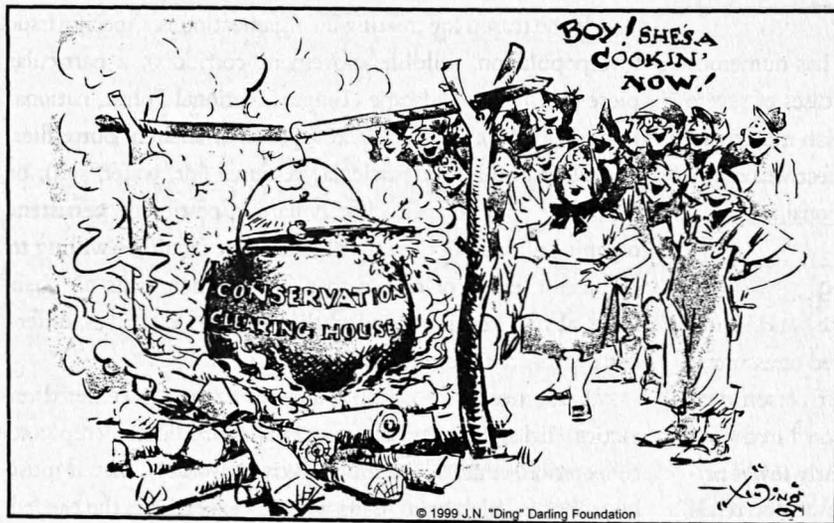
Every nonprofit's executive director dreams of an endowment or a larger endowment. Harvard University doesn't start any program unless it is fully endowed. The upsides of endowments are obvious: dedicated and (hopefully) stable money to carry out the work. However, endowments also have downsides. With an adequate endowment, an organization can live forever, even if it has long since become ineffective in its mission. The Izaak Walton League of America was a powerful force in American conservation in the middle of the twentieth century. It is not today. However, over time, enough of its membership provided for the organization in their wills, so that it continues on life support—even with declining membership and donor bases.

11. Reducing overlap

In the Oregon portion of the Klamath-Siskiyou bioregion where I live, there are four smallish (c)(3) organizations that work



It is hard to start a fire with one stick of wood



But...if you could ever get the fire wood together in one pile...

In the 1930s, cartoonist Ding Darling promoted the advantages of a collective effort for conservation; his work sparked the formation of the National Wildlife Federation.

to conserve and restore the area's forests and watersheds. Overlap is most obvious on the administrative and fundraising sides. All these groups ask the same foundations for money, seek money from overlapping pools of donors, have overlapping memberships, file IRS 990 tax returns, keep records, and do payroll.

Working essentially on the same landscape, these organizations all face great challenges. I have been to public meetings where all four groups sent at least one staff person. I did not perceive the quadruple coverage having four times the effect on government policy.

Overlap is less obvious on the program side. In conservation, the work is endless; there is always more that could be done with more time, people, and money. These four organizations, by practice and turf, usually allocate the work by one organization taking the lead and the others following. However, all these organizations put out newsletters (all could be better), serve as plaintiffs (often in the same lawsuits), educate (often the same targets), lobby (the same officials), challenge timber sales and other developments (often the same ones), and do community outreach (to the same media, civic leaders, etc.).

To add to the competitive mix, there are also several volunteer-run groups and a local office of the largest conservation organization in the world. In the California portion of the bioregion, several additional California organizations also overlap with these Oregon groups.

12. Reducing underlap

Even though the conservation movement often has numerous organizations overlapping on issues, it still has cases of severe underlap. It stands to reason that if the conservation movement becomes more efficient, and becomes more effective on the issues that it is working on, it can take on additional issues.

13. Forward, not backward, downsizing

As an organization grows, by raising more money and hiring people, it does more. Growth follows either stated or assumed priorities—but usually the latter. The first staff person does the highest priority thing, the next staff person hired does something that may be as important, but a slightly lower priority, and so on. In times of retrenching, an organization tends to contract in exactly the opposite direction it expanded. There are multiple reasons for this, including adherence to seniority (last hired, first fired), relative power of senior staff, etc. However, organizations facing contraction should think hard about what is important today (or will be tomorrow), and

not be unduly constrained by what was important earlier. It may well be that an organization's newer activities are more important than what it has traditionally done.

14. Simultaneous need for, lust for, and fear of growth

An organization may need to grow to achieve sustainability. Some organization leaders (board and staff) may seek growth because it means bigger budgets and bigger staffs to get the work done. Other leaders, especially if they are founders, may fear growth because it might mean a loss of relative power and/or a changing institutional culture.

15. For every rule there are always exceptions

In general, the conservation movement has too many very small and very large organizations. However, in some cases, it is wise to start a new institution. If the issue is new and different enough from other issues, if the underlap is so great that it is clear that it's not just a matter of making existing institutions more efficient to be able to fill the gaps, then a new organization may be the best option.

16. Organizational imperative: landscape/resource or strategy/tactics

How an organization views itself can be unduly limiting. In general, organizations define themselves either by their tactics or their issue.

If the reason for creating an organization is a specific issue (overpopulation, wildlife movement corridors); a particular piece or kind of landscape (Tongass National Forest, national forests, forests); one or more species (monarch butterflies, marine mammals); a particular resource (air, water, soil); or particular pollutants (nuclear radiation, pesticides, persistent organic pollutants), then the organization should be willing to embrace a range of tactics that further their aims for their issue, always keeping in mind that as an issue evolves, different tactics are necessary for success.

If the reason for creating an organization is centered on tactics (litigation, legislation, civil disobedience, corporate cooperation, education, administrative advocacy), then it must be willing to pick up an issue when its expertise is the needed tactic, and drop an issue when other tactics are necessary.⁸

17. What for art thou coalition?

If composed of organizations with diverse interests allied to achieve a specific political goal, coalitions are good. Coalitions

consisting primarily of organizations with the same general interests working on the same issues is indicative of organizational overlap.

If numerous groups are working on an issue, coordination is necessary for greatest effectiveness. However, if too many organizations are working on the issue, a good deal of time and resources must be spent on external coordination, often trying to resolve differences in goals, strategies, tactics, and techniques—the very differences that define and justify multiple organizations.

Coordination is generally a good thing, but not if it is simply to mitigate fundamental movement inefficiencies due to an excessive number of small or large unsustainable organizations.

18. Leaders versus managers

Is your organization dominated by leaders or managers? While not mutually exclusive, the two types tend toward opposite characteristics, as shown below. Any functioning organization needs both, and more of one than the other at different times in its evolution.

FACTOR	LEADERS	MANAGERS
Risk	Accept	Avoid
Vision	Long-Term	Short-Term
Worldviews	More Than One	One
Definition of Success	A Great Thing Occurred	A Bad Thing Avoided
Strategic Plans	Create	Implement
Handling Swamps ⁹	Drain	Fight the Alligators

Mergers and acquisitions

Mergers and acquisitions are common in the for-profit world, but rare in the nonprofit world. In a merger, two firms determine that they may be more profitable by merging—sharing costs, resources, customers, etc., and thus achieving efficiencies of scale. In a merger, the culture of two companies are combined. Acquisitions, on the other hand, are where one firm merely absorbs the assets (and usually liabilities) of the other. The culture of the smaller organization is less likely to survive in an acquisition.

Historically, in the nonprofit world, mergers and acquisitions are rare. There are probably many reasons, but one is that

by the time organizations get serious about considering a merger or acquisition, usually the liabilities of one of the organizations far exceeds its assets.

In considering and implementing an acquisition or a merger of two or more groups, there are no hard and fast rules. Each potential merger or acquisition is very fact-specific. Due diligence requires all factors to be considered, and that things be talked out (but not talked to death). Below are some suggestions to consider.

CONFIRM WANT. All affected entities must “want” a merger or acquisition. “Want” in this case may be defined as “realizing that there is no other choice.” While all affected entities (the organizations considering the option) have to want a merger or acquisition, all affected parties (staff, board, donors, volunteers, etc.) do not all have to agree (see “Factor Who” below).

DEFINE WHY. Why merge? Make a list. Be frank. Organization A is failing or has failed. Organization B is displacing or has displaced Organization A. The work of A and B could be better done together. Is A buying (or buying back lost) market share? Is A buying out the competition?

ACCESS WHAT. What is to possibly be merged? Make a list of assets and liabilities for all entities. The realm of assets generally worth acquiring from another organization is usually:

- > good name;
- > supporter/activist lists;
- > staff;
- > old furniture and obsolete computers.

Liabilities might include:

- > institutional baggage;
- > dysfunctional staff;
- > incompetent board;
- > burned-out founder;
- > debt;
- > old furniture and obsolete computers.

DETERMINE HOW. Will organization A absorb B? In total, or just staff and mailing list? Will A become an identifiable project of B? Will A and B form a new C?

FACTOR WHO. The *who* is often the most difficult factor. Most nonprofit organizations in need of merging or acquisition are supported and driven by powerful individual personalities. Usually employees, they are not interchangeable cogs in a machine of a huge organization. These individuals tend to be either essentially the entire organization or one of the key factors that makes the organization work.

These individuals, because they work very hard and/or are very good at what they do, hold great power in an organization—sometimes more power than is healthy. A key individual can be both an organization's greatest asset and greatest liability. It is when the latter outweighs the former, but the organization is paralyzed by a fear of change and the unknown, that organizations decline.

Other staff, though not individually key, can be collectively so. Most people who work in nonprofits are not doing it for the money. They believe in a cause so much that they are

willing to work harder and for less money because of other rewards they receive, including a feeling of doing good.

Mergers and acquisitions usually mean downsizing. That's where the efficiencies occur. Generally, not all program and development staff are needed or affordable. Definitely, not all administrative staff are needed. Certainly, not all board members are needed.

In any merger or acquisition, some staff and/or board have to either downsize themselves or be taken out of the game. This is probably the number one reason that more mergers and

Growth of Environmental Nonprofit Organizations

According to Internal Revenue Service data, there were 1,802 "environmental" organizations (very broadly defined) in 1990. By 1998, the number had increased 123% to 4,018. In contrast, the growth rate for all nonprofit organizations was 59%.

Total assets held by environmental nonprofits increased from \$3.3 billion in 1990 to \$7.9 billion in 1998 (\$6.3 billion in 1990 dollars). However, mean assets declined 13% and median assets declined 29%, adjusted for inflation. In contrast, these numbers were 9% up and 19% down respectively for all nonprofits.

Annual contributions to environmental nonprofits increased 82% from \$0.8 billion in 1990 to \$1.5 billion (inflation-adjusted) in 1998. Contributions for all nonprofits increased only 52%. Both mean and median contributions to environmental nonprofits declined by 21%. In contrast, the decline was 4% and 24% respectively for all nonprofits.

Dues, as a part of contributions, declined 17% from \$102.1 million in 1990 to \$85.9 million (inflation-adjusted) for environmental nonprofits. Among all nonprofits, dues collection increased 21%.

During the 1990s, as in the rest of society, the rich nonprofits got richer and the poor didn't (as evidenced by the general decline in mean and median numbers, while overall numbers generally increased). In 1998, the top 100 environmental organizations held 71% of that \$7.9 billion in assets. The remaining 97.5% of the environmental organizations held the remaining 29% of the assets.

By *assets*, the five largest environmental nonprofits in 1998 were:

- ▶ The Nature Conservancy (\$1.6 billion in assets)
- ▶ Puerto Rico Conservation Trust (\$605.3 million)
- ▶ Trust for Public Land (\$198.8 million)
- ▶ New York Botanical Garden (\$173.4 million)
- ▶ Massachusetts Audubon Society (\$142.1 million)

The only environmental nonprofit organization to rank in the top 100 nonprofits was the Nature Conservancy, coming in at 49th overall.

By *annual contributions*, the five largest environmental nonprofits in 1998 were:

- ▶ The Nature Conservancy (\$235 million in contributions)
- ▶ Trust for Public Land (\$80.8 million)
- ▶ New York Botanical Garden (\$36.2 million)
- ▶ Tides Center (\$29.8 million)
- ▶ Save the Redwoods League (\$28.5 million)

Again, only TNC made the top 100 among all nonprofits, coming in at 47th in contributions.

By *dues collection*, the five largest environmental nonprofits in 1998 were:

- ▶ National Audubon Society (\$10 million in dues)
- ▶ National Arbor Day Foundation (\$9.2 million)
- ▶ Urban Land Institute (\$4.5 million)
- ▶ Appalachian Mountain Club (\$3.1 million)
- ▶ Water Environment Federation (\$2.8 million)

—Andy Kerr

acquisitions don't occur in the nonprofit world. In the for-profit world, workers are viewed as a cost of doing business; in the nonprofit world, workers are the reason for being in business—to get the work done.

Nonprofit employees are mostly loved and respected, if not revered and/or feared. It is the culture of a nonprofit to be more fair than profitable (powerful). A for-profit values fairness less than profit and only to the degree that being unfair limits profit.

DECIDE WHERE. Location is often a consideration. Will A, now a project of B, be housed in the same location, or will A have to move?

CHOOSE WHEN. Timing is usually easy to determine, after the other questions have been answered. It may be after one or more events have occurred, such as retirement of a key staff person, the money has run out, etc.

THE CONSERVATION MOVEMENT, especially its public lands component, is comprised of too many small groups organized on the Somalian warlord model—having enough resources to be players, but not enough to win. Only by allying with other warlords do they have a chance of achieving their goals. A pack of cooperating warlords does not an army make.

The result is that too many organizations working on the same issues are trying to raise money, comply with administrative requirements, and do the noble work of saving the world. Mergers and/or acquisitions can achieve economies of scale and increased efficiencies (reduction of

overlap and underlap). Money can be more efficiently raised, health insurance costs can be lowered, resources more effectively marshaled, etc. In times of declining foundation monies, such actions can mean that the same work can be done. In times of more monies, such actions means that even more work can be done.¹⁰

Merging is painful, perhaps especially so for organizations populated by Darwinian adherents who place great stock in the concept of the survival of the fittest (or at least of the least wounded). When the Darwinian type is also a founder who is fundamentally a contrarian—and additionally doesn't want his or her fiefdom disturbed—the prospects for merger are slim to none.

In these tight financial times, some conservation nonprofits have already died. Undoubtedly, more will do so. Merging can be a way for some organizations to die and be reborn so the important work can continue, even if under a different name or structure.

The only thing more difficult than merging may be—not merging. ☹

Since starting his conservation career during the Ford Administration, Andy Kerr (www.andykerr.net) has run a largish small nonprofit organization, started others, consulted for some very large and very small ones, served on the boards of others, and directed projects under the umbrella of another. He is now Czar of The Larch Company, a for-profit, non-membership conservation organization that represents human generations yet unborn and species that cannot talk, where all profits are dedicated to conservation.

NOTES

1. The literature on ecological destruction and despair is, unfortunately, voluminous. One overview of the trends of environmental conservation is Chris Bright et al. (Worldwatch Institute), 2003, *State of the World* (New York: W.W. Norton).
2. "Efficiency" in the for-profit world equates to profit; in the nonprofit world to power ("effectiveness" for those conservationists uncomfortable with power).
3. My comparison of the for-profit and nonprofit worlds here is limited to efficiency. Such comparisons should not be construed as endorsement of the for-profit sector's sustainability, equity, or justice.
4. Denise Joines, 2003, A Note from the Wilburforce Foundation (email to grantees), September 16.
5. In the early 1960s the IRS revoked the 501(c)(3) charitable status of the Sierra Club, which converted to a 501(c)(4) social welfare organization. While David Brower lost his job as executive director for buying full-page ads in the *New York Times* to oppose Congressional funding of dams in the Grand Canyon (it worked!), the Sierra Club soon formed a new companion (c)(3), the Sierra Club Foundation. At that time any "lobbying" by a (c)(3) was illegal. The law now allows (c)(3)s to lobby, but under severe limits. The government revocation of the Sierra Club's charitable (c)(3) status is probably the single most important factor in making it the most political-powerful conservation organization in the United States.
6. For more information, see Andy Kerr and Sally Cross, 1996, Let's Get Political, *Wild Earth* 6(1) Spring: 72–74. The Alliance for Justice (www.allianceforjustice.org) has numerous publications on how to maximize legislative lobbying within the bounds of the (c)(3) law.
7. Eileen Morgan Johnson, 2003 (General Counsel, National Wildlife Federation), pers. comm, August 12.
8. Andy Kerr, 1995, It's Not Either/Or; It's All or Nothing, *Wild Earth* 5(1) Spring: 42–44.
9. The author would happily entertain an ecologically correct alternative to this metaphor rooted in history and therefore widely understood.
10. Much of what I have said here about nonprofit social change organizations is equally applicable to the charitable foundations that fund them. Among the additional challenges and opportunities facing foundations is that money both makes and allows people to be weird. Stir in issues found in most families, but now amplified by wealth, and it can be an awful situation. A few years ago, a major environmental grantmaker, the W. Alton Jones Foundation, self-destructed. Family factions grew over time, and a divorce catalyzed the break-up. Often, the passing of a patriarch or matriarch means a change in focus for the foundation. However, a general critique of foundations by this author would be biting the mammary that suckles him.

The Augmented Fourth

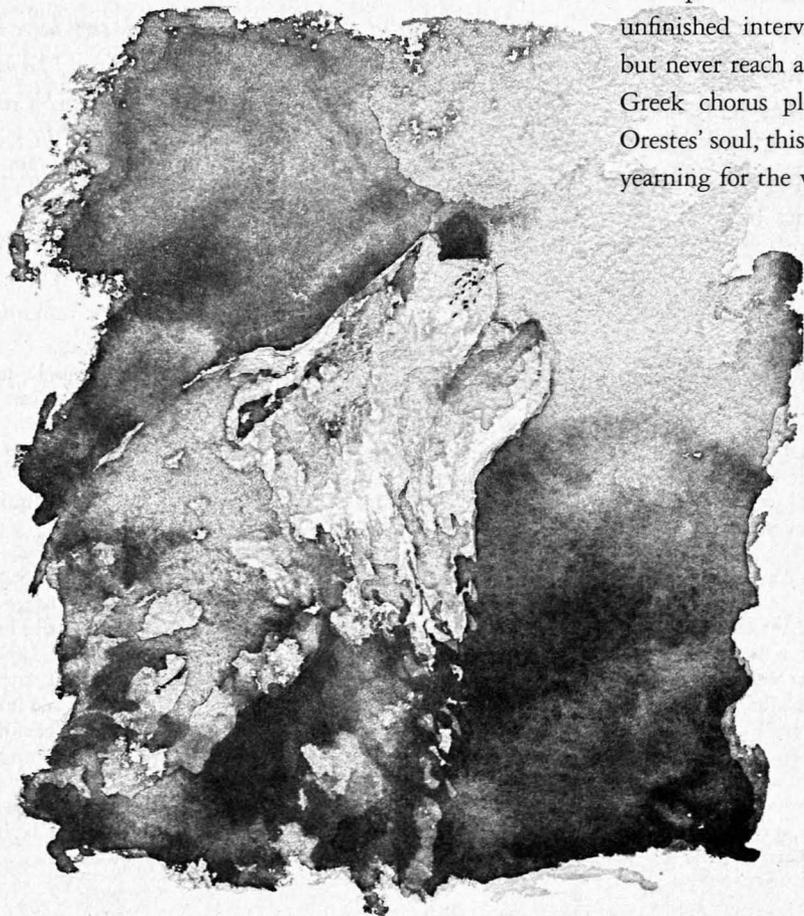
RAIN DRUMMED ON THE HATCHES and splashed off the decks, but still we could make out the sound of a wolf howling from the cliffs over the cove where we dropped anchor. There was only one wolf, although we listened carefully to be sure. The howl started low, leapt up, slid along the water, and sank away. Nothing answered the wolf's call. Frank and I listened, as the wolf must have listened, the question probing the clouds and damping out in the forest, in the draperies of lichens and drooping hemlock boughs.

But the only response was rain pounding, then rivering down my sleeves and soaking my gloves. I tucked my hands into my sleeves, ducked my head, and hunched my shoulders to direct the water down my raincoat instead, to the deck of the boat and off the stern to the sea. The wolf howled again. I knelt to raise the anchor so we could drift closer to the cliff.

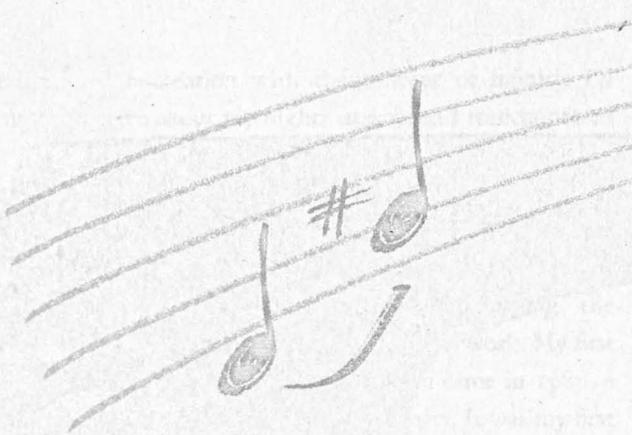
I knew the song the wolf sang. The first two tones made an augmented fourth, a dissonant interval, like the first two notes of "Maria" in *West Side Story*. It's an interval of yearning, of hope—the sound of human longing.

WHEN MY COLLEAGUE, a concert pianist, explained the augmented fourth, she brought both hands together in front of her body, palms skyward, fingers spread, and lifted the air. For her, words are not enough to describe this interval. This is a sound that floods the soul, she said, and she strained forward from the waist. The augmented fourth is a heartbreaking interval, dissonance that comes so close to consonance, pulls itself so close, but never reaches the perfect fifth that is almost within its grasp.

She leaned over the keyboard and played two notes: C, F-sharp. Then she flooded the room with music made of the unfinished intervals, harmonies that lead toward resolution but never reach a place of peace. Tony, reaching for Maria. A Greek chorus pleading with the gods to have mercy on Orestes' soul, this man who has murdered his mother. Tristan, yearning for the white sail that will bring his beloved Isolde



by KATHLEEN
DEAN
MOORE



on a following wind. And Robert Schumann, poor lovesick Schumann, yearning for Clara. *Yearning*: this ancient word, diving straight through history from the beginnings of language itself, a word as old as *home* or *earth*. No one in Christian medieval Europe sang the augmented fourth, my colleague said. It was the *diabolus in musica*, the devil's chord—so powerful it could grab a parishioner, drag him to his knees and pull him, scraping on the paving stones, straight to hell. And there I was in that tide-dragged island wilderness, also on my knees, trying to understand the pull of these same two notes.

I sat on my heels and strained to hear the wolf again, but the rain defeated me. There must have been three rainstorms stacked above us: A grayness in the air that wetted every surface, even under the canopy, soaking our hair but barely dimpling the water. An overloaded cloud dropping rain like sand from a shovel. And one unbearably heavy cloud that held the rain until it broke loose in huge drops that raised welts on the sea.

Listening intently, we pulled in our rockfish jigs and let the boat drift among small islands, until finally the dusk turned into dark. Then Frank started up the engine and slowly steered us back to Pine Island where we had made camp.

THERE IS NO darker night than a night of rain on an island. Frank played his flashlight beam over the inlet to make sure the boat was still resting at anchor. I sat on an overturned bucket under a tarp stretched between hemlocks. Under my boots, the ground was springy, a thick layer of moss on a century of hemlock needles. Rain poured onto the tarp, pooling in a corner that sagged until the edge of the tarp let loose, dashing the water to the ground. The tarp rebounded, spattering drops that sizzled against the lantern and wet my cheeks. I pulled my bucket closer to the center of the tarp. Even under its shelter, it was hard to stay out of the rain. Water bounced off the stems of highbush blueberries and salal, dripped from every stray end of rope, runnelled the length of

hemlock roots. I sat hunched, forearms resting on knees, and drank whiskey, closely rationed.

Somewhere people were laughing in brightly lit places that smelled of books and coffee. Families were sitting down to dinner, somewhere, and fishermen were making fast their boats in harbors, calling out to friends as they hoisted their gear bags to their shoulders and turned toward home. But there were no other people here, and not another point of light for fifty miles in all directions. Tonight, just our little family, and in my flashlight beam, a narrow strip of island rapidly sinking into a flooding tide.

A loud mournful wail. I was on my feet, reaching for binoculars, but of course there was nothing to see in that darkness. It sounded again—a musical arch of three tones. I ducked past the tarp and groped to the edge of the island, and there was the call again. I thought it was the wail of a common loon. Waking at night, the loon might have found itself suddenly alone, or in the storm lost sight of its mate. It called again with frantic urgency; first, two sustained tones, the second higher and longer—two wavering tones on that rainy night after so many days of rain. Then it added another interval, even higher and longer. That was the wild, heartbreaking sound of the augmented fourth.

I YANKED OFF my hood and turned my face toward the call. The loon flew toward me, then veered suddenly, and the cry slowly faded away. I strained forward, trying so hard to hear an answering call. What I heard was water on water and the slosh of tide on rock.

I should have felt a loneliness close to despair, there, in the night, in the rain, a thousand miles from home. What I felt instead was uncommon joy. What was there to long for, where all I wanted was what I suddenly had?—to be fully part of the night, joined by a song, by a simple shared song, to the loon, to the wolf, to the keening of all humankind, all of us together in this one infinite night, all of us floating in the same darkness, each of us, as we howl our loneliness, finding that we are not alone after all. ☾

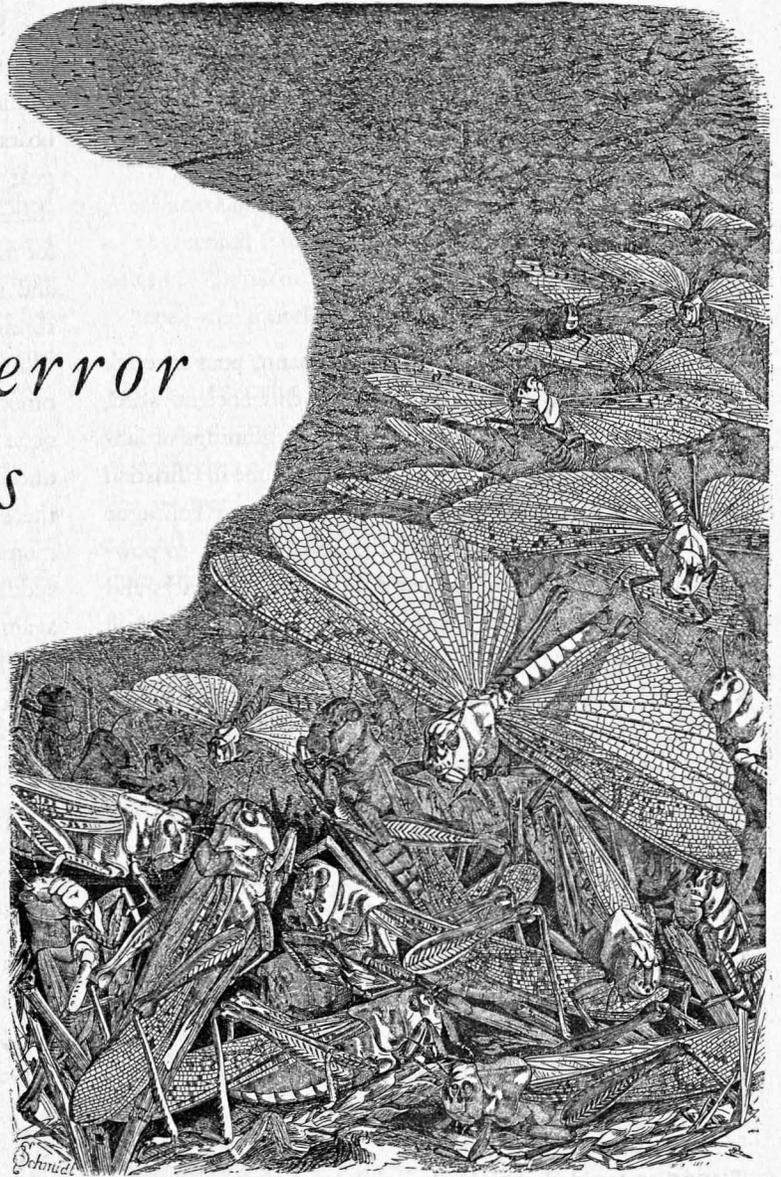
Kathleen Dean Moore, a regular contributor to *Wild Earth*, writes and lives in Corvallis, Oregon, where she is a professor at Oregon State University. She seeks the hidden connections between apparently separated things—the paradox of a lone island connected to the sea of being—in her forthcoming book, *The Pine Island Paradox* (Milkweed Editions, June 2004; www.milkweed.org), in which this essay appears.

The Joyful Terror of Oneness

A VISCERAL PANIC, rooted in primal fear, swept through me. There was nowhere to run as my dreamself was engulfed by an expanding mass. Utterly indifferent to me, the amorphous, swelling presence became a recurring visitor, and I dreaded falling asleep in the nights following one of its suffocating visits. Fortunately, most childhood nightmares fade with time. Mine transformed.

Unbidden, it was terrifying. But I discovered that I could invoke its presence. As an adolescent and into my college years, I could lie perfectly still and turn my consciousness inward. Deep into the still void, my mind escaped into contemplation of being: a consciousness amidst vastness, a mote in a universe of light years, an instant in a story of eons. An ecstatic horror would creep through me, balanced on the edge of being everything—and nothing.

This capacity faded with adulthood, although vestiges remain and manifest in strange ways: a vague discomfort in crowds, an intense reaction to Hitchcock's *The Birds*, and



by JEFFREY A. LOCKWOOD

an irrational fascination with the concept of infinity. I'd almost forgotten about my nightmares when I reencountered the joyful terror on the high plains of Wyoming.

AT THE UNIVERSITY of Wyoming, the study of grasshoppers is a proud tradition that originated with the plagues that decimated struggling farms and ranches during the Depression. It has been my job to carry on this work. My first real encounter with a large-scale infestation came in 1988, a couple of years after I arrived at the university. It was my first inkling that grasshopper outbreaks are not just anonymous mobs of individuals, any more than you and I are just seething masses of cells.

My research associate at that time was Larry DeBrey, a Wyoming native. He'd been a fire crew chief for the Forest Service, worked in highway construction, and owned a lumber company. He despised the pomp, posturing, and pretense of science; field ecology was his love. We were working on our first control program, monitoring a grasshopper outbreak that covered an area equivalent to 10,000 acres (nearly 16 square miles) south of Kaycee, Wyoming.

A wave of grasshoppers washed down the hillside, created by our hike into the grasslands from the battered Chevy pickup parked on the dusty two-track. As we stopped and set up our gear at the study site, the rolling swell of insect life settled, and the pandemonium of the prairie gave way to a scorching stillness. Larry and I were on our hands and knees digging for grasshopper eggs, when he looked up and started laughing. Larry was prone to sudden insights regarding the absurdity of the human condition—so I sat back on my haunches and patiently waited for his explanation.

"Why here?" he asked.

"Why here what?" I replied.

"Why am I digging this damn hole precisely between these two clumps of grass in the middle of a...this?" he answered, sweeping his arm across the horizon.

On this expanse of sun-baked rangeland, where the tallest grass brushed the tops of our boots and the curvature of the earth was the only limit to our view, I glimpsed it. An immense, hyaline presence stretched over the grassland. For a few seconds, I became aware that the object of our work, the grasshopper population, was a living whole. In those fleeting moments I had perceived the transcendent being—we were extracting cells from a creature larger than any textbook had ever admitted. Then the waking dream evaporated. I'd not had time to fully comprehend my experience,

let alone articulate such a strange understanding of our investigation. Rather than muttering incoherently about invisible beings and calling into question my own sanity, I answered Larry's question with a nervous laugh and a shake of my head.

A JUNE MORNING in 1993 found me in the grasshopper war room in the back of Crazy Tony's—a restaurant, bar, pool room, and general gathering spot in Guernsey, Wyoming. The back room was like a cave. Between the absence of windows, the dark paneling, and a half-dozen grimy light fixtures embedded in the ceiling I could barely make out the pitchers of iced-tea sweating on the tables. The U.S. Department of Agriculture's officer-in-charge, along with a half dozen of his scouts and my crew of three, gathered at the edge of a halo of light. Two halogen work lamps were aimed at the maps spread on the wobbly tables. Our task was to find incipient grasshopper infestations for an experimental program to determine if controlling small, high-density hotspots could prevent large-scale outbreaks from developing.

"We got into one yesterday," offered Scott, one of my graduate students. "It's on Rutherford's place. The density isn't great, maybe 12 to 15 per yard."

"How big?" I asked.

"More than a section but probably not two. It's bounded to the east by the hills and to the south by wheat fallows."

Studying the map, I suggested, "But it looks like it could expand to the northwest."

"Sure could," Scott offered. The scouts nodded in agreement.

So, we had an incipient infestation of at least a dozen grasshoppers per square yard over an expanse of about 1,000 acres (about as many football fields in area), putting another 10,000 acres at risk—a viable candidate for our program.

A good graduate student becomes your teacher on occasion, and Scott Schell was very good. But Wyomingites are not terribly forthcoming with their feelings, so one must listen carefully to hear their truths. On that morning, everyone except Scott employed plural terms to describe the amassed grasshoppers, "They thin out to the south," or "There are some bandwinged adults on the tops but mostly spurthroated nymphs in the draws" (referring to the common names for the grasshopper subfamilies). In describing an infestation, Scott repeatedly used the singular case, "This one has 20 per yard, but it can't be more than a couple hundred acres." His words suggested that he had encountered a massive individual, rather than a mass of individuals.

I DESPERATELY WANTED to somehow prove the existence of these immense living beings to others, to confirm my intuition with evidence. Trapped in an inverted fable, I knew there was a living, gossamer fabric, draped like a set of new clothes on the Grassland Emperor, but I couldn't see it. From the roadside or air, grasshopper infestations are invisible. Even standing in its midst, the population cannot be perceived. Only when walking through an infestation do you experience its presence, as the grasshoppers scatter in hopping, flying chaos. But just beyond your disturbance, the scene is calm. Like air, a population can be sensed only through its movement.

Ecologists model grasshopper outbreaks using growth curves, and pest managers map infestations using geometric shapes. But you can't be engulfed by an abstraction. The infestations often encompass thousands of acres—impossibly large to actually witness or confirm. We really had no idea whether populations were simple or branching shapes, whether their edges were sharp or diffuse, whether their interiors were homogeneous or clumped, whether they were mobile or sessile. We didn't know whether "outbreak" was a noun or a verb.

The first convincing image that these specters were real beings was delivered from outer space, which was somehow appropriate. In 1995 Scott had become my research associate, and in an effort to monitor ecological correlates of outbreaks we acquired satellite imagery of the rangelands where we had been tracking grasshopper infestations. On the ground, one infestation had struck us as being particularly tangible. Covering an area of 50 football fields, this seething mass of life was almost comprehensible. The satellite's true-color images revealed the distinct pattern of the wheatgrass pasture but gave no indication of any other living entity. In the field, we had recorded 40 grasshoppers per square yard—a positive biopsy but no detectable tumor.

Then, rather than trying to see an invisible being with visible light, we used a portion of spectrum inaccessible to our senses—infrared and thermal reflectance. What emerged from the satellite image was the unmistakable footprint of a colossal organism. I say footprint because we were actually viewing the defoliation, along with the drying and warming of the soil, caused by its feeding—not the being itself. We have since documented several such markings left behind by these immense life forms. Now we know that these thin ecological tissues, stretched taught over the prairie, live up to five years. They can double their biomass in the span of a Wyoming summer and when fully mature typically weigh 300 tons.

A YEAR LATER, I squatted in the shade of the pickup and watched Scott walking methodically towards me, stopping every ten steps to jot in the ever-present spiral notepad that he keeps tucked in his shirt pocket. I marveled at how he could wear jeans and a long-sleeved shirt in the summer heat.

"I can't see where we treated." Scott scowled, adding, "The numbers are down everywhere."

"Dean was supposed to skip 200 feet between swaths," I replied.

"I flagged it with Sandy. Dean was dead-on with every pass."

I started to offer an explanation, but Scott knew what I was about to say. He refuted my hypothesis before I had a chance to speak. "It was calm. No drift into the untreated swaths."

"It's working as well as the traditional method. I figured it would be good, but not this good," I offered, trying to convince myself of our success.

We were developing a new control method in which insecticide is applied in 100-foot swaths alternating with untreated swaths of varying widths, rather than as a blanket coverage. The economic and ecological benefits were potentially immense. But here we were just two days after the treatment and we couldn't tell where the insecticide had been applied. There should have been zones with low densities corresponding to the treated swaths, alternating with strips of higher densities—or so we thought.

It's still a bit mysterious, but now, after dozens of trials yielding similar results, I believe that this overall thinning of the population is actually the healing of a torn ecological membrane. If the treated strips are widely spaced, the grasshoppers move into the wound, stretching the tissue but leaving no scar. But, as the swaths are moved closer together, the tissue is too extensively damaged, and it cannot heal. The outbreak collapses, as if your skin suffered a severe abrasion, leaving too few cells in the raw wound to repair the injury.

AT TEN GRASSHOPPERS per square yard, one hops from underfoot with every step, and you begin to sense a continuity. If pressed into a sheet, the grasshoppers would form a continuous film over the prairie the thickness of plastic wrap. At 25 grasshoppers per square yard, there is riotous explosion with your every step. At 40, the chaos becomes self-perpetuating, and a rolling wave of life anticipates your next few paces. At a hundred grasshoppers per square yard, the world is transformed.

Two years ago in Whalen Canyon, I stared warily across the barbed-wire fence line as the dust from my truck hung over the road for a quarter mile. The view across Mr. Martin's

pasture towards the Platte River was eerie. The sagebrush, normally grey-green with leathery leaves, were skeletons. The yucca were shredded, as if attacked by a crazed rancher armed with a lawn trimmer. Even the Canadian thistles looked like refugees from a horrific hailstorm, except it hadn't rained in nearly a month. The grass was baked to a golden crisp and cropped to a height of a couple of inches, as if that crazed rancher had also owned a riding mower.

With a few steps into the field, the grasshoppers seethed from the sparse vegetation in biblical proportions. They were clinging to the skeletons of the sagebrush and blanketing the shady sides of the fenceposts to avoid the searing heat of the soil. In the draws, where the only hint of green vegetation remained, the grasshoppers formed a virtual carpet. There were so many that they were incapable of directional movement, or perhaps the riot incited by my arrival obscured their view. In any case, rather than waves of movement parting in my path, there was sheer pandemonium. Grasshoppers ricocheted off my face and chest, clung to my legs, and boiled in every direction.

It had been 30 years since I had felt my heart pound with the rising panic of being engulfed in the bowels of an enormous presence. As I continued to penetrate this living insectan tissue, the childhood nightmare transformed to the joyful terror of my youth. I had chosen to enter this vast being. Infused with the tangible abstraction of unimaginable scale, I wanted to stay in the midst of all and to run from the edge of nothingness.

I can't remember returning from this living being on the Wyoming prairie. But in the end, of course, I came back. Mostly. You see, to fully enter the wholeness of living nature—to lose oneself in the life of another place or being, if even for a moment—is to remain forever. This may be the key to conservation that we've not yet come to recognize.

I love the grasshoppers and grasslands because I have become part of them and they are part of me. In this way biological conservation becomes an act of "self" preservation, the preservation of a self that reaches beyond my organismal boundaries. To lose the distinction between self and other is oneness, the loving foundation upon which Leopold and Muir so sagaciously exhorted us to build conservation. But to heed their call we must open ourselves to that experience. ☾

Jeffrey Lockwood is professor of natural sciences and humanities in the Departments of Renewable Resources and Philosophy at the University of Wyoming. As an insect ecologist and environmental ethicist, he is particularly interested in the relationships among the people, plants, and creatures of the western steppe.

Scrub Sketches, Florida

A forest of shoulder-high oaks
Roots deep into dunes that once skirted a prehistoric sea

Sky stretches to horizon, broken by scattered pines

The rumble of bulldozers—
85% of scrub gone
the rest fragments

In the morning, webs glisten from the tips of rosemary ridges
Towhee raises his question through dry crinkling litter
Winter droughts,
summer hurricanes
Plants scorched by the life-giving sun,
Consumed by fire that spreads life
You can taste the gritty ash on the hot breeze

Legless lizards swim a sea of sand
Mole crickets graze
subsurface fields of algae

Armadillos blindly crash, snuffle

Screeching, gaudy scrub jay caches acorns
against the coming dry season
From branch to branch,
wheezing, drab grey gnatcatcher hunts on the wing

A cactus pierces your shin and you know
You are alive when you tear out the spines

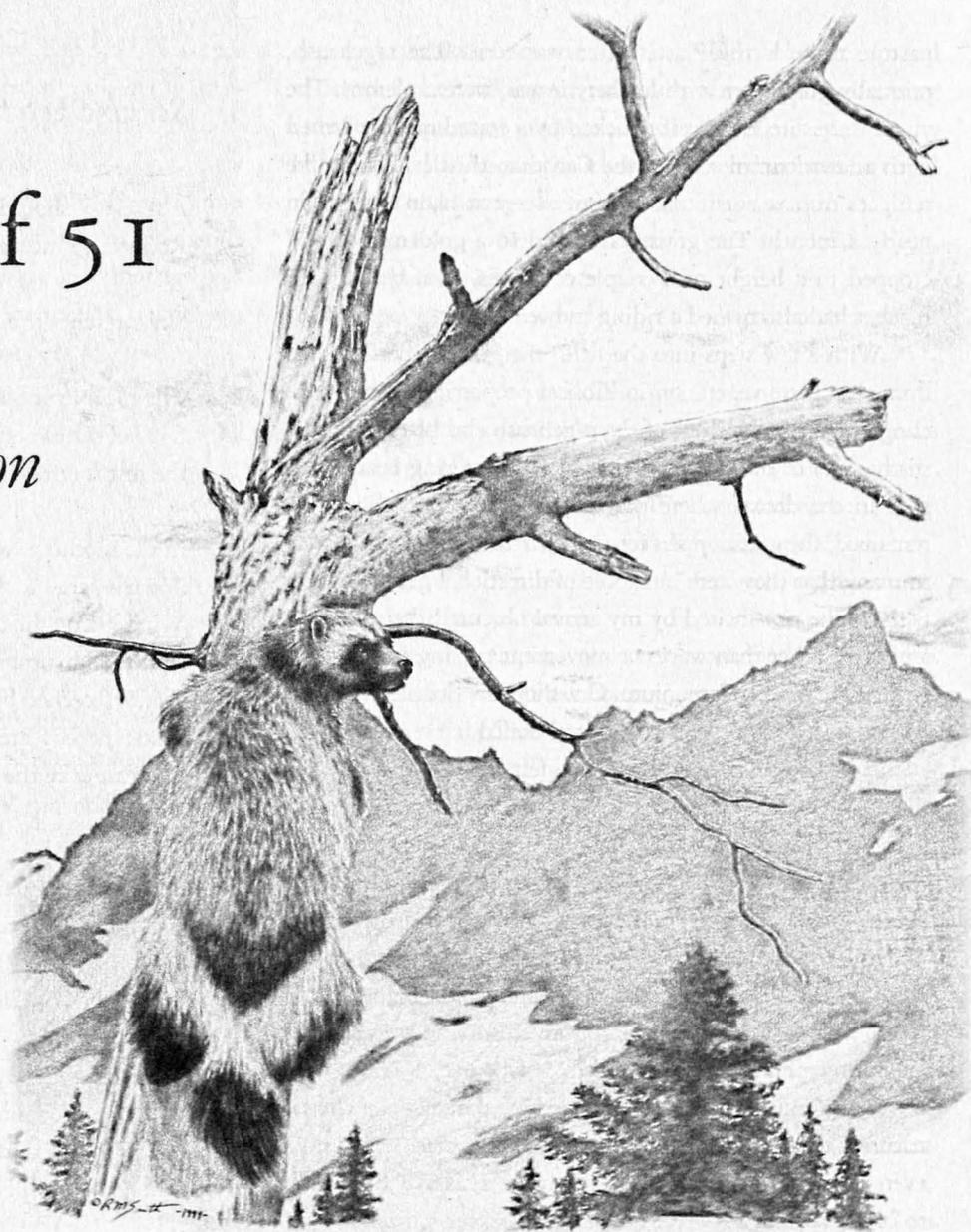
Dead tortoise stuck in a wire fence—
a round peg in a square hole
Wreathed by a sand angel
where she tried to pull herself through

Blazing stars punctuate the greeny brown
stillness with purple flowers

~ Owen Boyle

North of 51

*Will conservation
stay on track
in Ontario's
boreal forests?*



A Conversation with Justina Ray

CONSIDER THE POWER of the wolverine (*Gulo gulo*). Typically about 20–30 pounds, it has no compunction in taking down wild sheep and caribou, using its large feet to outpace prey that get bogged down in deep snow. A recent, unprecedented wolverine sighting in Michigan left a state biologist and a group of coyote hunters nearly speechless as the animal leapt down 30 feet from where it had been treed. Even the usually stone-faced *Walker's Mammals of the World* gives a glimmer of enthusiasm, writing, "it seems to be unexcelled in strength among mammals of its size." This member of the weasel family will dine on berries, lemmings, and bird eggs—though its massive head

allows the wolverine to bite through frozen carrion. Yet, like many carnivores around the world, the strength of the wolverine provides no power against the rifle, the road, or the rising temperatures of the planet. From these, its only defense is a huge tract of wild country.

Zoologist **Justina Ray** knows just such a place: the remarkably intact boreal forests of northern Canada. Here, caribou, wolves, and wolverines find refuge. But land use changes loom. Will these forests survive? Seeking a positive answer to this question, Dr. Ray has recently taken the helm as coordinator of the Wildlife Conservation Society's new program in Canada. In this role, she is working with many partners to apply new findings from field science directly into conservation planning for Canada's northern forests.

Her nearly two decades of field work have been good preparation, taking her from rainforest in the Central African Republic, to subdivisions in the Adirondacks, to the taiga of Canada; her numerous papers on the ecology of carnivores are built on hard-earned expertise in trapping, handling, and surveying many mammal species.

Wild Earth wanted to learn what she thought the future might hold for the boreal region and its residents. And—though she was eager to point out that she is not an expert on *Gulo gulo*—we couldn't help but ask her a lot of questions about a field study she is now part of that seeks to understand the mighty, mysterious wolverine.

Wild Earth's senior editor and staff writer, **Joshua Brown**, spoke with Justina Ray on December 31, 2003.



Your field studies, I imagine, involve long hours, howling snow storms, baking heat, marauding flies and mosquitoes—it must be challenging. Why do you do this work?

I don't remember any time when I wasn't interested in animals. I lived on the 10th floor of an apartment building in New York City so I didn't have experience with wildlife as a youngster except through books—and the American Museum of Natural History.

My first decision toward conservation came when I was about six and someone came into our class to do a presentation about whales. I learned about the threats to whale populations and was determined to boycott Japanese and Russian products. To me, that meant not going to my friend's birthday party at a Japanese restaurant. I was deeply moved about the plight of whales, although I don't believe that my solo boycott had much of an impact on overseas policymakers!

In school, I knew I was going into biology, but I didn't know that you could make a living in conservation until I read George Schaller's book, *The Year of the Gorilla*. I haven't looked back since.

This sense of mission—and your current efforts in Ontario—must have been honed by your pioneering work in Africa.

Yes. For my Ph.D., I went to central Africa in 1992 to undertake a carnivore community study. A lot of folks thought I was crazy to try this, and, in a way, they were right because at the

time there were no proven methods for live-trapping many of these animals. I had to spend a lot of my field time figuring out how to trap these animals, which didn't get me on the ground running.

But, once I did, there were many rewards: there I am, a pipsqueak researcher in the central African rainforest, and I live-trap this "rare" carnivore: the long-nosed mongoose (*Herpestes naso*). This animal had been known, prior to my work, from about 30 museum specimens—but, as it turned out, that was not because it was rare or highly endangered: it was simply that no effort had been taken to study them.

Give me another example.

One time I scooped up a dead shrew and pickled it; in these remote areas, I tried to collect anything. It turned out to be a new species to science and I got to name and describe it: *Sylvisorex konganensis*. (Kongana was the name of the camp where I was working.) That was no huge feat. Although I am exaggerating a bit, it is almost as if you put a little bit of effort into exploring these incredibly diverse, remote ecosystems and you become an expert in a minute!

Though I was not even thinking about shrews when I started out, I ended up discovering a lot about them through an enormous collection of scats I had gathered from the eight carnivores I was studying; over 1000 scats in a two-year period. When I got back to the lab, I analyzed scats for eight months—individual

teeth, bones, exoskeletons, seeds. A lot of the carnivores I was studying are truly omnivorous—they are vacuum cleaners out there. I found out quickly that there were many shrews in these scats. This was fascinating because I had read over and over again that carnivores don't like shrews. There is this folk wisdom that carnivores don't like shrews because they smell bad.

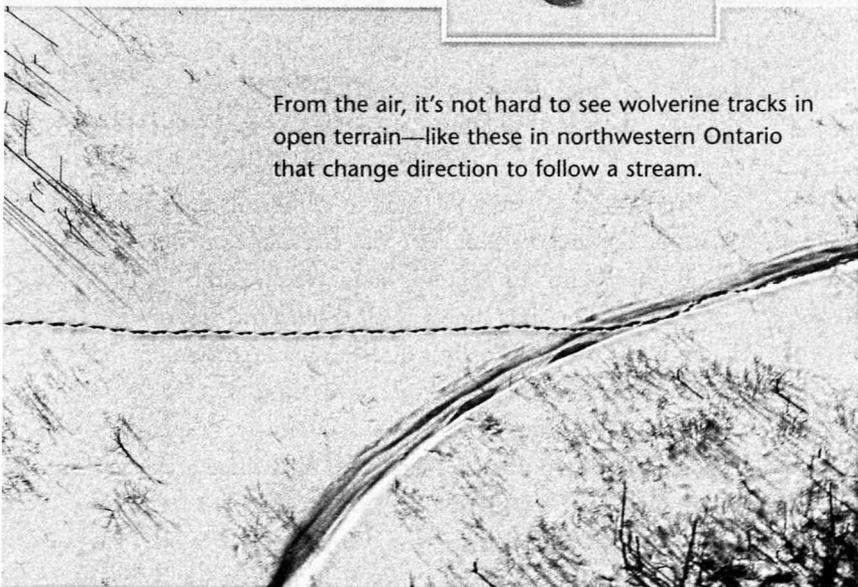
I sent these samples to the central African shrew expert of the world, Rainer Hutterer at the Museum Koenig in Bonn, Germany. He was so excited that he dropped everything and spent the next several weeks analyzing these teeth, and he found that there were 16 species of shrews represented in the scat collection—from a 35 square kilometer area! If you compare that with anywhere in North America, there are only 4–6 species. In

“If we just duplicate and push north the park system that we have in the rest of Canada, we stand to lose the boreal forest habitat on which a lot of wildlife depend.”

Justina Ray embarks on a day of wolverine survey flying.



From the air, it's not hard to see wolverine tracks in open terrain—like these in northwestern Ontario that change direction to follow a stream.



fact, this was a world record of shrew species. But we suspect that this isn't because this part of central Africa was such a spectacular shrew habitat, but because the method of discovering these shrews—i.e., by using the carnivores as the “trap” and looking in their scat—was far more effective for sampling the different microhabitats than any human-made shrew trap.

Almost every piece of data that I collected in Africa contributed to baseline knowledge about a species—which is very different from the work I do now in North America where there are 30 or 40 researchers looking at each species.

I know that wolverines are one of many animals that you study now in Canada; tell me more about that.

Right now I am working in northern Ontario as a partner in the first ecological study of wolverines in lowland boreal forest habitat. In Ontario, most of the current range for wolverines is north of the 51st parallel “cut line,” where logging is not allowed; it's a roadless area. And most of that area is home for 28 First Nations' communities. These are only connected to the rest of Ontario by winter ice roads for two or three months a year. Other than that it's just fly-in. These folks are living with wolverines. It's a very different existence to live with a large carnivore than to live in the city, so it's no surprise to find very different attitudes about this animal—all in the same province.

One major thrust of the work we are doing with wolverines is interviewing First Nations people in six communities. I go up there for about a week at a time and interview elders and trappers and listen to what it is like to live with wolverines. What are their historical relationships? Their individual relationships?

My earlier work in Africa has helped in this process a great deal. I worked very closely with indigenous people there for nearly three years. I gained an understanding of how decisions are made and what priorities are made in a context where folks are living right next to wildlife, and where social issues can loom much larger than worrying about whether a particular wildlife species persists in the landscape.

When you are talking with trappers and elders from the various First Nation groups, is there tension because their perception of wolverines is so different from yours?

There is definitely some tension—after all, my focus is on the conservation of all wildlife, including wolverines—but mostly I'm there to

listen and to understand the context in which we can make some good decisions or recommendations.

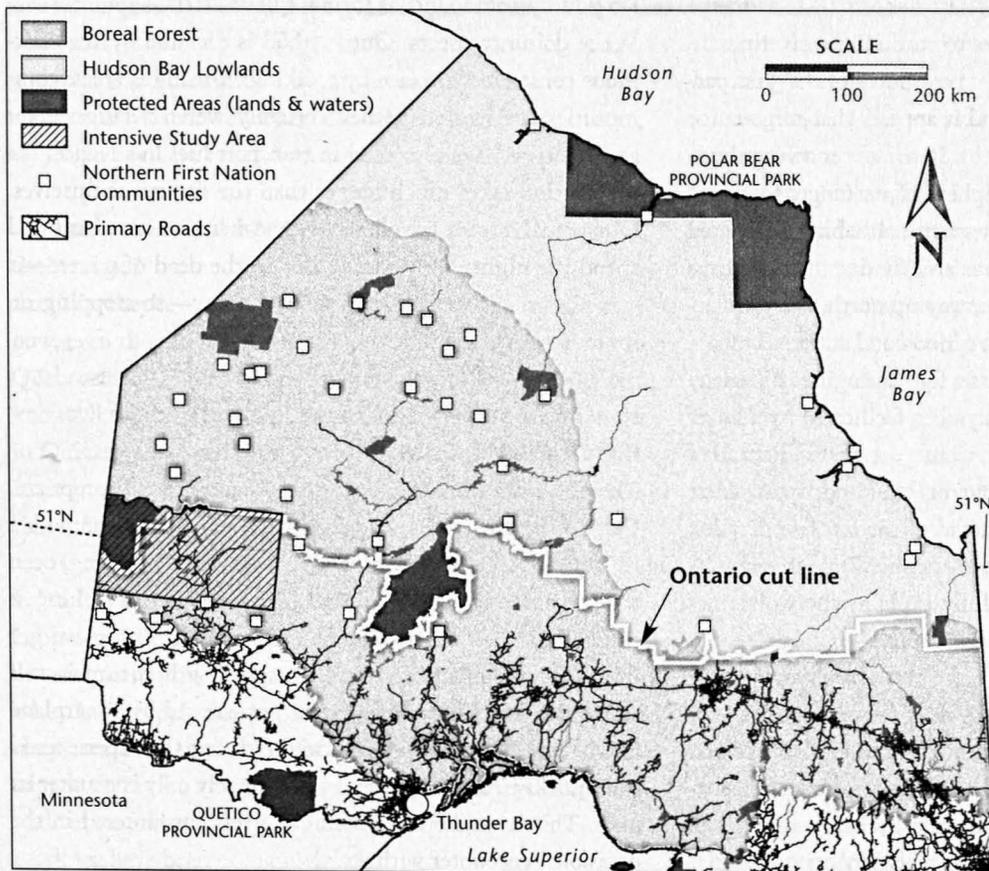
There was one individual who, when I was discussing the wolverine research, leaned over the table and said, "You're not trying to protect these things are you?" That gave me something to think about! Very truthfully, my quest is to learn what it is like to live with wolverines, because we have lost that understanding in Ontario—or at least western science has. Although wolverines do still persist in managed forests, or at least on their edges, their distribution has retracted from where it used to be, which means that there are lessons to be learned so that the range doesn't continue to disappear in the face of development being pushed northward. We need to first understand what we are asking folks to *do* when we ask for a conservation effort.

The Ontario government doesn't specifically monitor wolverines other than through fur auction returns. This made me and one of the project partners, Neil Dawson from the Ontario Ministry of Natural Resources, want to know if the auction data provides an accurate gauge of how many wolverines are being harvested in total; do all animals harvested come to auction?

What did you find out?

It is clear that, for most First Nations trappers I interviewed who have harvested wolverines, the primary motivation is to get rid of wolverines on the trap-lines that they set out for other furbearers. They want, for example, to prevent a wolverine from taking their target species. As scavengers, and very powerful ones at that, wolverines are famous for robbing trap-lines and breaking into supply caches. Nevertheless, wolverine fur is valuable, hence pretty much all of it ends up at the fur auctions. So the auction data so far does appear to provide a very good indication of overall harvest levels.

This is an example of how talking to people who are living with wolverines provides insight into conservation strategies: what I found out in my interviews strongly suggests that there are some situations where one would *not* want to recommend that all fur trapping cease. The fur auctions give us at least some sense about what is being taken from the land that is not being monitored by any other means—and chances are those wolverines might be harvested anyway even if they don't come to auction.



Northern Ontario

Wolverine and woodland caribou ranges have receded during the past century as industrial development has expanded. Presently, the southern limits of the distribution of both hover around the current managed forest boundary—the "cut line." Within the intensive study area, the Ontario Wolverine Project employs live-trapping, camera-trapping, hair-snaring and radiotelemetry. Aerial surveys for wolverines span the entire province north of the 50th parallel.

So you're saying that some trappers are going to trap or shoot the wolverines anyway even if it becomes illegal?

In some cases, there is a good chance of that because of the damage that a wolverine can do on occasion. Livelihoods and deeply held beliefs are at play here, although the perception of them as trap-thieves does not match up with the actual damage experienced. At the same time, it's fascinating to trappers and others living in the North that wolverines have been extirpated from many places where they once lived, which is often viewed with mixed feelings.

Are you optimistic about the long-term trends for wolverines?

Well, the long-term trends probably have little to do with wolverine harvest levels *per se*. They have to do with access. Folks often consider wolverines to be very difficult animals to trap and a lot of today's trappers in northern Ontario don't set traps specifically for them. There are only a handful that I have encountered that decide specifically to go after wolverine. It's not more than 6–10 wolverines that are harvested a year in the whole 450,000 square kilometer area. Wolverines are mostly harvested through opportunistic encounters—on a snowmobile, for example. The more motorized access there is to the landscape, the more opportunities to encounter wolverines.

The wolverine situation right now north of the 51st parallel in Ontario is quite good, and it appears that some range has been reclaimed since the 1970s. It was never a very abundant animal—this is at the periphery of its range; Ontario's lowland forests may be relatively marginal habitat compared to some core areas in mountainous and tundra areas. Perhaps it's doing well right now because, way up north, the prey situation has been pretty good with caribou and scattered moose and a few wolves to provide carcasses for scavenging. A healthy wolverine population has probably been facilitated by a lower level of trapping effort than in previous generations. Instead of spending nine months a year out on the land, many First Nations peoples are in settlements as of the last few decades, and spending less overall time in the bush. While this changing pattern of land use doesn't fully explain why wolverines are doing well today, it certainly contributes.

But this could change quickly: there are plans to move logging north of the "cut line" which is presently at the 51st parallel, and mining interests are quite high, and where you access natural resources you need roads. And roads are probably the biggest worry looming on the horizon—more than logging, more than mining—for the wolverine.

I've heard Michael Soulé say that the top three conservation problems are roads, roads, and roads.

I'm beginning to believe the same thing.

How do you do a large-scale survey of an elusive creature like the wolverine?

One of our partners, Audrey Magoun (one of the directors of the Wolverine Foundation and one of the first people to do a wolverine study in the 1980s), has experience in Alaska where there is a community of bush pilots who make their living on wildlife research. These are not only tremendous pilots, they have tremendous abilities to discern tracks and to understand what is going on from a vantage point of about 300 feet above ground. We were able to secure funding from the Wildlife Conservation Society, World Wildlife Fund–Canada, and the Ontario government to do aerial surveys over a two-year period looking for wolverine tracks in this 450,000 square kilometer area; it's been extraordinary. These pilots flew their PA-18 Supercubs in from Alaska—and we have covered more than 15,000 kilometers during two separate surveys.

Do you fly some kind of formal quadrant?

We're doing transects. Our method is dictated by the enormous constraints we face by working in roadless areas: communities are scattered; they certainly weren't designed for aerial surveys! We also need to transport fuel in advance; the preparation takes much longer than the surveys themselves. Our actual routes are dictated by where we can land and spend the night. We're doing this in the dead of winter—it was minus 38° Celsius on a recent survey—so stopping on route is not the best idea.

How do wolverines react to the fly-overs and the live-trapping? Is there debate about their level of stress?

There is always debate about stress—and that's appropriate. Certainly a wolverine is better off without a collar than with a collar; certainly a wolverine is better off not having been trapped than having been trapped. However, when looking at the broader perspective, the amount of information we get from the few animals we collar or track for a short time is well worth the cost. Wolverines might get stressed by an airplane for the few minutes that it is overhead, but the experience is over quickly. And a wolverine will probably only encounter us once. This is unlike the amount of stress encountered in the occasional encounter with wolves!

This stress on a few individuals needs to be weighed against the cost of not being able to answer critical questions about their needs, and, potentially, allowing a land-use pattern that endangers the entire population. For example, we have trapped and outfitted six wolverines with satellite collars in order to get an idea about range use and movements in relation to logging and other human disturbances; it is highly useful to know what we are talking about in terms of the areas that these animals range over. We can't just apply information from elsewhere—the boreal forest is too different from the other places where they have been studied. We don't know what it means to be a wolverine in these habitats; we don't know what kinds of denning structures they need; we don't know what are the limiting factors in their environment; we don't know how many there are and where they are. This information will bear directly on the size of protected areas and land management strategies.

Nevertheless, much of the best conservation research now uses a suite of entirely non-invasive techniques: camera traps, track plates, scat collection, scat-sniffing dogs. These non-invasive methods, where we can use them, are going to be favored more and more. I'm interested in trying to hone those non-invasive techniques. The fact that we got such great results with our aerial surveys in northern Ontario, and some promising results with hair snares and camera traps on a smaller study area, is very encouraging for wolverines in that whole range. In the future, we might not have to set up camp, try to trap these animals.

Are the wolverines in Ontario at the southern edge of their range?

Actually, they're at the eastern and southern edge of their range now, even though they used to range much further east—into Quebec and Labrador—and further south in Ontario. The last known harvest of a wolverine in Labrador was in the 1950s and in Quebec was in the 1980s. But they may still persist there. Inuit in those areas swear they see tracks. We're not sure, but there are plans to start an investigation.

Our aerial technique has piqued the interest of the Labrador Inuit Association and the Newfoundland and Labrador Wildlife Agency; they think this might be the ticket to exploring the wolverine sightings that have been reported by Inuit people and to contribute to recovery planning that they have been engaged in for several years. So they are planning a survey for 2005 that is very much designed like ours, and we are going to help. It's a neat application of some of the work we have been doing up north.

That's really exciting. You're hoping that you're going to find these creatures even though they haven't been scientifically documented in Labrador in 50 years.

It's very important to know because it will dictate the direction of conservation and management. For example, should they gear up to reintroduce wolverines? Presently, there may be good habitat in northern Labrador; the caribou populations appear to be in good shape and there are not many people. Wolverines would do well in that landscape. But managers need to know: are they there now?

Were wolverines once in the Adirondacks and New England?

They certainly are documented in several states and provinces, and some old maps show wolverine distribution extending down into New England, New York, and even into northern Pennsylvania. However, if you look very closely at records of wolverines—historical records in New York, for example—you only come up with a handful. This probably indicates that they were not strongly present in these areas; they were probably stragglers. But we're not sure.

Would it be a leap then to project what it would take to "restore" them to New England if this area was never a stronghold for them anyway?

I wouldn't proclaim from the hilltop that they *weren't* there as a stronghold. What we do know is that today's landscape is different from what it was like 300 years ago. These animals need enormous ranges. I would be extremely hesitant to get excited about reintroducing them in New England before we have wolves and caribou there—a sequence of changes is needed before you get wolverines into the restoration equation.

Also, there is probably some climate trigger that wolverines respond to. Though this is not proven, Audrey Magoun has a hypothesis that wolverine distribution is tied to a particular temperature and snow signature. If this is true, it would mean that the climate is even more important than human factors, and we certainly don't have the same climate today in New England as we find in their present stronghold.

How does your research about wolverines fit into the larger conservation landscape?

The wolverine work is only one aspect of my present research. The reason I am part of that study—other than the fact that I have grown to be fascinated with these creatures, of course—is because I'm involved in the Northern Boreal Initiative. This is a government-led land-use planning exercise in which the gov-

ernment is mandated to designate protected areas *prior* to letting any resource extraction go on north of the 51st parallel. This northern territory is currently unallocated, inaccessible forest. With resource development options becoming increasingly limited in southern Ontario, forest products and mining companies are looking northward. In addition, planning is underway to build an all-weather road network connecting northern Aboriginal communities in the province, many of which are grappling with achieving a balance between the pursuit of new economic opportunities and maintaining their cultural and ecological integrity in traditional use areas.

It became clear to the protected areas team of the Initiative that we needed more information. Most of the government's resources—in terms of research and monitoring—are geared toward areas where development is already taking place. North of the 51st has been all but ignored—so we have very little on which to base management decisions.

We decided to start studying the few species that stand to lose the most by moving “business as usual” up north. Woodland caribou and wolverine are particularly vulnerable to the kind of land uses being proposed for north of the cut line. They require very large, relatively intact areas. If we just duplicate and push north the kind of park system that we currently have in the rest of Canada, we stand to lose the source boreal forest habitat on which a lot of Ontario wildlife depend. Development has continually pushed these species northward—we need to help them hold their ground.

What do you need to know—what are the burning questions—before you can make good management recommendations?

There are so many burning questions that a fire might start! At the top of my list are threshold questions. We know a lot about the ecology of species either in pristine areas or in impacted areas. But we don't understand the thresholds: in a particular context, how much development can happen before that species or community will start seeing effects?

We are gaining this understanding with some animals. For example, with American marten the great work that has been done in Maine is helping us to understand some of those thresholds with regards to forest management. Also, I just wrapped up a project with Roland Kays and Matthew Gompfer in the Adirondacks looking at how carnivore communities respond to landscape change. The Adirondacks present a strong contrast between pristine areas in the middle of the park spanning out to the agricultural and suburban fron-

tier. We are measuring community structure in various parts of this landscape that allows us to identify thresholds of change. For example, at what degree of landscape fragmentation do raccoons start to appear? But we don't have that appreciation for the thresholds of some of these larger species like caribou and wolverine—and we're going to need that if we are going to do conservation right in the northern boreal forest.

The history of conservation in North America is mostly one of small victories and slow retreat. Do you think we can succeed in protecting the boreal forests?

You can't be a conservationist without being optimistic. I see this as a tremendous opportunity to do good conservation planning in northern Canada. That's where eyes are going to be turning because these are some of the last true wilderness areas left on the planet. There are a lot of amazing people in the effort, hell-bent on doing it right.

I also note that we have enormous pressures; there are powerful forces against conservation right now. And these forces are resource-dependent and these resources lie in these northern areas. Without changing this extractive behavior we don't have much hope. But I refuse to concentrate on that!

The northern boreal forest is the only area in North America where we are actually proactively establishing protected areas and trying to think about the conservation of the whole landscape—rather than retroactively fitting in protected areas within a sea of development.

Today, we still have source boreal forests. North America has northern Canada, Finland and the rest of Scandinavia have the Russian forest, and lots of birds and other wildlife depend on these source habitats—more than many people imagine. But this could all change, unless we act quickly.

I hope I'll continue to see boreal birds—winter irruptions of crossbills, and flocks of white-crowned sparrows traveling north each spring—resting in the cedars behind my house in Vermont.

Isn't that amazing that some boreal birds may now be in danger? But if they don't have a northern stronghold to rely on anymore then what do they have? The whole boreal forest could look cut-over like it is south of the 51st parallel. Imagine traveling farther and farther north through industrial timberland and all of the sudden you get to the boundary of the trees and that's it. But we don't have to accept business as usual; this chapter of forest history could have a much better ending, if we work together. ☺



Fertility Decline No Mystery

by Virginia Deane Abernethy

THE RESULTS OF a March 8, 2002, United Nations report on declining fertility rates make pleasant reading; a *New York Times* summary states that, "The decline in birthrates in nations where poverty and illiteracy are still widespread defies almost all conventional wisdom. Planners once argued—and some still do—that a falling birthrate can only follow improved living standards and more educational opportunities, not outrun them. It now seems that women are not waiting for that day" (Crossette 2002; see also Francis 2002).

For women's rights advocates the response is triumphalist—given any power at all to control their own reproduction, women have opted for smaller family size. For environmentalists the lower fertility rates are a relief—fewer people means less pressure on Earth's

carrying capacity. Only some professional demographers are bemused; they have long maintained that a decline in poverty and illiteracy are preconditions for smaller family size, a hypothesis that is manifestly inadequate.

For me, the UN report is a great vindication. As an anthropologist, for several decades I have explored the effects of economic opportunity, concluding that a sense of expanding opportunity encourages people to raise their family size targets (Abernethy 1979, 1993). Conversely, *falling expectations and the perception of heightened competition for limited goods bring about reproductive and marital caution*. I call this the *economic opportunity hypothesis*.

Fertility rates are now falling almost worldwide because maintaining a culturally defined "good" standard of living is becoming more difficult in most settings. Despite over one trillion dollars in foreign aid given by the United States alone since World War II (Poverty Lobby II 2002) and globalized trade, increasing numbers of people live in poverty or must compete harder to stay in the middle class. "Most people in Latin America, the Middle East and Central Asia are poorer than at the cold war's close, despite the fast economic integration of the 1990s" (Kahn and Weiner 2002).

In today's poorer countries, clean fresh water is scarce for a growing number of people. Worldwide, grain production per capita has not risen since the mid-1980s, and an enormous gap between the infant mortality rates in developed and developing countries—the difference between 8 and 67 deaths per 1000—persists (World Population Data Sheet 2001).

Explosive population growth is a principal contributor to these negative developments. Optimistically, some would say, the economic opportunity (EO) hypothesis implies that runaway population growth is self-correcting in the long run, because reproductive caution is triggered by the tougher economic, social, and environmental conditions associated with rapid population growth. That long run appears to have arrived.

Testing the hypothesis in the wake of economic collapse

The economic collapse of former "Asian tigers" (Hong Kong, Indonesia, Japan, Malaysia, the Philippines, Singapore, South Korea, Taiwan, and Thailand) in late summer 1997 presented the opportunity for a *prospective* test of the economic opportunity hypothesis. I predicted that the tigers' collapsing economies would cause their fertility rates to decline at a faster rate during the 1997–1999 interval than observed in preceding two-year intervals (Abernethy 1998). Fertility had been

declining in each of these countries for varying numbers of years, but now that decline was expected to accelerate.

The nine economies of the former Asian tigers are modern in at least one primary sector of the society and, until 1997, this sector was relatively affluent. The economies vary greatly, however, in the pervasiveness of modernizing influences. The Philippines might have been excluded because it never achieved independent economic take-off and remained heavily reliant on the presence of U.S. naval bases for nearly a century, until the early 1990s. Other observers would exclude Japan from the sample because of the length of time that its economy has been modernizing. Japan began to invest in technology and education before the turn of the twentieth century and to modernize other facets of society immediately after World War II. Taiwan and Hong Kong embarked on extensive modernization within a decade of the ending of World War II (Abernethy and Penalzoza 2002).

Whatever their differences and pace of change, some generalizations apply. By 1997, each country had experienced improvements in standard of living, education was increasingly appreciated as the high road to economic success, and the prospect of entering the middle class was influencing an increasing proportion of the population (Abernethy and Penalzoza 2002).

Then, within a matter of months after late summer of 1997, the nine economic tigers faced collapsing asset values including currency devaluation of up to 40%. The downward spiral was initiated by a sharp devaluation of the Thai *baht* and quickly spread. In Japan, the unemployment rates in 1998 and 1999 rose to a level higher than at any time since 1953. Personal bankruptcies in 1999 were 50% higher than in 1997 and, a further sign of falling incomes, Japanese retail sales declined from 1997 through 1999. In 1998, the Japanese suicide rate was the highest recorded. Contemplating an uncertain future, a majority of university students expressed a preference for government as opposed to private-sector employment (Abernethy and Penalzoza 2002).

The EO hypothesis suggests that efforts to adjust to uncertainty, unemployment, and the negative wealth effect are likely to entail the derailment of marital and reproductive plans. Further decline from already low fertility rates in most Asian tiger economies seemed possible. Under similarly difficult circumstances, fertility rates in East Germany temporarily declined to a level where, if maintained over women's entire lifetimes, they would have led to an average completed family size of as little as 0.6 children per woman (Conrad et al. 1996).

What happened? The predicted fertility decline in former tigers materialized. The fertility rate by country within two-year intervals is shown in Table I. Table II shows the percentage change in fertility rates, by interval. The relevant finding is that the decline in the 1997–1999 interval is more than *six times* as great as the average of declines in previous intervals (Abernethy and Penaloza 2002). A comparison group of countries that experienced no particular economic shock showed a random pattern of fertility rates.

Table I. The Total Fertility Rate for "Asian Tiger" countries by year

	1991	1993	1995	1997	1999
Hong Kong	1.2	1.2	1.2	1.2*	1.1
Indonesia	3.03	3.03	2.8	2.9	2.8
Japan	1.5	1.5	1.5	1.5	1.4
Malaysia	4.1	3.6	3.3	3.3	3.2
Philippines	4.1	4.1	4.1	4.1	3.7
Singapore	1.8	1.7	1.8	1.7	1.6
South Korea	1.6	1.6	1.6	1.7	1.6
Taiwan	1.7	1.6	1.8	1.8	1.4
Thailand	2.2	2.4	2.2	1.9	2.0

*Estimated. Hong Kong's changed administrative status—reversion to Mainland China—is responsible for a gap in Population Reference Bureau data.

Table II. Percentage change in Total Fertility Rate, by country, in two-year intervals

	1991–93	1993–95	1995–97	1997–99
Hong Kong	0.0%	0.0%	0.0%	-8.3%
Indonesia	0.0	-7.6	+3.6	-3.4
Japan	0.0	0.0	0.0	-6.7
Malaysia	-12.2	-8.3	0.0	-3.0
Philippines	0.0	0.0	0.0	-9.8
Singapore	-5.6	+5.9	-5.6	-5.9
South Korea	0.0	0.0	+6.3	-5.9
Taiwan	-5.9	+12.5	0.0	-22.2
Thailand	+9.1	-8.3	-13.6	+5.3
Average Decline	-1.6%	-0.6%	-1.0%	-6.6%

Table II shows that the fertility decline in the 1997–1999 interval is approximately six times greater than the average of declines in preceding two-year intervals.

SOURCE: WORLD POPULATION DATA SHEETS, 1991–1999. WASHINGTON, D.C.: POPULATION REFERENCE BUREAU.

Illustrations of the economic opportunity hypothesis

MALAWI. Malawi's first census, in 1966, counted a population of 4 million. By 1995 it was 10 million. In recent years, the annual rate of population growth has been 3.5%. Confronted with rising population and limited arable land, the 85% of Malawians who derive their livelihood from subsistence farming have three options: they can work harder on existing holdings ("agricultural intensification"), they can migrate to available but marginal lands, or they can limit family size to avoid adding to pressure on the land.

Anthropologist Ezekiel Kalipeni suggests that the hard work of agricultural intensification holds greatest promise in the short term but cannot keep ahead of population momentum. Migration to marginal lands occurs but is unattractive—which leaves limiting family size. In comparison with other sub-Saharan Africans, rural Malawians began relatively early, in fact, to treat fertility control as a real choice. Between 1977 and 1987, crude birth rates declined from 48 to 41 births per 1000 persons in the population.

Kalipeni tested a number of traditional explanations for the fertility decline but found no significant relationships between the fertility rate and *education, infant mortality, or urbanization* in either 1977 or 1987 data. However, his 1987 regression model revealed a statistically significant *inverse* relationship between the fertility rate and *population density* ($r = -.40$); that is, the denser the population, the lower the fertility rate. Drawing together all data, Kalipeni infers that land hunger was the central stimulus in the onset of Malawi's fertility decline (Kalipeni 1996).

RWANDA. The beginning and course of population cycles are sometimes shrouded in history. One may conclude, however, that Malawian and Rwandan stories illustrate the effects of contrasting expectations. Relatively early, the Malawians accepted a theory of limits on arable land. Rwandan farmers, on the contrary, were encouraged to believe that the settlement of fertile new lands would be a continuing option.

The Belgian colonial government and, after Rwandan independence in 1962, its successor indigenous government recognized growing population pressure but, according to John May, they projected an image of expansionary opportunity until the 1980s. The governments' principal responses to population pressure after World War II were agricultural intensification and "extensification." Extensification entailed dispersing the Rwandan population to empty *paysannats* within Rwanda

and to less congested territories in neighboring countries: Zaire (now the Democratic Republic of Congo), Uganda, and Tanzania. These strategies, especially relocation, became "by far the most important policy response ever adopted in Rwanda to cope with rapid population growth" (May 1995).

May speculates that agricultural extensification created a frontier mentality—an image of opportunity—and that these expansive expectations may have *raised* the fertility rate: "In fact, the relative availability of land during the agricultural colonization and intensification processes might have been conducive to higher fertility levels" (May 1995).

The mid-1980s fertility rate was 8.5 births per woman. By the 1990s, Rwanda was "the most densely populated country of continental sub-Saharan Africa" (May 1995). "Largely because of extremely high fertility," states demographer Leon Bouvier, the population quadrupled between 1950 and 1993 (Bouvier 1995).

Belatedly, in 1981, international aid donors forced the initiation of a national family planning effort. Fertility began to decline in 1985 and within five years arrived at 6.2, a fall of more than 2 children per woman. One could easily infer that offering women modern contraception caused the fertility decline. That, however, would overlook a contrary fact: *by 1992, only 12.9% of married, reproductive-age women used modern contraceptive methods* (May 1995). Later marriage, May observes, was the most visible contributor to the Rwandan fertility decline.

Delayed marriage is just one of many behavioral adjustments that can be adopted independently of contraception in any society—rural or urban, deeply illiterate or highly educated, patriarchal or egalitarian. Delayed marriage in response to adversity may be a pan-African or even pan-human response. Yoruba villagers in Nigeria explicitly ascribe decisions to delay marriage to "hard economic times" (Caldwell et al. 1992), and nineteenth century Irish, even before the 1845 famine, responded to land hunger with very late marriage or celibacy in a very large fraction of the population (Connell 1968).

John May reasons that Rwandans began to delay marriage by the late 1980s because the incentive structure had changed. Gains from intensifying agriculture had run their course. Land productivity decreased as marginal soils brought into cultivation 20 years earlier steadily deteriorated. Droughts appeared to worsen, and the competition among alternate uses for land (e.g., cultivation, pastureland, forests, and domestic woodlots for fuel) intensified. Political realities ruled out further population dispersal, so family plots were subdivided to accommodate each maturing generation. Many farms reached a size that

barely supports a family. By 1984, 57% of family holdings were less than one hectare (May 1995).

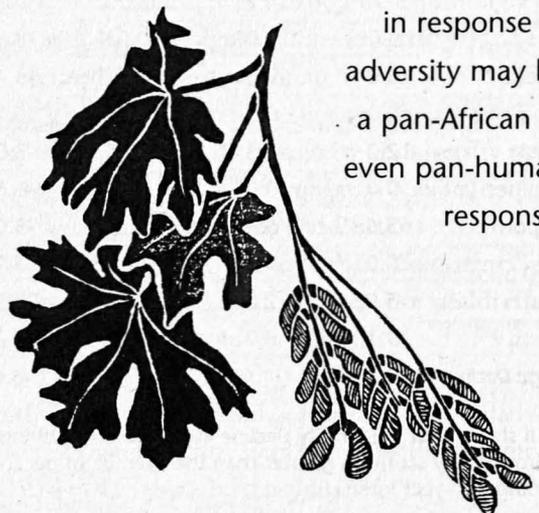
The shrinking opportunity structure apparently forced itself into Rwandan calculations by the mid-1980s and accounted for delayed marriages and first births. The new availability of contraception no doubt helped by making it easier to space and limit births within marriage. But motivation is key. In the absence of *wanting* to limit family size, both a World Bank-sponsored study (Pritchett 1994) and the literature underlying the EO hypothesis show that contraceptive programs are nearly ineffective.

May concludes that different government policies might have led to fertility decline sooner. The dispersal of the population through out-migration was a principal policy that shielded the people from the ecological realities of carrying capacity and prevented a timely response (May 1995).

SOUTH ASIA. Timothy Dyson's analysis of a century of major famines in the Indian subcontinent connects the fertility rate to fluctuations in the natural and socioeconomic environment. He shows that small price increases for staple foods—typically the first response to a drought and a warning of possible famine—resulted in significantly lower fertility rates.

The mechanism was a series of behavioral adjustments. Dowries, for example, are more difficult to accumulate when crops are failing, so marriages and therefore births were delayed.

Delayed marriage
in response to
adversity may be
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even pan-human
response.



Reproduction within marriage was also often delayed because married men left home to seek work in less affected areas.

Such marital and reproductive responses to price-mediated signs of shortage, coming well before the full force of famine materialized, effectively reduced the total fertility rate because a birth delayed is often a birth avoided. These adaptations seem also to have largely forestalled significant, famine-induced increases in mortality. Mortality appeared actually to fall among reproductive-age women, perhaps because of lower exposure to the perils of childbirth (Dyson 1991a, 1991b).

MOROCCO. The Moroccan fertility rate rose in the wake of independence (1957), strong world prices for a principal export (phosphates), and the government's use of export profits to subsidize social programs. The total fertility rate was approximately 7 in 1960, and by 1973 had risen to 7.4 children per woman (Courbage 1995).

Late 1974 and 1975 were watershed years, however, because phosphate prices collapsed. Declining revenues forced the government to both raise personal income taxes and scale back subsidies for health care, education, food, and housing. The new role of government was not giver but taker of incomes, and it drove a renewed imperative: family self-reliance. Families cast back onto their own resources sought to satisfy basic needs (such as housing) as well as recently acquired tastes (for example, education and health care). Many women entered the workforce for the first time in order to supplement family income.

Youssef Courbage suggests that these unanticipated pressures on family lifestyles were the major cause of a fertility decline beginning in 1975. "The sudden reversal of the economic and fiscal condition of Moroccan households is related to the sharp drop in fertility, which diminished by 20 percent from 7.3 to 5.9 children in just four years" (Courbage 1995). Socioeconomic pressures were unrelenting and, by 1997, the Moroccan total fertility rate was 3.3 children per woman.

MALAYSIA. Before withdrawing from their Malaysian colony in 1957, the British instituted democratic reforms that left the more numerous Malays politically dominant. In addition, Great Britain affirmed "the 'special position of the Malays,' reserving for them four-fifths of all jobs in the civil service, three-fourths of university scholarships and training programs offered by the federal government, and a majority of license permits from the operation of trade and business" (Govindasamy and DaVanzo 1992).

The Malay gained at the expense of the Indians and Chinese—Malaysia's two other principal ethnic groups. As the Malays consolidated their economic and cultural advantage, both Indians and Chinese were progressively discriminated against in access to education, jobs, and public office. Many Chinese fled to Singapore after race riots and a switch in the official language from English to Malay in the early 1960s. (In 1965, Singapore became a separate political entity.)

Demographers Govindasamy and DaVanzo trace the culmination of Malay bureaucratic and legislative power through the passage of a 20-year blueprint for development (1971–1990) known as the New Economic Policy. By 1983, "the Malay language was used as a medium of instruction at all levels of education" and competency in Malay became a criterion for graduation and civil service jobs (Govindasamy and DaVanzo 1992).

The reversals in Malaysia's power structure after 1957 foretold demographic trends. In 1957, when Malays were the least educated and poorest as well as the most rural population, they had the *lowest* total fertility rate. When they acquired political power at the expense of other ethnic groups, the pattern reversed.

Indian and Chinese fertility rates declined, respectively, from nearly 8 children per woman in 1957 to about 3 in 1987; and from more than 7 to 2.5 children over the same period. The Malay fertility rate, in contrast, increased by 12%. Thus, by 1987, after the Malays had consolidated power, their fertility rate stood "twice as high as the Chinese and 63 percent higher than that of the Indians" (Govindasamy and DaVanzo 1992). Differential ethnic fertility has been persistent except for a brief period when trend lines crossed. By 1988, the Malays were a solid majority of the population.

Persistently high Malay fertility—despite increasing urbanization, economic expansion, and better education and health care—has been variously attributed to the pronatalism of Muslim religious forces as well as, by Govindasamy and DaVanzo, to the reversal in the opportunity structures, particularly after 1971. They offer the interpretation that the differential access to political and economic advantage "is consistent with the arrested decline in total fertility rates for Malays in the mid-1970s in the face of continuing decline for Chinese and Indians" (Govindasamy and DaVanzo 1992).

Differential fertility among groups which gain (or lose) access to political levers and the spoils of victory may be a common phenomenon. Shifting political arrangements offer a promising setting in which to test the economic opportunity model.

THE UNITED STATES. Demographic studies of the United States span the earliest English settlements to the present. Several points are significant. First, colonists in the New World—whether Roman Catholic French in Quebec or English Protestants in New England—averaged much higher fertility rates than were usual in the societies from which they came. The colonists' high rates have been attributed to seemingly boundless natural resources which could absorb almost any amount of labor and, indeed, could not be transformed into wealth without human labor.

Second, the transition from the frontier to established agricultural community meant that free land vanished and good land became expensive. Land prices became an obstacle to setting up families on farms of the expected size and quality, delaying marriage. Economist Richard Easterlin shows that denser settlement, with or without industrialization, was linked to declining fertility (Easterlin 1971, 1976).

Third, economic cycles are superimposed on other factors almost from the beginning of colonial settlement. For example, prosperity in Concord, an offshoot of the Massachusetts Bay colony settled by Puritans in 1630, varied with earnings from the export of lumber and agricultural products. The export trade relied upon backloading, the return trip of ships that had brought new colonists, as well as on strong demand for raw products in England.

The first hiatus in Concord's export trade occurred around 1642 when Puritans temporarily ceased immigrating to the colony, so no ships were available to carry back lumber and other colonial products. Subsequent interruptions in revenue from exports followed economic recessions and collapsing demand in England. Each dislocation in the colony's export market, including 1642, the 1680s, the 1740s, and the 1790s, affected fertility. Political scientist Brian Berry observes that, in every case, the contracting export market was followed by decline in the fertility rate (Berry 1996).

Richard Easterlin traces the later history of the colonies and the United States, showing how the domestic economy drove fertility rates. For example, the 1920 break in farm prices followed by the Great Depression of 1929–1939 was reflected in declining fertility first in rural areas and then in urban areas (Easterlin 1962). The economy revived during World War II and, particularly after the war, was characterized by low inflation, growth in labor productivity, and a labor force that was sufficiently small and stable to drive up entry-level wages and accelerate promotions. Easterlin concludes that the expansive opportunities available to young entry-level workers account for

the rapid increase in family formation and family size that became known as the 1947–1962 baby boom (Easterlin 1962).

Fertility drifted lower during the 1960s as after-tax, inflation-adjusted income failed to rise at the pace to which labor had become accustomed. The 1973–74 oil shock began the "quiet depression," with productivity and wage increases much below those of the previous three decades. Fertility followed economic trends, declining to 1.7 children per woman in 1976 (Macunovich and Easterlin 1990). The fertility rate of native-born Americans as the United States enters the twenty-first century is 1.9, which is below replacement level.

Discussion

These brief histories linking economic and fertility variables include single society vignettes, comparisons between countries, and one prospective, statistical test of the economic opportunity hypothesis. Many more supporting examples for fertility changes linked to perceived economic opportunity are available, including analyses of demographic trends in Egypt, Peru, and the U.S. in recent decades. [See the complete version of this paper at www.int-res.com/articles/esep/2002/article1.pdf.]

How many illustrations and statistical tests constitute proof of a scientific proposition? Outside of mathematics, perhaps nothing is ever proved because science operates, famously, through putting its hypotheses in jeopardy. Social science hypotheses are perhaps hardest to prove because only trivialities can be tested under controlled laboratory conditions. Theories about important relationships usually await testing through opportune circumstances that arise in nature, or by an accumulation of examples that almost always allow alternate explanation. The economic opportunity hypothesis is easily mired in such objections.

Nevertheless, readers who plan their own families with one eye on a budget may easily embrace the EO hypothesis because it seems like common sense. Others, whose family history includes suffering through the Great Depression and, perhaps, whispered tales of an aunt who aborted a third or fourth pregnancy, acknowledge that small families are imposed by a sense of limited resources, whereas larger families would be wanted if their means of support were no object. Finally, biologists who recognize a common, large-animal-species pattern of adjusting fertility to available resources tend to accept the hypothesis as true.

The economic opportunity hypothesis suggests that a sense of contracting opportunity promotes low or declining fertility whereas the perception of expanding opportunity

allows people to raise family size targets. Mechanisms associated with small family size include delaying marriage or interrupting marital relations, abstinence before marriage, or protected sex. Social, cultural, and behavioral adjustments as well as intentional contraception can limit childbearing.

The hypothesis has its roots in biology, anthropology, economics, and psychology. The incentive structure and the innate motive to maximize one's chances for *successful* reproduction are assumed to underlie the relationship between perception of economic prospects and fertility.

The EO hypothesis, the women's empowerment lobby, and the "just provide contraception" school do not have mutually exclusive interests. The questions of *why* women want fewer children than most in the third world currently have, and *how* avoiding pregnancy can be made easier, link these perspectives to the economic opportunity hypothesis. In fact, women today want fewer children because raising children in a culturally acceptable manner is hard and possibly getting harder. Depending upon gender roles and family structure, women may feel the constraints earlier and more acutely than men. And easily used contraception is clearly helpful in avoiding pregnancy where privacy, stability, and hygienic conditions are in short supply.

One implication of the EO hypothesis is that most humanitarian aid and refugee resettlement may neutralize the subtle, or direr, signals of economic and resource emergency that ordinarily lead to reproductive caution. That is, large-

scale international interventions may be counterproductive in the long term. Exceptions, because they create a better incentive structure, are assistance with family planning and micro-loans that link small amounts of start-up capital to large measures of self-help. These types of assistance tend to be offered on a small scale in face-to-face settings.

The economic opportunity hypothesis does not militate against helping. But its message is to be aware that assistance may change the incentive structure. One ought not risk giving the impression that wealth and assistance are limitless. Humans are genetically programmed to seek reproductive success. Restraint is the hard part, needing to be strengthened by fear of consequences. ☹

Virginia Abernethy is Emerita Professor of Psychiatry at the Vanderbilt University Medical Center, where she taught from 1975–1999, and is author of the book *Population Politics: The Choices that Shape Our Future*. An anthropologist and long-time student of human attitudes and behaviors that affect fertility, she has published widely on these topics and for several years edited the scholarly journal *Population and Environment*. ☞ This article is adapted from a longer paper of the same name that appeared in the online journal *Ethics in Science and Environmental Politics (ESEP)*. ESEP 2002: 1–11. It is used here by permission of Inter-Research and the author. The original is available at www.int-res.com/articles/esepl/2002/article1.pdf.

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Forests in Peril

Tracking Deciduous Trees from Ice-Age Refuges into the Greenhouse World

by Hazel R. Delcourt

McDonald & Woodward Publishing, 2002

234 pages, \$22.95

FOR PEOPLE WHO, through book learning or on-the-ground experience, can appreciate the distinctions among diverse forest assemblages of eastern North America, it comes as a shock to witness American beech an hour's drive from the Gulf of Mexico—and hanging out with evergreen magnolias and American holly to boot. For beech, this truly is an alien world. Yet northern relicts and odd botanical combinations are the norm in the rare and dispersed “pocket refuges” of the Gulf Coastal Plain, from the Florida panhandle to the bluffs along the lower Mississippi River.

As Hazel Delcourt vividly demonstrates, pocket refuges are not just curiosities. Here, more than anywhere else, one can time-travel 18,000 years back into the Pleistocene, when the entire continent was cooler and lobes of glacial ice advanced as far south as southern Ohio. At that time, many of our most familiar and beloved plants of the Midwest and central to southern Appalachians took refuge on rich soils near the Gulf coast. The amazing fact is that residual populations of many of these plants can still be found in former Ice Age refuges, thanks to special habitats created by wind-deposited glacial loess, which erodes into deep ravines that are cool, moist, and fire-resistant.

Those who cherish the richness of forest life in the Smoky Mountains of North Carolina, or the Cumberland Plateau of Tennessee, or the limestone

country of southern Indiana might do well to make a pilgrimage to one of these sanctuaries: perhaps the Tunica Hills of Louisiana or the bluffs along the east side of the Apalachicola River in northern Florida. Were it not for these special places, our continent might have lost many species to climate change, including its dogwoods and its tulip trees.

In her accessible and worldview-shifting book, Delcourt illuminates the dramatic changes in how scientists have understood the origin and dynamics of eastern North America's deciduous forest types—perspectives changed in part because of three decades of her own paleoecological sleuthing. As the title suggests, plant species on the move in response to climate warming or cooling (alternations of which have happened perhaps 20 times during the past two million years) may depend utterly on corridors or archipelagoes of suitable habitats for their survival.

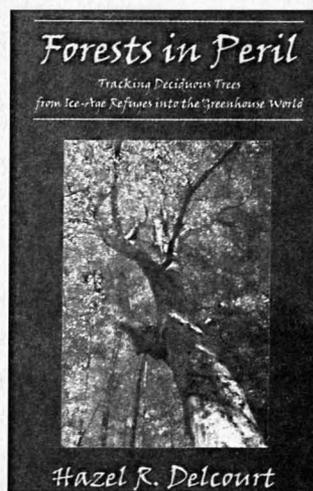
Forests in Peril thus brings a crucial deep-time perspective to one of the central concepts in conservation biology today: corridors. Throughout the Pleistocene, rich soils and moist microclimates traversing sandy, dry landscapes would have hosted mesophytic forest species in transit. These species, moreover, migrated not as integrated communities but opportunistically, species by species, hopscotching from one safe site to the next. The corridor that Hazel Delcourt has mapped out between the Tunica Hills of Louisiana and the Cumberland Plateau of Tennessee is

rather narrow: dependent on a thinning wedge of glacial loess blown from the Mississippi shoals onto its eastward bluffs and hills. Sadly, many of the ravines that facilitated plant movement in the last 15,000 years have been turned into reservoirs or recreational lakes, no longer able to function as safe sites for plant migrations.

The conservation implications of this deep-time awareness are profound, given the probability of impending climate warming. We may be rather sure of *what* is native, but precisely *where* becomes problematic. For example, a small population of cool-temperate American beech still thrives in the rich soils along the Apalachicola River west of Tallahassee. As the climate continues to warm, those southernmost remnant beech trees may be endangered. Their brethren, though, may still be vibrant far to the north, provided that their gene pool remains robust and climate change does not exceed their tolerances. What, however, of other species that are “stranded” in the south in isolated pockets with no stepping stones to accommodate their northward-moving phalanx? How do we, as conservationists, relate to these truly imperiled plants? For example, should we

attempt to save one of the world's most endangered conifers, *Torreya taxifolia*, by helping it “get back” to places like the Smokies, where we suspect it thrived during previous interglacials and for millions of years of prior Cenozoic warmth?

Delcourt suggests that anthropogenic fires set by prehistoric Native Americans for purposes



of game management may have disrupted the continuity of habitats that otherwise would have been corridors for northward movement of plants during the current interglacial. If so, human interference with plant migration has not been confined to the modern agrarian and industrial age. Even a pre-Columbian standard for management may thus be a prescription for extinction, especially if our fossil-fuels addiction nudges the current interglacial into a "super-interglacial."

The closing chapter of *Forests in Peril* is a stunning synthesis. Delcourt lays out patterns and predictions, while posing questions of great consequence for those committed to biological conservation. I was at once exhilarated as Delcourt's breadth of understanding became my own—and horrified by the conservation challenges that suddenly lurched into view. "My personal and professional odyssey as a historian of deciduous trees," she writes, "has brought me to the realization that the future of the eastern deciduous forest is now at risk." She later concludes, "We can provide corridors to allow for species to migrate successfully in the face of climate change. We may also need to be prepared to transplant endangered species to new locations where climate will be favorable."

Self-willed migrations facilitated by effective seed dispersers and served by generous corridors are, unquestionably, the ideal. But when the ideal fails for one species or another, we may need to step in to their rescue, not only with good science, but with a strong dose of intuition, humility, and heart. ☾

Reviewed by Connie Barlow, a proponent of deep-time awareness in conservation and a frequent contributor to Wild Earth.

The Death of Our Planet's Species

A Challenge to Ecology and Ethics

by Martin Gorke
Island Press, 2003
408 pages, \$37.50

THE GERMAN PHILOSOPHER Martin Gorke dares to justify a comprehensive and thought-provoking position in environmental ethics: that all nature—sentient and insentient, individuated and unindividuated, animate and inanimate—deserves ethical consideration. Gorke's "pluralistic holism" is not to be conflated with biocentrism. Whereas biocentrism prescribes moral value for nature's individuated organisms, pluralistic holism claims that whole species, populations, ecosystems, and geological formations deserve our respect as well. Gorke's position draws support from recent German scientific and philosophical literature, but his holistic ethical theory is indebted to Aldo Leopold's land ethic. Therefore, students of American environmental ethics will be conversant with Gorke's thesis and concerns.

But be forewarned: *The Death of Our Planet's Species* consists entirely of sophisticated and meticulously crafted argumentation. There is little narrative to entertain the casual reader. What the persistent reader will find are persuasive arguments on issues that concern all conservationists.

The first issue treated by Gorke is "technical optimism," the dominant cultural view that science and technology enables humans to understand, predict, and manage nature. In a series of arguments, Gorke justifies the skeptical conclusion that nature is too complex, chaotic, and decentralized to be universally understood and managed. Like Leopold, he concludes that nature study teaches humility—not hubris.

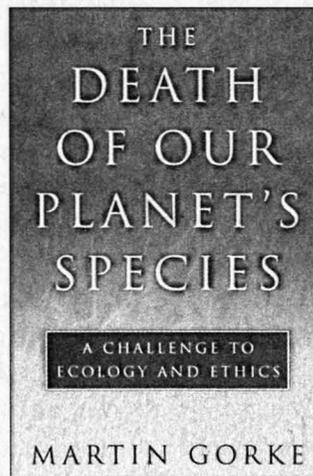
Leopoldian conservationists will applaud the book's opening arguments, but Gorke turns skepticism against the conservationist's own agenda when he next diagnoses and criticizes the movement's own dogmatism, "ecologism."

Ecologism is the view that from nature study we can derive norms to govern society and restrain activity.

Gorke argues that, in so far as they espouse ecologism, defenders of nature commit the naturalistic fallacy: they purport to deduce how things ought to be with humans from the way things are in nature. For

example, if science detects nature's "stability," "balance," "equilibrium," "harmony," or "economy," it seems to follow that humans should pattern their lives according to the natural order. But Gorke argues that recent findings in science indicate there is no universal order present in nature by which we can determine our conduct as ethical beings.

For example, Gorke argues that a main tributary of the conservation movement must revoke the claim that biodiversity is an infallible norm for human conduct. The claim is based on the premise that biodiversity is an



automatic indicator of stability and health in ecosystems. Given this, and given that stability and health seem inherently valuable, many conclude, as Leopold concluded, that policies and activities should be geared to promote biodiversity. But Gorke points out that disturbed ecosystems sometimes exhibit more biodiversity than wilderness areas and that some genuinely wild and stable landscapes exhibit species homogeneity. Biodiversity, therefore, does not automatically translate into stability and health. Gorke does not deny that "species diversity might still be a good measure and a good supportive argument...under certain circumstances"; his point is that conservationists should stop assuming, as an absolute rule, that biodiversity indicates stability, health, and wildness.

The third issue treated by Gorke is the strategy of supporting protectionist claims with appeals to human interests. For example, conservationists sometimes raise the prospect of potential medicinal resources when they want to protect an endangered species or a diverse habitat. But Gorke argues that anthropocentric arguments are ultimately self-defeating. Specifically, appeals to human interests do not justify the degree of restraint and protection necessary to achieve non-anthropocentric goals. Moreover, once anthropocentric interests enter the debate, they tend to override due consideration of non-anthropocentric interests.

Here the issue of endangered species enters the argument. Since endangered species protection is a high priority for the conservation movement, Gorke proposes that the subject serves as a good litmus test for how well environmental ethics justify our intuitions. He thinks that both

anthropocentric and biocentric positions manifest significant shortcomings. The utilitarian calculus of the former tends to promote development and resource extraction. The reductionist ontology of the latter excludes entire species and ecosystems from ethical purview.

Gorke's answer to the problem of justifying protection of endangered species is holistic pluralism: an ethical theory that asserts intrinsic value for all aspects of reality. Drawing on recent science, Gorke infers that reality is always beyond our comprehension and manipulation. He argues that a humble appreciation for the otherness of nature, coupled with a genuine and indiscriminating sense of altruism, justify the ethical restraint required to save Earth's species from extinction.

But while Gorke's skeptical arguments against dogmatism are powerful and elaborate, his development of holistic pluralism is lamentably cursory. ☹

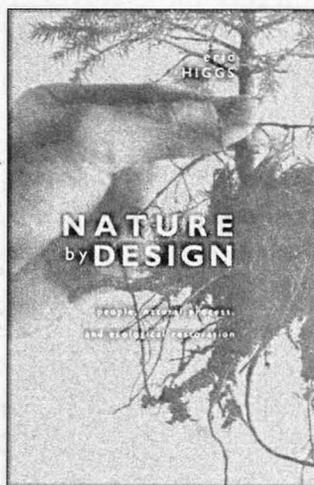
Reviewed by Paul Medeiros, an instructor of ethics, environmental ethics, and critical thinking.

Nature by Design

People, Process, and Ecological Restoration

by Eric Higgs
MIT Press, 2003
341 pages, \$27.95

NATURE BY DESIGN does much to clarify and advance the still young field of ecological restoration. With his renaiss-



sance-man background in ecology, philosophy, environmental planning, and anthropology, Eric Higgs offers a big-picture yet fine-grained discussion of the roots and challenges of ecological restoration. In the process, this elo-

quent book takes the reader on an exploration of the vexing "humans and nature" question: How do humans fit into nature? Should we leave nature alone, as some critics of restoration have argued, because restoration is only another instance of human domination? Should we count on our ingenuity to find technological fixes for damaged ecosystems, or is technology part of the problem rather than the solution? Is there no nature to be left alone because "nature" is merely a construct of the collective human mind?

Higgs manages to give the complexity of these questions justice by grounding his theoretical discussions in a number of case studies and applying to them a deeply reflective, non-dogmatic, and inquisitive mind. Whether we value preservation of wild nature or not, whether we think wild nature exists or not, we are "running out of places for which preservation is a viable option." Restoration must therefore work in conjunction with preservation.

To lay the groundwork for the kind of restoration he favors, Higgs offers a compelling critique of technology's role in our lives. For this, he draws on philosopher Albert Borgmann's view of technology as a pervasive pattern that distracts us from the things and activities that matter to us, that separates product from process and actions from consequences, and by

which we experience the world primarily through objects and commodities rather than through direct experience with what Higgs terms “focal things” and “focal practices.” An extreme example of such distancing is the experience “imagined” by Disney World’s Wilderness Lodge. This section alone makes the book worth reading.

Applying this critique of technology to restoration projects, Higgs argues eloquently for what he terms focal restoration: restoration that builds—and depends on—community engagement and local culture rather than technological grandeur. Judging by recent articles in the restoration literature in which the terms “focal practice” and “focal restoration” are used, Higgs’s analysis is hitting a chord. The detailed index makes this book’s thoughtful content all the more accessible. ☺

Reviewed by Kerstin Lange, an ecological planner who conducts landscape analyses from a natural history perspective in northern Vermont.

Lewis and Clark Among the Grizzlies

Legend and Legacy in
the American West

by Paul Schullery
Falcon Press, 2002
256 pages, \$14.95

THROUGHOUT THE northern hemisphere, probably no wild creature has haunted the imagination like the Great Bear. It has been many things to many people: worthy opponent and medicine animal to tribal societies; belligerent

beast to big game hunters; “varmint” to ranchers and farmers; man-eating monster to dime novelists; keystone species to ecologists; and most recently, celebrated cause for conservationists. For the men of Jefferson’s Corps of Discovery, it was specimen, as well as coveted source of grease and meat. They shot grizzlies on sight, killing over 40 in the course of their journey.

Paul Schullery’s excellent environmental history *Lewis and Clark Among the Grizzlies* is an exploration in its own right. Utilizing anecdotal evidence from the journals, the author fleshes out the “White Bear” described by Lewis and Clark. Drawing on genetics, paleontology, biogeography and anthropology, he depicts the grizzly bear, *Ursus arctos*, in all its complexity. Besides discussing speciation and taxonomy, Schullery interjects rewarding digressions on topics as arcane as the uses of bear grease (a substitute for butter; hair oil for native women), genital deformities (erroneously used as a mark to distinguish black bears from grizzlies), the effectiveness of smooth-bore muskets (slow to reload and rather inaccurate past 100 yards), and bear repellent (quite effective, yet risky in windy conditions).

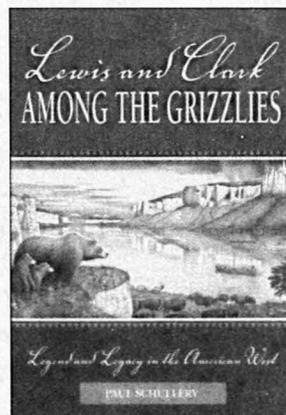
Almost in passing, he deconstructs “barstool biology,” long-held popular notions such as that bears “learn” to avoid gun-wielding humans. Using selective pressure as an explanation, Schullery argues that aggressive (or curious) individuals were simply culled from the population.

His ultimate goal is the reconstruction of “an

even vaguely accurate portrait of prevailing wildlife conditions in the past.” To that purpose, he puts the explorers’ spotty observations to the test—and finds them rather astute and reliable. Attempts at quantification, however, are bound to be imprecise, even when such complementing sources as fur trade records are used. Where necessary, the author corrects information, which the Corps gathered, in light of modern research. To his credit, he never loses the reader in a wilderness of facts or accounts, but succeeds in integrating the extensive literatures of bears and the Lewis and Clark expedition. For many conservationists, the book’s greatest merit will be its insightful examination of the changing public images of grizzly bears, and evolving human-bear relationships.

As befits a historian, Schullery is scrupulous in his use of source material. He extrapolates with caution, tending to err on the conservative side. Occasionally, overlapping quotes about yet another bear of yet another color observed (or pursued) can become a bit tedious—especially when no new insights are gained. One also wishes the bibliography had been kept separate from the notes.

But these shortcomings are trivial in a work whose take on history is so refreshing. Most of the time, the writing is lively. This is in part due to the bear episodes, the “fire-and-flee theatrics” that at times resemble slapstick routines. Schullery also leavens the text with some deadpan comments. And the idiosyncratic orthography of the diarists pro-



vides its own form of entertainment. Ultimately, Schullery's admiration for Lewis and Clark's achievements and for the charismatic protagonist of the book pervades the pages.

Regrettably, Lewis and Clark failed to report in depth on bear ceremonies or beliefs of the Arikara and Mandan, the Crow, Shoshone, or Nez Perce tribes. This is in part because it was not

included in their job description, but also a result of their assumed superiority in the face of "superstitious rights" (rites). To amend their omissions, I suggest an excellent companion volume to this work, David Rockwell's *Giving Voice to Bear: North American Indian Rituals, Myths and Images of the Bear*.

In the glut of titles published to mark the bicentennial of the great

expedition, this thorough and accessible case study will hold its ground. Anybody with an interest in grizzlies, or our shifting perceptions of them, will find much of value in *Lewis and Clark Among the Grizzlies*. ☺

Reviewed by **Michael Engelhard**, a writer and outdoor educator who lives in Moab, Utah.

► LETTERS, FROM PAGE 5

such a preservation condition came late, after years and years of mismanagement for economic purposes (with "cultural" cutting never abolished). Now Vallombrosa is only a beautiful landscape forest, but not a biologically intact forest: plenty of roads and houses, too, and much of the area managed and reforested with exotic tree species from other parts of the world (mostly from North America). Only a little of the original forest remains.

Today, for Italian naturalists, "ancient, beautiful, and culturally prestigious forests" are the Adirondack forests—not Vallombrosa's. But the same, I am glad to have learned that the roots of the Adirondack Forest Preserve are Italian, too, because today Adirondack forest preservation may teach to us a better Italian wild forests future!

Franco Zunino

Murialdo, Italy

Franco Zunino is with the Wilderness Associazione Italiana.

John Elder responds: *I appreciated Franco Zunino's response to my essay and look forward to learning more about the*

work of the Wilderness Associazione Italiana. He wonders about my characterization of the forest at Vallombrosa as "one of the most ancient, beautiful, and culturally prestigious in Italy," though, and I would like to say a few words more about that claim.

It is certainly true, as Mr. Zunino asserts, that this "Riserva Naturale" is far from being a wilderness. In addition to the main Abbey at Vallombrosa, there are a number of chapels and other devotional sites in the woods, along with roads and many other signs of cultivation. A massive fir plantation, dating from the eighteenth century, rises on the slope right above the monastery. But my point in the essay, and in the book-length project from which it comes, is to talk about the evolution of a stewardship ethic amid the errors and disasters of history. We need a whole-landscape vision that can affirm wilderness, sustainable forestry, and viable human communities alike. I yield to no one in my admiration of Adirondack wilderness. But for me those unroaded tracts are all the more valuable for being in a "peopled park" that also includes settlements and appropriate industry. We American environmentalists need to seek a

more historically informed and socially inclusive perspective if we are to become truly effective at protecting wild habitat. This is why I find Vallombrosa so inspiring—with its 1,000-year record of stewardship and its special attractiveness for George Perkins Marsh.

John Elder of Bristol, Vermont, is the Stewart Professor of English and Environmental Studies at Middlebury College. His forthcoming book about George Perkins Marsh is titled *Pilgrimage to Vallombrosa*.

BACK ISSUES of *Wild Earth* are treasure: I have just read Lyanda Lynn Haupt's landscape story, "One-Eyed Dunlin," and Pete Upham's poem, "The Limits of Philosophy," from the fall 2002 issue. It doesn't get any better than these writers.

Elizabeth Caffrey

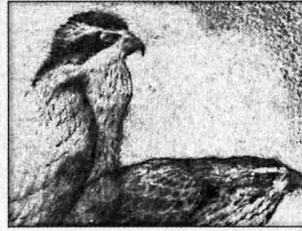
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ERRATUM A printing error caused a few readers to find their winter *Wild Earth* contained some missing and some duplicate pages. If you received such an issue, please contact us for a replacement copy.



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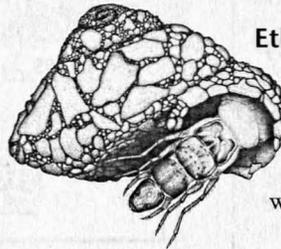


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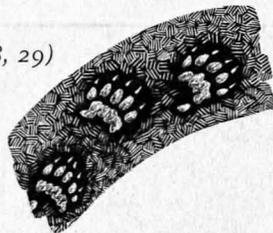
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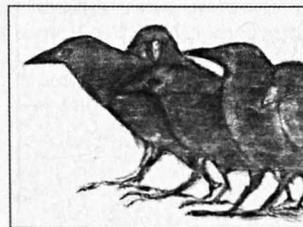
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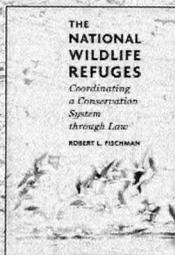
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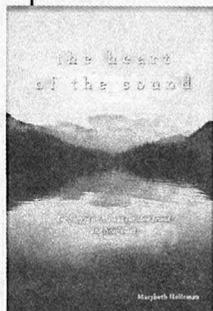
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PROFESSOR OF ECOSYSTEM MANAGEMENT,
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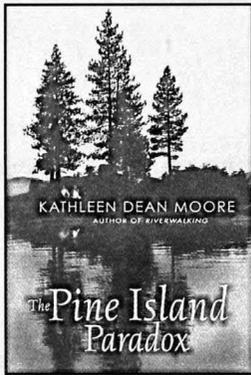
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The award-winning author of *Riverwalking* and *Holdfast*, Moore believes we live in a world of islands—both real and imagined—mapped out for us by generations of Western philosophers whose mission was, it seems, to steadfastly remove humans from nature. Through her signature essays about family vacations, wilderness adventures, and backyard gardening, Moore maps out a different philosophy about what it means to connect, to live in a culture where islands are truly linked beneath the surface. Moore's insights bring together the land ethic of Aldo Leopold with ideas about the bonds that support healthy human relationships.

BACK ISSUES

Thirty-three 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 2003-2004 • The National Wildlife Refuge System Barry Lopez and Sarah James on the Arctic Refuge, 100 Years of Wildlife Refuges by Steve Chase and Mark Madison, Theodore Roosevelt commentaries, Malheur National Wildlife Refuge history, The Crazy-Quilt Refuge System, interview with former USFWS Director Lynn Greenwalt, Wildlands on the Great Plains by Kathleen Dean Moore, forum on Trapping on National Wildlife Refuges, Pronghorn Race Extinction Across Sonoran Desert, Refuge Resources

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

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

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

Fall 2002 • Dave Foreman on overpopulation, Paul Hawken on Commerce and Wilderness, Jay Kardan on literary conservationists, John Elder descends into Darkness and Memory, interview with Mike Fay, John Terborgh asks whether the "working" forest works for biodiversity, Steve Stringham pleads 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

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Marking 40 Years for the Wilderness Act

www.wilderness.net A remarkable tool for wilderness activists and scholars, wilderness.net is a web-based clearinghouse that provides information about the National Wilderness Preservation System, links to agency offices, laws involved in designation of particular wilderness areas, a search function, discussion forums, and more. A special section on the 40th anniversary of the Wilderness Act includes a calendar.

www.wildernessforever.org In the countdown to the Wilderness Act's anniversary, look to this website to see how people nationwide are working to protect more of America's wild places. Read about wilderness heroes, sign up for the Campaign for America's Wilderness e-newsletter, download publications—and learn more about the upcoming Wilderness Week described below.

Wilderness Week Conservationists will converge upon Washington, D.C., to celebrate 40 years of the Wilderness Act, September 18–22, 2004. Share lessons from today's efforts to protect wild places and strategize about effective ways to preserve wilderness in the decades ahead through evening events, networking opportunities, and educational lunch sessions. An awards dinner on September 19 will honor wilderness champions of the past four decades. Groups are encouraged to organize a delegation to come to Washington and hold their own campaign-specific sessions, meetings with Members of Congress, and develop other events during the week. Contact Jen Schmidt at the Campaign for America's Wilderness (jschmidt@leaveitwild.org) or Melyssa Watson at the Wilderness Support Center (mwatson@frontier.net) for more information.

Wilderness Conference The 40th Anniversary National Wilderness Conference will convene in the Adirondacks, hiking ground of wilderness visionary Bob Marshall and writing place of Wilderness Act author Howard Zahniser. Held at the Silver Bay Conference Center in Lake George, New York, October 21–23, 2004, the conference will commemorate the Wilderness Act, focusing on the history, present-day realities, and future of the National Wilderness Preservation System. Sponsors include the Association for the Protection of the Adirondacks, Natural Resources Defense Council, and Wilderness Watch. Visit www.wilderness40th.org for more information.

Eastern Wilderness Conference To celebrate wilderness in the eastern U.S., a "Go Wild!" conference will be held at the University of Vermont, Burlington, Vermont, November 12–13, 2004. Conservationists, scientists, scholars, and artists will focus on the amazing story of wilderness recovery in the East as well as directions for ecological restoration. For more information, visit www.forestwatch.org or contact Mollie Matteson, mollie@forestwatch.org.

Forum on Wilderness The September 2003 issue of *The George Wright Forum* is devoted to "The Challenge of Wilderness Stewardship." Guest-edited by David J. Parsons and David N. Cole, the 96-page journal includes articles on ecological restoration in wilderness, wolf handling at Isle Royale, and cultural resource management in wilderness. The George Wright Society's mission is to advance the scientific and heritage values of parks and protected areas. For information, visit www.georgewright.org, email info@georgewright.org, or call 906-487-9722.

Action Booklet *Celebrating the 40th Anniversary of the Wilderness Act—With Action!* is available from the Campaign for America's Wilderness. This outreach guide presents ideas for celebrating the anniversary of the signing of the Wilderness Act in local communities, including a list of important dates leading up to the anniversary, tips on how to organize Wilderness Act events, instructions for contacting elected officials, suggestions for recruiting volunteers and building coalitions, and information on how to work with media. Visit the "Take Action" section of www.wildernessforever.org to download the booklet or call 212-645-9880 x17.

Wilderness Report Card The American Wilderness Coalition's *Wild Card: Wilderness Report Card 2004* provides a comparative analysis of the votes and positions taken by all Members of Congress on current wilderness and public lands issues. This thoroughly researched and well-designed booklet is a valuable tool for wilderness advocates as well as a resource for the general public. Visit www.americanwilderness.org to download the report card.

MEET ONE of the master masons of the insect world, *Helicopsyche*. These caddisflies build a snug, stone home—a helical case for protection in their larval state. This use of the helix is a spectacular innovation on the (ho-hum) straight tube designs that are characteristic of other species in their order, Trichoptera. Molluscs evolved a helical body design millions of years earlier than insects, but they secrete the shell—they are not builders! The *Helicopsyche* were some of the first species to *construct* a helix. These water-dwellers are born with silk glands and an innate ability to gather stones and fasten them into a helical case. Enterprising jewelers have exploited this behavior by raising caddisflies in captivity, with only ornamental pebbles and gems for building supplies, and turning the cases into earrings and other jewelry.

The helical stone case of *Helicopsyche* provides ballast, strength, camouflage, and it enhances respiration. *Helicopsyche* undulates its abdomen within the case, channeling water through the spaces and creating a constant flow of oxygenated water across the gills (which are located on the abdomen). The case is stronger than ordinary straight tubes—researchers found that despite averaging only 2.39 millimeters in height, cases could resist a crushing force of up to 1.3 pounds. Using this size-strength ratio, a similar case large enough for you to crawl in—say, three feet high—could withstand a crushing force of nearly 5,000 pounds! Caddisflies begin building cases as newborns and don't vacate them until after they pupate. They can make

Species Spotlight

minor repairs to a case but will not rebuild entirely; only young larvae are suited to handle the fine sand grains needed to build the apex.

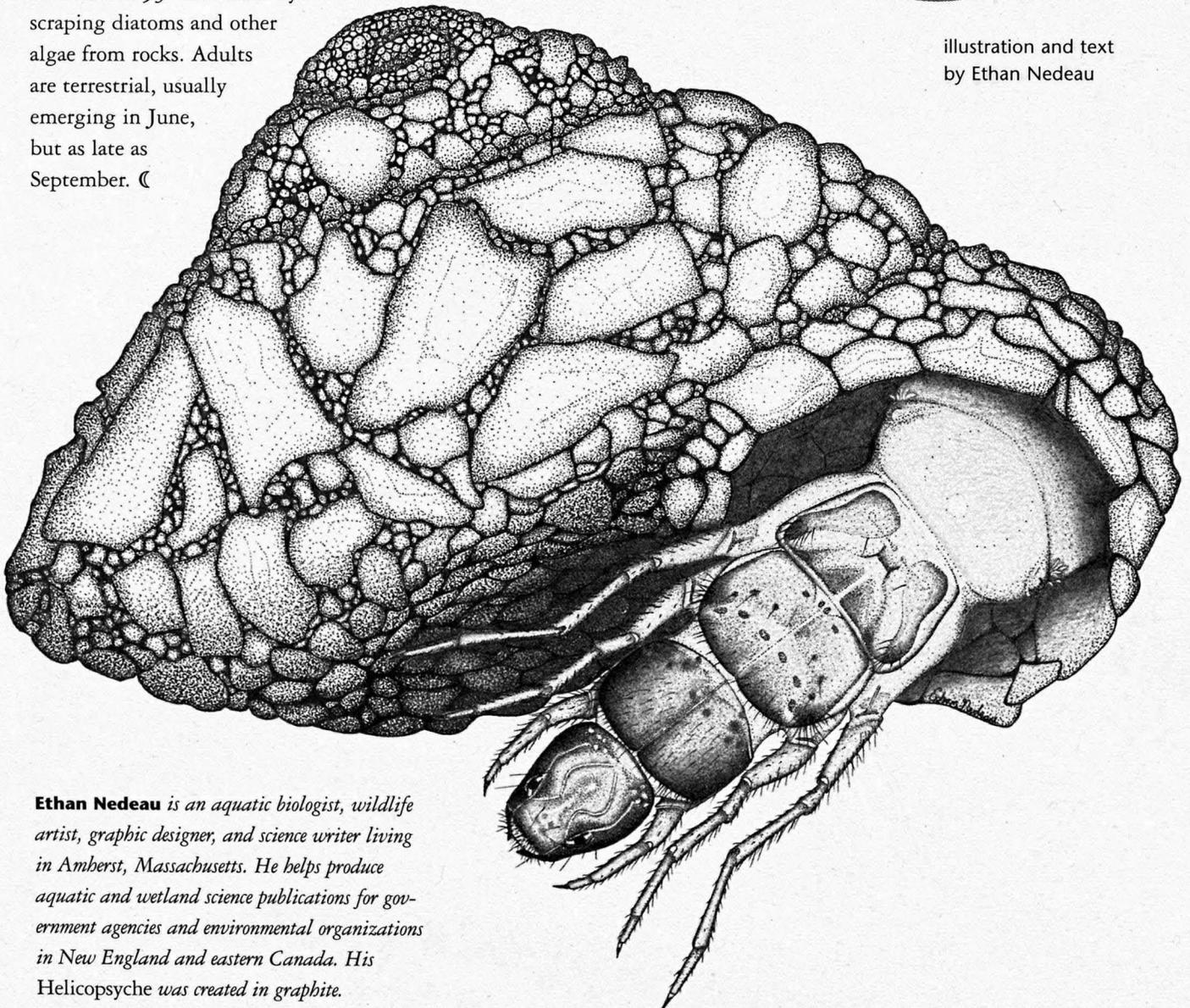
Fossil *Helicopsyche* have been found from the Eocene Epoch, 38–54 million years ago. Its global distribution suggests it was present on Pangaea before the great continental breakup. The genus *Helicopsyche* is comprised of about 100 species worldwide, though only four species are found north of Mexico, and only one species, *Helicopsyche borealis*, is widespread and common in northern North America. It inhabits small, clean streams and rivers, and sometimes, shallow lakeshores. It has been found in thermal springs in Wyoming in waters of 93° F. It feeds by scraping diatoms and other algae from rocks. Adults are terrestrial, usually emerging in June, but as late as September. ☺

Insect Stonemasons

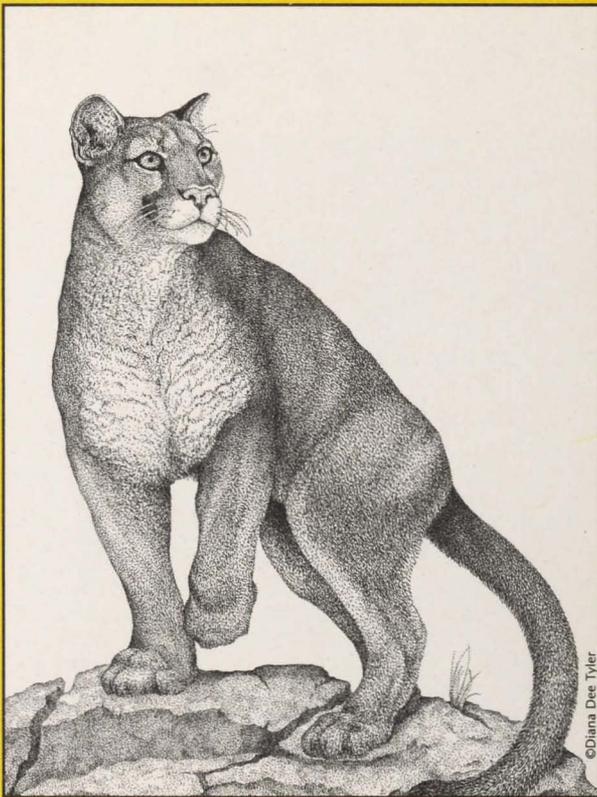
Caddisfly *Helicopsyche*

KINGDOM	Animalia
PHYLUM	Arthropoda
CLASS	Insecta
ORDER	Trichoptera
FAMILY	Helicopsychidae
GENUS	<i>Helicopsyche</i>
SPECIES	<i>borealis</i>

illustration and text
by Ethan Nedeau



Ethan Nedeau is an aquatic biologist, wildlife artist, graphic designer, and science writer living in Amherst, Massachusetts. He helps produce aquatic and wetland science publications for government agencies and environmental organizations in New England and eastern Canada. His *Helicopsyche* was created in graphite.



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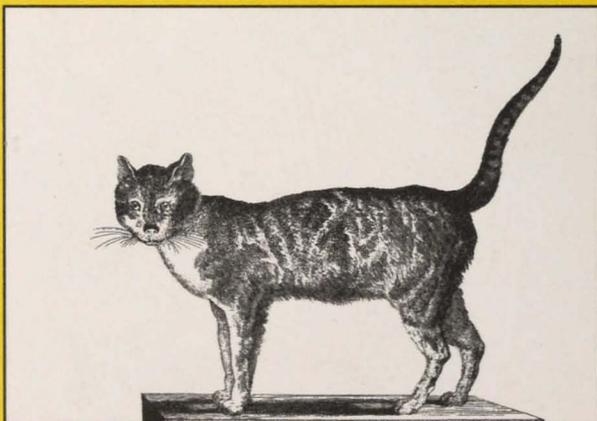
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