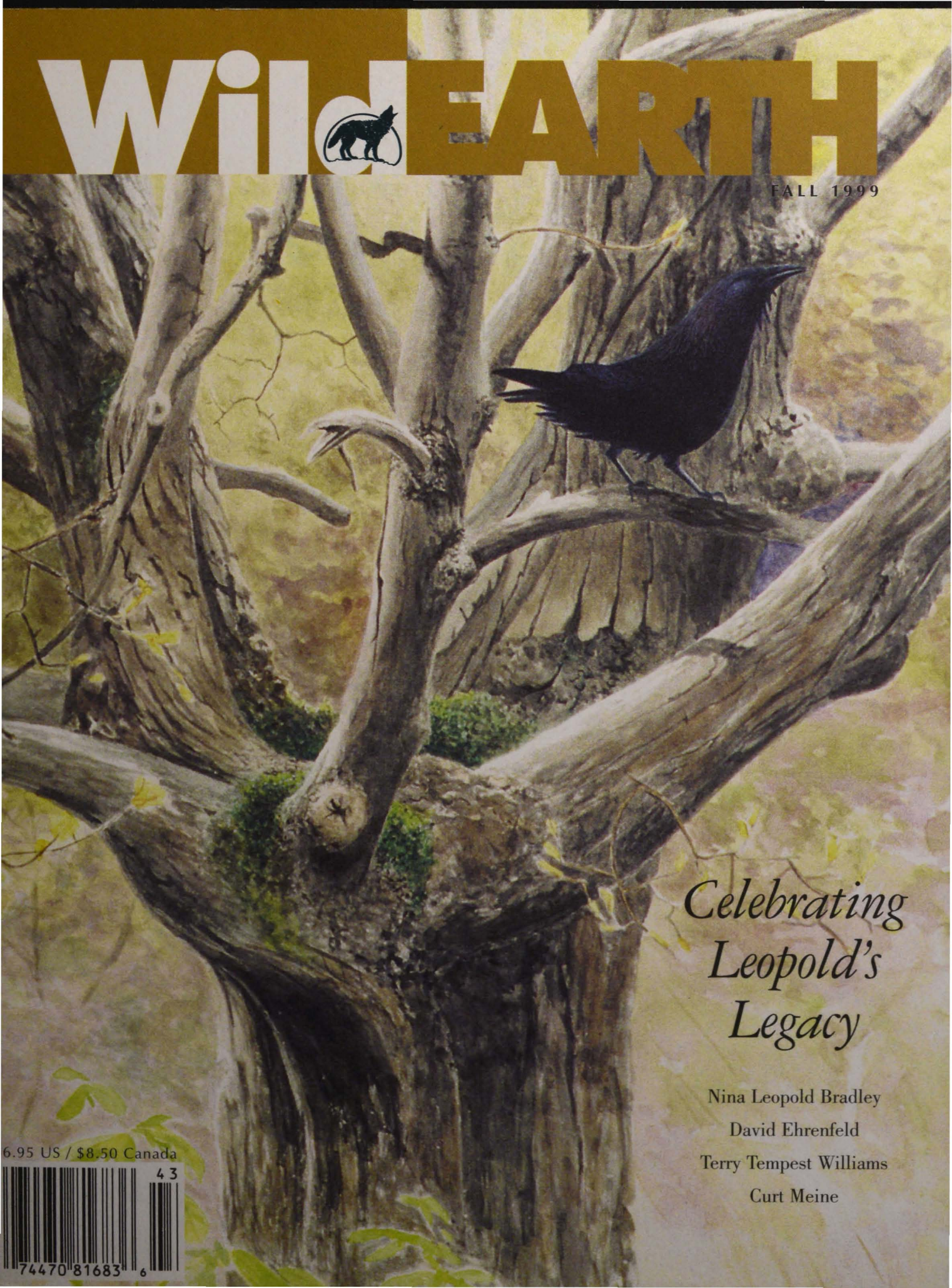
Wild EARTH

FALL 1999



Celebrating Leopold's Legacy

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6.95 US / $8.50 Canada

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Wilderness As a Land Laboratory

by Aldo Leopold

The recreational value of wilderness has been often and ably presented, but its scientific value is as yet but dimly understood. This is an attempt to set forth the need of wilderness as a base-datum for problems of land health.

continues on page 2

"Wilderness As a Land Laboratory" was first published in The Living Wilderness *(July, 1941), publication of The Wilderness Society, Washington, DC. It is reprinted here with permission of The Wilderness Society and the Aldo Leopold Foundation.*

illustration by Davis Te Selle

About Wild Earth *and The Wildlands Project*

Wild Earth is a quarterly journal melding conservation biology and wildlands activism. Our efforts to strengthen the conservation movement involve the following:

- We serve as the publishing wing of The Wildlands Project.
- We provide a forum for the many effective but little-known regional wilderness groups and coalitions in North America, and serve as a networking tool for wilderness activists.
- We make the teachings of conservation biology accessible to non-scientists, that activists may employ them in defense of biodiversity.
- We expose threats to habitat and wildlife.
- We facilitate discussion on ways to end and reverse the human population explosion.
- We defend wilderness both as concept and as place.

The Wildlands Project is the organization guiding the design of a continental wilderness recovery strategy. Through advocacy, education, scientific consultation, and cooperation with many regional groups, The Wildlands Project is drafting a blueprint for an interconnected, continental-scale system of protected wildlands linked by habitat corridors.

Wild Earth and The Wildlands Project are closely allied but independent nonprofit organizations dedicated to the restoration and protection of wilderness and biodiversity. We share a vision of an ecologically healthy North America—with adequate habitat for all native species, containing vibrant human and natural communities.

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cover art
"The Raven that Sang," (1999) watercolor by Bob Ellis

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WILD EARTH (ISSN 1055-1166) is published quarterly by the Cenozoic Society, Inc., PO Box 455, Richmond, VT 05477. The Cenozoic Society is a nonprofit educational, scientific, and charitable corporation. ■ Cenozoic Society Board: John Davis (CA), Barbara Dean (CA), Dave Foreman (NM), David Johns (OR), Reed Noss (OR). ■ Membership in the Cenozoic Society is open to the public and includes a subscription to *Wild Earth*. Non-membership and institutional subscriptions are also available. Individual memberships $25; low income memberships $15. Subscriptions to Canada and Mexico $30 per year, overseas subscriptions $45 (air mail). ■ Periodicals postage paid at Richmond, VT. ■ POSTMASTER: Send address changes to *Wild Earth*, PO Box 455, Richmond, VT 05477. ■ All editorial and membership correspondence should be sent to Wild Earth, PO Box 455, Richmond, VT 05477. We strongly discourage submissions of unsolicited manuscripts. We welcome submissions of artwork. Artists who want their work returned should include a stamped, self-addressed envelope. *Wild Earth* assumes no responsibility for unsolicited materials. ■ *Wild Earth* accepts limited advertising that is compatible with its policies and goals. For rates/information contact Lina Miller at (802) 434-4077. ■ *Wild Earth* is available on microfilm from University Microfilms, Inc., 300 North Zeeb Rd., Ann Arbor, Michigan 48106-1346. Statistical abstracting by Pierien Press, PO Box 1808, Ann Arbor, MI 48106. ■ Articles appearing in *Wild Earth* are indexed in *Environment Abstracts, Environmental Periodicals Bibliography, The Alternative Press Index* and *Wildlife Review Abstracts*. *Wild Earth* is printed on 100% PCW paper (cover and insert) and 50–100% PCW paper (inside), all processed chlorine-free.

Wilderness As a Land Laboratory *continued*

THE MOST IMPORTANT CHARACTERISTIC OF ORGANISM IS THAT CAPACITY for internal self-renewal known as health.

There are two organisms in which the unconscious automatic processes of self-renewal have been supplemented by conscious interference and control. One of these is man himself (medicine and public health). The other is land (agriculture and conservation).

The effort to control the health of land has not been very successful. It is now generally understood that when soil loses fertility, or washes away faster than it forms, and when water systems exhibit abnormal floods and shortages, the land is sick.

Other evidences are generally known as facts, but not as symptoms of land sickness. The disappearance of plant and animal species without visible causes, despite efforts to protect them, and the irruption of others as pests, despite efforts to control them, must, in the absence of simpler explanations, be regarded as symptoms of derangement in the land-organism. Both are occurring too frequently to be dismissed as normal evolutionary changes.

The status of thought on these ailments of the land is reflected in the fact that our treatments for them are still prevailingly local.

Thus when a soil loses fertility we pour on fertilizer, or at best alter its tame flora and fauna, without considering the fact that its wild flora and fauna, which built the soil to begin with, may likewise be important to its maintenance. It was recently discovered, for example, that good tobacco crops depend, for some unknown reason, on the pre-conditioning of the soil by wild ragweed. It does not occur to us that such unexpected chains of dependency may have wide prevalence in Nature.

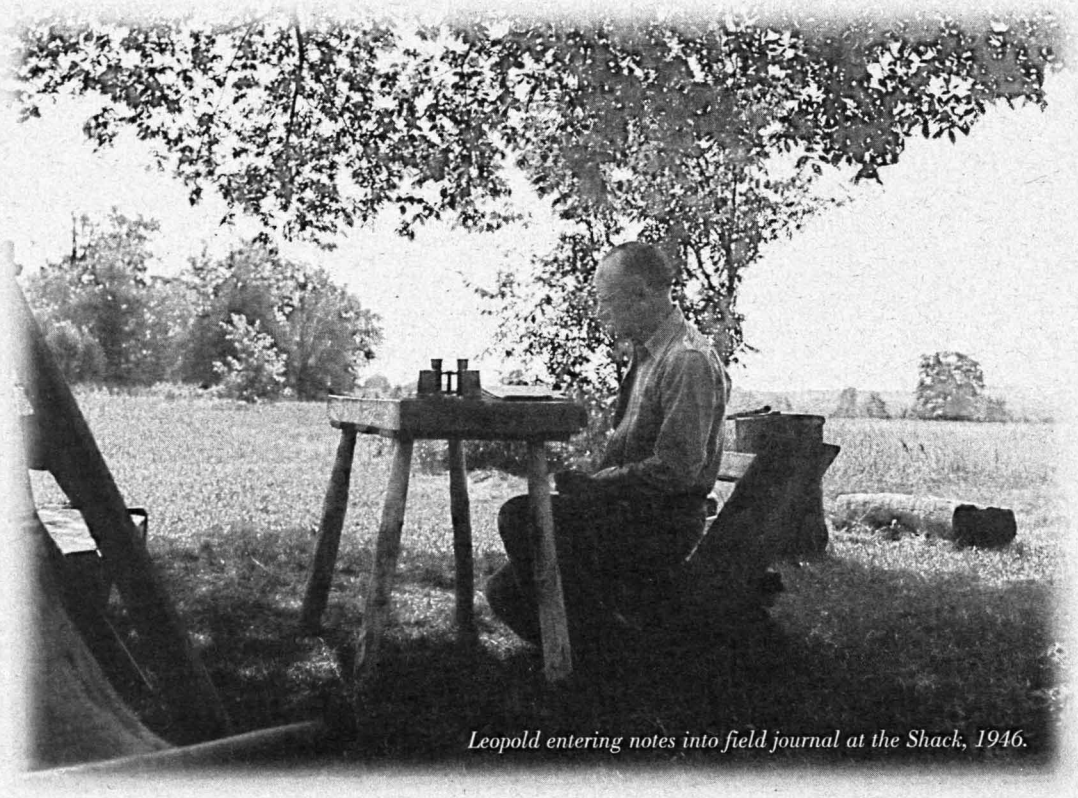
When prairie dogs, ground squirrels, or mice increase to pest levels we poison them, but we do not look beyond the animal to find the cause of the irruption. We assume that animal troubles must have animal causes. The latest scientific evidence points to derangements of the *plant* community as the real seat of rodent irruptions, but few or no explorations of this clue are being made.

Many forest plantations are producing one-log or two-log trees on soil which originally grew three-log and four-log trees. Why? Advanced foresters know that the cause probably lies not in the tree, but in the micro-flora of the soil, and that it may take more years to restore the soil flora than it took to destroy it.

Many conservation treatments are obviously superficial. Flood control dams have no relation to the cause of floods. Check dams and terraces do not touch the cause of erosion. Refuges and propagating plants to maintain animals do not explain why the animal fails to maintain itself.

In general, the trend of the evidence indicates that in land, just as in the human body, the symptom may lie in one organ and the cause in another. The practices we now call conservation are, to a large extent, local alleviations of biotic pain. They are necessary, but they must not be confused with cures. The art of land doctoring is being practiced with vigor, but the science of land health is a job for the future.

A science of land health needs, first of all, a base-datum of normality, a picture of how healthy land maintains itself as an organism.



Leopold entering notes into field journal at the Shack, 1946.

A SCIENCE OF LAND HEALTH NEEDS, FIRST OF ALL, A BASE-datum of normality, a picture of how healthy land maintains itself as an organism.

We have two available norms. One is found where land physiology remains largely normal despite centuries of human occupation. I know of only one such place: northeastern Europe. It is not likely that we shall fail to study it.

The other and most perfect norm is wilderness. Paleontology offers abundant evidence that wilderness maintained itself for immensely long periods; that its component species were rarely lost, neither did they get out of hand; that weather and water built soil as fast or faster than it was carried away. Wilderness, then, assumes unexpected importance as a land laboratory.

One cannot study the physiology of Montana in the Amazon; each biotic province needs its own wilderness for comparative studies of used and unused land. It is of course too late to salvage more than a lop-sided system of wilderness remnants, and most of these remnants are far too small to retain their normality. The latest report* from Yellowstone Park, for example, states that cougars and wolves are gone. Grizzlies and mountain sheep are probably going. The irruption of elk following the loss of carnivores has damaged the plant community in a manner comparable to sheep grazing. "Hoofed locusts" are not necessarily tame.

I know of only one wilderness south of the Canadian boundary which retains its full flora and fauna (save only the wild Indian) and which has only one intruded species (the wild horse). It lies on the summit of the Sierra Madre in Chihuahua. Its preservation and study, as a norm for the sick lands on both sides of the border, would be a good neighborly act well worthy of international consideration.

All wilderness areas, no matter how small or imperfect, have a large value to land science. The important thing is to realize that recreation is not their only or even their principal utility. In fact, the boundary between recreation and science, like the boundaries between park and forest, animal and plant, tame and wild, exists only in the imperfections of the human mind. ☾

Aldo Leopold (1887–1948) was one of the 20th century's foremost conservationists. Various conferences, books, and publications are celebrating his enduring legacy this year, the 50th anniversary of the publication of his classic work, A Sand County Almanac.

* Murie, Adolph. *Ecology of the Coyote in the Yellowstone.* Fauna series No. 4 of the National Parks of the United States. [Washington, DC: Government Printing Office, 1940.]

Photo by Carl Leopold Courtesy Aldo Leopold Foundation

I was struck by Monique Miller's comment in "Wild Earth Update," (winter 1998/99) that "Sometimes it seems that only a virulent airborne virus or some other equally cataclysmic event—by drastically reducing human numbers and our ecologically destructive activities—will end the current biodiversity crisis." Like many of us, I have speculated on this theme and have come to suspect that such an event is, unfortunately, probably in the near offing. Dense populations, the potential for rapid transmission, and the difficulty of control set the stage for tragedy. If something such as this does occur it will, as usual, fall most heavily on the very young, very old, and very poor. The horror of such an event is, however, almost incomprehensible. In addition, human diebacks, for whatever reason, often seem to be followed by substantial population increases.

Consequently, such a cataclysm would not likely work to "end the biodiversity crisis," but rather worsen it. The answer to ecological and environmental problems cannot be in this direction. I don't claim to have any substantive answers, but if a dieback is coming the only way such a massive tragedy will work in favor of biodiversity and a healthy future Earth is if it induces or is predated by a major shift in the ways in which we humans think about and relate to the rest of the Creation. If we are going to suffer a massive human population decline, we can't simply come out on the other end fewer in numbers but ready to repeat the cycle again. As you know, in the past, environmental degradation has been a major component in the decline and fall of many civilizations from the Near East to Central America. This time, however, Earth itself may well be, as far as humanity is concerned, "in the balance."

TOM BAUGH
Tucker, Georgia

I was sorry to read Carl Esbjornson's claim that "biocentrism" is an oxymoron because "the biosphere has no center" ("In Defense of Anthropocentrism: A Wilderness Proposal," spring 1999). Actually, the word denotes a centrality of human *concern*. It's about priority. That the biosphere itself has no actual center and the fact that it contains complexities "that humans cannot even begin to comprehend" are utterly beside the point.

There is pressing need for a word to express the granting by the human spirit of precedence to the global collective of life processes rather than to human interests. Whether by design or historical accident "biocentrism" has become that needed word, and because its use is on the increase its influence is spreading. While at first contact it may seem a trifle technical, it's really quite easy to explain, and one sees teenagers using it easily and with obvious appreciation for its intent.

Esbjornson's attempt at a semantic delegitimization of this perfectly valid word by manipulation of definition, and his division of the straightforward anthropocentric concept into "ideological anthropocentrism" (bad) and "biological anthropocentrism" (good), simply obfuscates. And when he writes that his "biological anthropocentrism, by necessarily including human beings, implies the end of the 'separate-but-equal' doctrine of wilderness that has driven much of wilderness thought in this century...," I hear the voices of J. Baird Callicott and William Cronon.

BILL WILLERS
Bill Willers is emeritus professor of biology at the University of Wisconsin at Oshkosh.

In the last paragraph of his essay, "Population Growth, Agriculture, and the Changing American West," (spring 1999) George Wuerthner writes that "Someday an astute demographer or biologist will calculate the minimum amount of land necessary to meet the vital needs (food, shelter, fuel, fiber) of Americans." He might like to know that the task has already been done, using the methodology of eco-footprinting. More specifically, the calculations are based on the data contained in *Ecological Footprints of Nations* (1997) by Dr. Mathis Wackernagel et al. The carrying capacity results, calculated by Andrew Ferguson of the Optimum Population Trust in the UK, are due to be published soon in the *Encyclopedia of Human Ecology*, chief editor Dr. Kenneth Watt, University of California.

The methodology is to calculate the number of people that the current national supply of ecologically productive land could *sustain indefinitely* when the people concerned are follow-

ing a specified lifestyle. For the USA, the results are as follows: (a) with present lifestyle, about 114 million; (b) with roughly half of present energy consumption, about 200 million; (c) with European levels of consumption and energy use reduced to a fifth of what it is today, about 254 million. Of course there is no space here to set out all the parameters needed to complete such calculations, but that is hardly necessary, since the results are so substantially at variance with Wuerthner's prediction that it would be possible to support—presumably he meant sustainably—270 million people on less than 20% of the nation's land base. His statement is in direct opposition not only to the aforementioned analysis, but also to the conclusion reached by David Pimentel, Mario Giampietro, and Sandra Bukkens in their 1998 paper, *An Optimum Population for North and Latin America*. Their estimate for North America was 200 million.

We have made comparable calculations for the 19 largest countries in Europe.

DAVID WILLEY
David Willey is Chairman of the Optimum Population Trust, United Kingdom.

George Wuerthner responds: *I am very pleased to read David Willey's letter and to know of the Optimum Population Trust's (OPT) useful efforts to calculate sustainable human population levels. Mr. Willey questions my assertion that it's likely the US population could be supported on 20% of its land area and suggests it would take nearly all of our land base to support the US population at even the more modest European levels of consumption and energy use. Since I haven't seen the studies he cites, I can't respond directly to them; however, I believe one reason for our different conclusions is our basic assumptions. I presume that the OPT figures are based on meeting all resource "needs" at current levels of consumption, including energy, fiber, water, land for urbanization, etc. I was talking specifically about the amount of land necessary to* grow food only.

Secondly, to speculate that we might grow all the food we need on a fraction of our land base assumes a relatively meat-free diet—not maintaining the status quo. Most US farmland currently grows livestock forage, not food for direct human consumption. All the nation's vegetables (not counting home garden plots) are grown on less than three million acres of land. Fruits and orchards occupy another five million acres. By comparison, we use more than 75 million acres growing corn, another 74 million on sorghum, and 60 million just growing hay—nearly all of which are fed to domestic livestock. A substantial proportion of wheat and other grain output is also consumed by livestock. All of this crop production requires a huge input of energy in the form of gasoline, fertilizers, and petroleum-based pesticides—so a substantial percentage of our energy "needs" could also be eliminated by a change in diet.

In addition to the agricultural lands we use to grow crops consumed by livestock, another 300 million acres of public land are grazed by livestock, and hundreds of millions more acres in private ownership are used for livestock pasture and rangelands.

Third, much of the current land base used for agricultural production is very marginal; perhaps it was not even included in OPT calculations. Vast areas of the arid public lands now used for grazing can annually support only one cow per 100–250 acres, compared to one cow per acre in moist landscapes in the eastern United States. Eliminating livestock from these arid lands would barely affect food production, but would free up hundreds of millions of acres for wildlife habitat and primitive recreation.

Although it's difficult to get concise figures (and I am trying to nail these down), it appears that Americans may use more than a billion acres of our country growing livestock forage and for grazing by domestic livestock. Thus, it is not unreasonable to believe that a reduction in meat consumption—particularly beef—would free up huge acreages for rewilding. This alone would be a tremendous step toward ecological recovery, even if not addressing comprehensively the other problems associated with our tremendous consumption and waste of resources so well documented by OPT and others.

At a time when most Americans are in denial about the extinction crisis we are precipitating, and when too many conservationists still argue over issues we should have settled years ago (should we end commodity extraction on public lands? of course we should…), Paul Martin and David Burney do us a great favor by sparking debate over whether we ought to reintroduce elephants to North America ("Bring Back the Elephants!" spring 1999). The Overkill Hypothesis is probably right, alas, but trying to correct our greatest Paleolithic sin by bringing African or Asian elephants (or any other species that belongs in Africa or Asia or Australia or anywhere else outside our continent) to North America could be a mammoth mistake—or, *less* likely, could be a great gain for the natural world. Here are the positive and

the negative aspects of the overcompensation program, as I see it.

Positive

1) Martin and Burney's proposal challenges us to take the long view; in evolutionary time, the Pleistocene ended but an eyeblink ago.

2) Martin and Burney implicitly, and Connie Barlow more explicitly ("Rewilding for Evolution," spring '99), advance an evolutionary argument for Nature preservation—for big Wilderness.

3) The Overkill Hypothesis educates people about extinction, *Homo sapiens*' propensity to kill more than necessary, evolution, floral dynamics (if they keep reading), and the urgent need for large-scale wildland protection and recovery—all crucial matters that our nation's leading presidential candidates for 2000 seem studiously to be avoiding. (Which brings to mind the question, can Dan Quayle spell "proboscideans"?)

4) Elephants might do substantially less ecological damage than do the cows and sheep that now overrun most land in the American West, and many lands in the American East.

5) Elephants might trample the cows and sheep....

Negative

1) If wildlife advocates were to divert much of their attention to bringing back the elephants, high-priority wildlife needs might go unmet; let's restore all the mammals we've extirpated in the last 500 years before we try to "restart evolution" of animals that our forebears exterminated 10,000 or more years ago, especially if plant communities have evolved in the absence of the megafauna since then.

2) Were we to import African or Asian elephants (or other species from other continents), we'd also import their commensal species. Any large species comes with a whole host of parasites. Even while overcoming our bias against parasitic arthropods, let us beware that any microfaunal species that we bring into North America could wreak havoc on native species.

3) The species being proposed for entry into North America have never been here before (evolutionarily speaking). African and Asian elephants deserve our utmost concern and veneration; but they do not belong in North America.

4) Advocating a biota that has not existed for at least 10,000 years, and unfortunately can never again be wholly represented, may blur the benchmark. Conservation biologists and wildland advocates have largely agreed on the "pre-Columbian" landscape of half a millennium ago as a target for our wildlife protection and recovery efforts. This is a relatively clear, comprehensible baseline and, arguably, a plausible goal—unlike the goal of restoring the pre-Pleistocene biota. Plus, were we to switch to a more ancient benchmark, we might find ourselves on a technological slippery slope. Should we try to recreate extinct species through genetic engineering, or biotechnology? I'd say genetic engineering is way too dangerous a technology to ever safely employ.

5) Efforts to create or recreate ecosystems we've never really known perpetuate our deadly penchant for meddling. Until people accept that *Nature knows best*, until we learn to simply let Nature be—and become ourselves just plain members of the biotic community, as Aldo Leopold poetically put it half a century ago—we'll be stuck in the same manipulative mindset that is causing the extinction crisis.

Let's bring back the bison, gray wolf, red wolf, eastern cougar, lynx, wolverine, woodland caribou, salmon, darters, mussels, crayfish, orchids, lilies, and other wildlife that we European Americans have extirpated during our misspent youth in North America, as we try to mature into good (plain) biotic community members. Let's let the poor pachyderms be. Our goal should be recovery as near as possible to the wild wonderful landscape American Indians were inhabiting and Europeans stumbled onto 500 years ago. Yes, the lands of 20,000 years ago, before the overkill by early human hunters, were wilder and more wonderful still; but let's be reasonable and settle for 500 years of atonement.

JOHN DAVIS

John Davis is Biodiversity and Wilderness Program Officer at the Foundation for Deep Ecology, San Francisco, California.

I am fortunate to be a teacher of children, a position in which I have the privilege of seeing the truth of Sam Hitt's assertion that a shift in values is taking place in this country, a shift toward a more biocentric worldview ("Biocentric Values Go Mainstream," spring 1999). To my view, however, what our society is experiencing is not so much a *shift* in values, as much as it is a realization that we must *hold on* to the values that each and every one of us was born with.

Children have an innate awe of the wild world; they are born with a humility toward it; they are eager to learn about and experience it.

Unfortunately, there are overwhelming and pervasive influences in our society that, with unbelievable swiftness, can snuff out children's curiosity and respect for the natural world. The villains are familiar to all of us: TeeVee, consumer culture, economic pressures on families, the tyranny of business and industry in our lives.

I am troubled, however, by the zealotry of many who believe that combating these villains depends on legislation and regulation. Many of the remedies being proposed to "steer our culture" include outlawing certain behaviors and products, and using the power of the state to punish violations. I see little resistance to this dangerous trend toward increased regulation, legislation, stipulation, legalization, illegalization, and categorization of every human activity.

We certainly need legislative efforts to protect physical Wildernesses (capital "W"). But there is more—so much more—that we can do to restore the cultural and spiritual wilderness values that our country was built on, that Thoreau and Muir and Leopold taught us is the fountain of our freedom, and that all Americans inherently possess. Such a wilderness (small "w") is not as much a physical place as it is a spiritual place. It is the place where we hone our innate wilderness skills of knowing the limits of our bodies and limitlessness of our minds. It is the place where we are humbled by powers much greater than ourselves; the place where we learn to love and be loved.

We were all, as children, deeply immersed in this wilderness. And we can all return there.

CINDY GRAY
Portola, California

The Golden Book Encyclopedia

In a hundred years, the child will still have pictures,
only the colored ink denoting extinction
will have risen; true frogs, newts, spadefoots, toads
will join the eryops and other ancient forms.

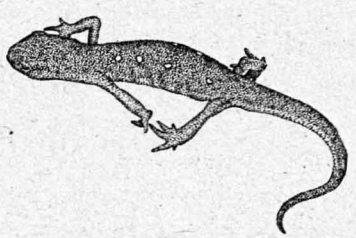
And the child will gaze at the back of the slimy
salamander, run his finger across the slick-
skinned page, study the bulging amphibian eyes.
He'll be told how the bogs were filled once with croaking

frogs in evenings, and how the small
brown-green bodies would dart about, not
always eluding the hands of the agile
children. He'll have to imagine what delight

such a palm-hold held: wet pulse of a life
that offered an eon, a length of time

far greater than this brief period locked
in the sterile pages of a hard-bound book.

—Anne Coray



©Diana Dee Tyler

red-spotted newt by D.D. Tyler

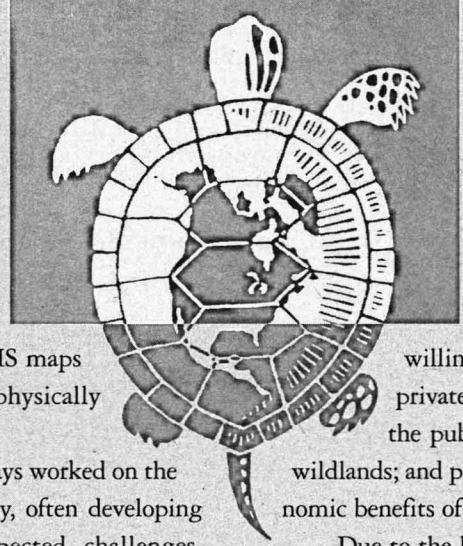
ERRATUM *Geographically astute readers may have noticed a* non sequitur *in last issue's species spotlight on the green sea turtle. A passage noting the species' status—listed by the US Fish & Wildlife Service as Threatened, except for Florida and Mexico populations that are considered Endangered—was altered by a typing glitch that inserted the word "New" before "Mexico." New Mexico, a landlocked state, would indeed be a tough neighborhood for sea turtles.*

CONGRATULATIONS
to Eric and Sue Anderson of Custer, Wisconsin, who won the Davis Te Selle lithograph, "Table Rock—November." The lucky winners entered the drawing by sending a Wild Earth *gift subscription to a neighbor. Thanks to everyone who participated.*

The Wildlands Project

Update

BY STEVE GATEWOOD AND KIM VACARIU



As autumn heralds another harvest season, years of determined reserve design work by several groups cooperating with The Wildlands Project (TWP) are coming to fruition. State-of-the-art reserve designs for landscapes in Oregon, the Yukon, Grand Canyon country, British Columbia, Maine, and the Sky Islands of Arizona and New Mexico are nearing public release.

While the first crop of such proposals undergoes expert scientific and social review, questions persist about what actions will be necessary to transform GIS maps and reams of scientific documents into physically protected wildlands.

Wildlands reserve designers have always worked on the leading edge of conservation methodology, often developing new techniques in response to unexpected challenges. Charrette-based vision mapping and use of focal species, once novel concepts for regional conservation planning, are now becoming accepted tools thanks to the work of TWP staff, cooperators, and scientists across the continent. With implementation at hand, the same spirit of innovation must now address a new and different kind of landscape.

Current reserve mapping projects are already adapting to the need to incorporate implementation strategies. Together, reserve maps and proposed implementation steps form a *conservation plan*, a holistic document that lives on a basic diet of defensible science, but also must thrive in a world of helter-skelter social, political, and economic interactions.

So how are these organic documents actually brought to market? Following expert review and final editing, conservation plans may include hundreds of pages of text, maps, charts, graphics, and photos. The full-length versions will be distributed to local, state, and federal land management agencies, and to other key nongovernment organizations and individuals wishing to comment on the plan.

A condensed summary of each conservation plan will be published for distribution to the media and public via mail, meetings, open houses, presentations, and other outreach opportunities where local spokespeople can articulate our wildlands recovery vision. Whether this "delivery process" is handled by a "wholesaler"—an entity skilled at marketing such products—or directly by reserve design groups will be decided by the principal cooperators involved.

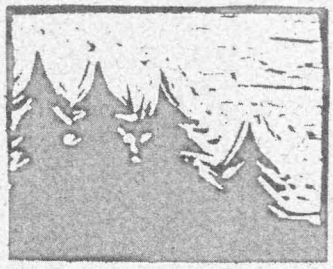
Dave Foreman's analogy comparing this process to assembling a jigsaw puzzle is apt. The picture on the cover of the puzzle box represents the fully implemented conservation plan. Each piece of the puzzle is laid down by a different player, including government agencies, land trusts, private individuals, conservation groups, and others. Pieces of the puzzle include: enlarging Wilderness Areas; changing public lands management; adopting local zoning and planning regulations; protecting private lands via voluntary conservation easements; purchasing key private lands from willing sellers; finding incentives for managing private lands to protect native species; educating the public about the social benefits of protecting wildlands; and promoting community awareness of the economic benefits of safeguarding Nature.

Due to the large number of puzzle pieces, and the fact that each piece will be laid down using a variety of implementation "tools" (science, education, letter-writing, lobbying, legal work, fund-raising, tax incentives, etc.), full implementation of conservation plans will take several decades, with some land protected relatively quickly and other types of protection accomplished much later. This year's initial crop of regional conservation plans will set the stage for TWP's next challenge: defining markets and marketability.

JUST AS THE SEASONS CHANGE, so too does the face of The Wildlands Project. TWP recently welcomed new additions to the board of directors, including William Meadows, Michael Phillips, and Gary Tabor. Leaving service on the board, with our gratitude, are Reed Noss, Libby Ellis, and Mitch Friedman. In addition, this will be the last update I write as Executive Director, as I will be leaving TWP at the end of October. It has been a wonderful experience to work with such an amazing group of people for the past several years. The staff and board, our contractors, Wild Earth, cooperating groups, and the many foundations and individuals who have supported our ambitious work will continue to hold a special place in my life. As I move on to new conservation challenges, I remain committed to the TWP vision. I'm sure we will continue to cross paths as the rewilding of North America unfolds, but for now my deepest thanks go out to all who have blazed the path this far.

Steve Gatewood is executive director and Kim Vacariu is communications-outreach director for The Wildlands Project.

A Wilderness View



Leopold's Legacy

Arguably, *Wild Earth* has become the preeminent forum for dialogue on the current health and future direction of the American wilderness movement. A sustained and sophisticated discussion of where that movement is and where it's going would be impossible, of course, if it were uninformed by history. Thus in these pages one often finds references to pioneering conservationists; a quick look through the *WE* backlist turns up recent articles about Benton MacKaye, Rosalie Edge, Howard Zahniser, Ernie Dickerman, and Margaret Murie.

These figures, along with many others of greater or lesser renown, and a few more famous individuals with names like Thoreau, Muir, Marshall, and Carson, laid the cornerstones and first courses of the edifice that is American conservation—both the actual terrain comprising our systems of public and private protected natural areas, and the cognitive terrain, the way we think about the land that makes affection for living Nature and action on its behalf an honorable American tradition. Aldo Leopold (1887–1948) sits in the front pew of this great temple.

This year, the fiftieth anniversary of the publication of his classic work, *A Sand County Almanac*, Leopold's legacy is being widely celebrated in journal and magazine articles, with academic conferences, and in two superb forthcoming books: *The Essential Aldo Leopold: Quotations and Commentaries*, edited by Curt Meine and Richard Knight (University of Wisconsin Press), and *For the Health of the Land: Previously Unpublished Essays and Other Writings*, by Aldo Leopold, edited by J. Baird Callicott and Eric Freyfogle (Island Press). Is all this hoopla warranted? Absolutely. A half century after his death, Leopold continues to exert a powerful, and still growing, influence on people who love the land, and thereby on the land itself.

There are as many reasons to value Leopold's legacy as there are conservationists. Wilderness lovers, hunters and anglers, ecologically minded farmers and ranchers, and restorationists are all in his debt; various biological disciplines, including wildlife management, ecological restoration, conservation biology, and landscape ecology, are, to a greater or lesser degree, his intellectual spawn. Like the Bible, the canon of Leopold's writings can give aid and comfort to many camps.

If there is a central truth to be distilled from Leopold's expansive body of thought, perhaps it is this: To think well about land use and land health, one must think expansively. Nina Leopold Bradley, writing in this issue [Aldo Leopold: On the Path Toward Unity of Knowledge], suggests that the formidable challenges facing our society will be addressed effectively only by people and institutions that avoid reductionism. Her father's work, she notes, reflects a broadly integrative, interdisciplinary approach that "...brought together Nature and culture, emotion and intellect, philosophy and science, ethics and aesthetics."

As we celebrate Aldo Leopold's life and work—looking back across the decades at a man who, long before such ideas would become popular, articulated the ecological and evolutionary basis for wilderness preservation; the social value of wild country for recreation and spiritual sustenance; and the practical and moral necessity of expanding our ethical concern to the larger biotic community—it is ironic that we yet remain behind him, trailing in his shadow. Whether one thinks of him horseback, meandering through stately ponderosa pines in the Gila, or striding across a used-up farm field, shovel and seedling in hand, or paddling a canoe through singing waters, Aldo Leopold is always out in front, leaving those of us in his wake to emulate his confident stroke, and watch the swirling eddies dance off his paddle blade. We hear his words of encouragement—to soak in the sights of Nature, to view the landscape we travel through with scientific rigor and kindly affection—and we paddle harder, trying to catch up.

—TOM BUTLER

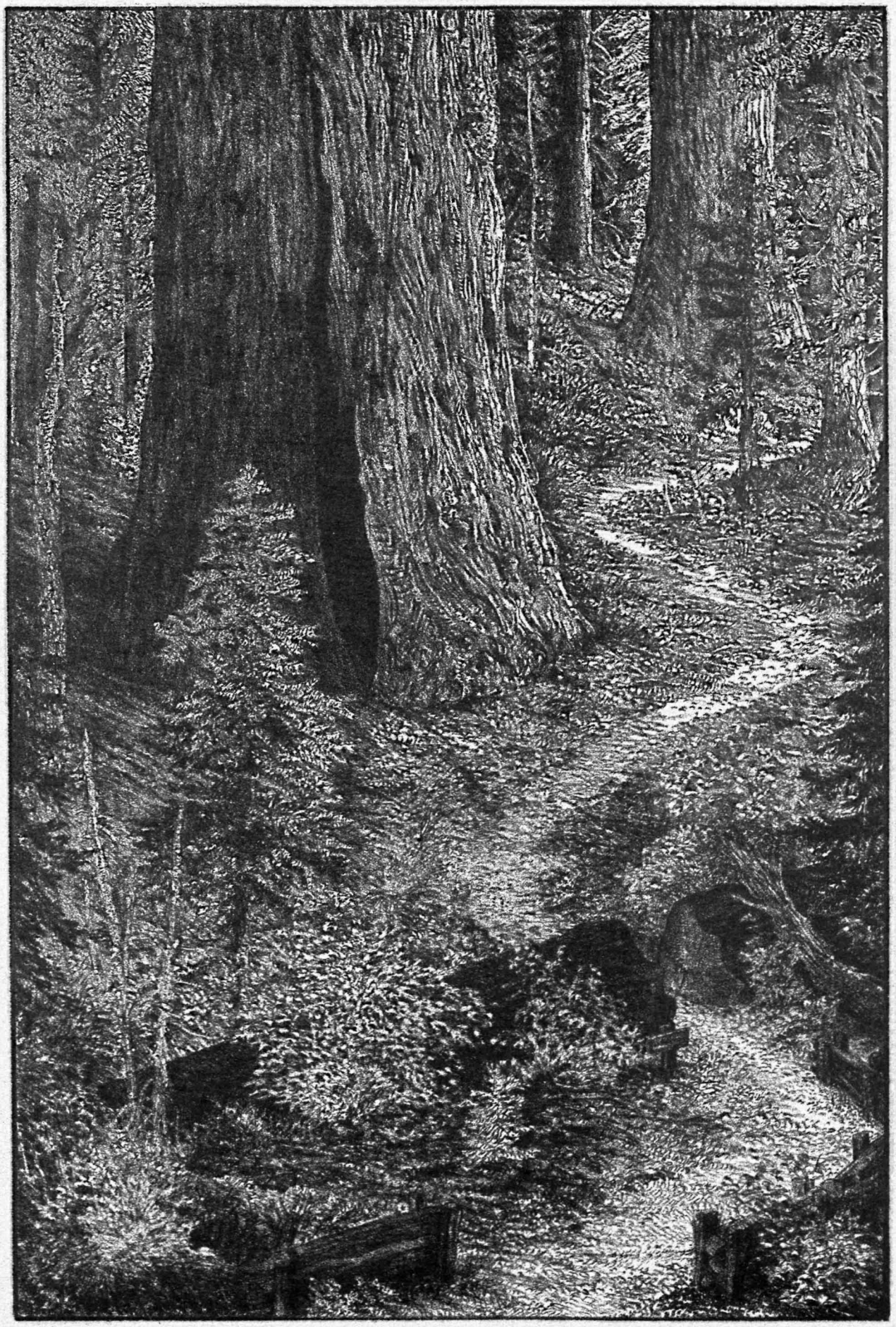


illustration by Davis Te Selle

Aldo Leopold

On the Path Toward Unity of Knowledge

by Nina Leopold Bradley

Today we have begun to understand that solving problems of land use and land health necessitates connecting theory, knowledge, and practice across many disciplines.

Yet we also see two powerful trends occurring in science: evolution toward specialization and an increasing focus on microscopic and sub-microscopic levels of biological organization. As revealing of Nature as these trends may be, there is something missing. For example, we know that to understand the processes and ramifications of global climate change, we must integrate the knowledge of paleo-climatologists, wetland ecologists, geo-morphologists, agronomists, and atmospheric chemists—all at a macro level.

Would, then, our understanding be complete? No. There is still something missing. We would need also to consult economists, social historians, political scientists, and even humanists. Because, as we understand the mechanics of climate change and humanity's role as a causing force, we must make judgements about what we should *do* as well as what we understand.

C.P. Snow wrote in 1959 that the polarization between the sciences and the humanities "is sheer loss to us all...it is at the same time practical, intellectual and creative loss." In his important book *Consilience* (1998), E.O. Wilson attempts to draw together the sciences and the humanities. He suggests that in order to understand our planet as a unified entity, and to meet the challenges of international environmental issues, we must integrate knowledge from what may appear to be far-flung fields. He appeals for a powerful conservation ethic as a part of ecology and even as a part of religion. He calls for a return to the idea of unification of knowledge.

I believe that my father, Aldo Leopold, integrated a remarkable range of knowledge—scientific, literary, biologic, and poetic. While in Germany in 1935 he expressed his concern about the ongoing fragmentation of knowledge and the need for more interdisciplinary thinking. Sitting in a Berlin hotel room one evening, Leopold jotted down some notes on the back of a piece of hotel stationery. He expressed his concern over the compartmental tendencies in ecology:

> *One of the anomalies of modern ecology is that it is the creation of two groups, each of which seems barely aware of the existence of the other. The one studies the human community almost as if it were a separate entity, and calls its findings sociology, economics, and history. The other studies the plant and animal community and comfortably relegates the hodge-podge of politics to the 'liberal arts.' The inevitable fusion of these two lines of thought will, perhaps, constitute the outstanding advance of the present century.*

Let us consider some of the reasoning and experiences in Leopold's life that contributed to his aspirations, his hopes for this "fusion" of disciplines, which he anticipated to be the "outstanding advance of the present century."

Throughout Aldo Leopold's life he persisted in his personal, intellectual struggle to better understand the land community and his own participation in it. Recording and integrating all the strands of his own first-hand experience, blending ecological science with philosophy and even with biblical history, he came to his final statement of the land ethic, a product of the heart as much as of the mind. With his use of the words *loved* and *respected* we can already see that he was integrating science with a broader humanism: "That land is a community is the basic concept of ecology, but that land is to be loved and respected is an extension of ethics."

In tracing Leopold's love of the outdoors, I have reviewed many of his letters. The outpouring of correspondence to his family in Burlington, Iowa, began at Lawrenceville prep school in New Jersey (1904–1905) and would not let up until long after his college days. Sent off at a rate that sometimes reached four or five letters a week, Aldo's writing was his reprieve from school work, his literary training ground, his naturalist's notebook, and his private connection to his family. From Aldo's letters home we feel a strong family bond which sustained him with caring and love.

Aldo's letters allowed him to explore and express his absorbing relationship with Nature. They became a regular chronological record of the natural events of the seasons. He took any opportunity to put down on paper his thoughts on natural history, sportsmanship, and humanity's relation to land, including the animals and plants that grow upon it. He learned to write by writing. His sensitivity to land health and to biological interconnectedness increased with the volume and quality of his observations. And I suspect that the blend of keeping records and his expanding writing skills made him ready to introduce the sweeping demands of ethics as a part of his definition of how people should cherish and care for the land. In this spirit Leopold wrote: "Keeping records enhances the pleasure of the search and the chance of finding order and meaning in these events."

In 1945, near the end of his life, Aldo published a phenological record from his 13 years on his sand county farm. The published paper expressed new dimensions in his depth of understanding:

> *Many of the events of the annual cycle recur year after year in a regular order. A year-to-year record of this order is a record of the rates at which solar energy flows to and through living things. They are the arteries of the land. By tracing their responses to the sun, phenology may eventually shed some light on that ultimate enigma, the land's inner workings.*

I believe that my father, Aldo Leopold, integrated a remarkable range of knowledge—scientific, literary, biologic, and poetic.

Aldo Leopold realized in 1947, and today we know even more clearly, that phenology is a powerful tool for monitoring the biotic response of plants and animals to weather and to climate fluctuation, yielding a glimpse into "the land's inner workings."

Leopold in the Rio Gavilan, 1930 (left); in Germany, 1935 (above); and in his Lawrenceville days, 1905.

Photos courtesy Aldo Leopold Foundation

As science begins to reveal the complexity of natural systems, the field of ecology is maturing, helping to describe the entwined hormonal, metabolic, and genetic components that regulate how plants, animals, soil, water, etc. operate as a community—as a web of interdependencies. The renewed sense of interconnectedness with Nature also expands the complexity with which individuals must appraise their role in the new environmentalism. That role is not merely technical; it involves judgements of right and wrong. Again I quote from Leopold (1935):

> *...just as important as the origin of plants, animals and soil is the question of how they operate as a community. Darwin lacked time to unravel any more than the beginnings of an answer. That task has fallen to the new science of ecology, which is daily uncovering a web of interdependencies so intricate as to amaze—were he here—Darwin himself, who of all men should have the least cause to tremble before the veil.*

Leopold was appalled by the highly artificial management system of the German landscape. In the slick, clean, simplified forests, he detected not the lack of wilderness *per se*, but the lack of wildness and biodiversity:

> *The forest landscape is deprived of a certain exuberance which arises from a rich variety of plants fighting with each other for a place in the sun. It is almost as if the geological clock had been set back to those dim ages when there were only pines and ferns. I never realized before that the melodies of nature are music only when played against the undertones of evolutionary history. In the German forest one now hears only a dismal fugue out of the timeless reaches of the carboniferous.*

Leopold realized that the German forests were an example of "pure...economic determinism as applied to land use." Germany was striving for maximum yields of both timber and game—and got neither. The intricate ecological processes of Nature had been overlooked, and greatly diminished.

In the 1930s Aldo visited the Rio ilan in northern Mexico. This river still ran clear between mossy, tree-lined banks. Wildfires burned periodically without any apparent damage, and deer thrived in the midst of their natural predators, wolves and mountain lions. "It is here," Leopold reflected years later, "I first realized...that all my life I had seen only sick land...here was a biota still in perfect aboriginal health."

In my father's essays we hear an emotional thread of *consilience.* He brought together Nature and culture, emotion and intellect, philosophy and science, ethics and aesthetics.

The vital new idea for Leopold was the concept of biotic health, a shift from the older conservation idea of economic biology, to a new biotic ecology. Here was a biota so complex by interwoven cooperations and competitions that "no man can say where utility begins or ends." This marks a new maturity in Leopold's thinking—"a fountain of energy flowing through a circuit of soils, plants, and animals." With this experience, he gained a new humility about the possibility of ever understanding how the whole system functioned. He realized that science leads to structural understanding, and with luck this may result in a stronger basis for an ethic.

Aldo Leopold's land ethic expresses a moral theory that begins, literally and philosophically, with what we know best—direct experience. Through his own participation in the land community, he came to a deeper personal understanding and appreciation of the land community. On his Wisconsin sand county farm, the Shack, he struggled to rebuild a diverse, healthy, aesthetically satisfying biota on land that had been abused and degraded. Here again, Leopold experienced a profound humility as he became acutely aware of the complexity of factors involved in life and death, growth and decay. Ethical and aesthetic values guided his decisions.

At the Shack, Leopold's wisdom grew as his scientific knowledge was nourished by personal contact with the soil. And probably most important, Aldo Leopold's land ethic was nourished by loving human relationships with his wife and family—loving and being loved, living in webs of relationships that defined and sustained him. He wrote, "There are two things that interest me, the relationship of people to each other and the relationship of people to land."

Leopold had a remarkable perception for unraveling and dramatizing natural events. He articulated the concept of land health and the relationships between economics, biology, and aesthetics—a tangled web of relationships: "A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise."

As Leopold's voice emerged, "Marshland Elegy" was a breakthrough essay in terms of conservation writing. It introduced a sense of drama and poetry into ecological imagery:

> *A dawn wind stirs on the great marsh. With almost imperceptible slowness it rolls a bank of fog across the wide morass. Like the white ghost of a glacier the mists advance, riding over phalanxes of tamarack, sliding across bog-meadows heavy with dew. A single silence hangs from horizon to horizon.*

In a splendid essay reviewing "Marshland Elegy," Curt Meine noted that "This was not the language of science, or policy, or pedagogy, or philosophy, although strong undertones of these hummed in, and in between, the lines. Rather, this voice carried a 'certitude' not unlike that of the cranes of which he wrote." In my father's essays we hear an emotional thread of *consilience*. He brought together Nature and culture, emotion and intellect, philosophy and science, ethics and aesthetics.

The renewed sense of interconnectedness with Nature and the willingness of individuals to act on that basis may be the core of the new environmentalism. Conservation issues are no longer narrow and vague. They are as broad as human population growth, climate change, and the global extinction crisis—and as personal as pollution in our backyards and chemical residues in our food. We know that environmentalism is more than a problem of chemistry, biology, or economics.

Progress toward more integrated learning may expand our ability to recognize and act upon our moral responsibility to the future. In 1947, Aldo Leopold defined the necessity for the integration of a wide span of knowledge, leading to humanity's ethical relation to the land. In the subsequent 50 years, others have refined such statements and have helped to reinforce the need for a unity of knowledge.

But we are only just beginning. ☾

Botanist and writer Nina Leopold Bradley carries on her family's tradition of research into land health and conservation action on its behalf. She is the recipient of many awards and honors, and serves on the board of directors of the Aldo Leopold Foundation (PO Box 77, Baraboo, WI 53913-0077).

Earth Stories

by David Ehrenfeld

He who owns a veteran bur oak owns more than a tree. He owns a historical library, and a reserved seat in the theater of evolution.

— Aldo Leopold, "Bur Oak," in *A Sand County Almanac* (1949)

illustration by Eva-Lena Rehnmark

As I look out the sealed window of the Environmental and Natural Resource Science Building where I work, I can see the middle-aged students who are taking the short course in Global Positioning System Training and Certification. They are pacing slowly and solemnly about the grassy circle in front of the building, staring fixedly at the GPS meters in their hands, yellow equipment packs with stout antennas strapped to their backs. Occasionally they pass the little bur oak that was planted in the center of the circle last year—one of only five bur oaks on campus—and their antennas brush its leaves, but they don't notice; it has no message for them. They are too busy, waiting for orbiting satellites to tell them where they are.

The world has changed in many ways since Aldo Leopold died in 1948, perhaps most of all in the barriers we have erected between ourselves and Nature. Yet Leopold's words remain as vivid and compelling as ever. Never mind that increasing numbers of Americans have never seen and never will see the mists advance "like the white ghost of a glacier...riding over phalanxes of tamarack, sliding across bog-meadows heavy with dew." Nor are they likely, any more, to experience "a single silence," which "hangs from horizon to horizon."[1] Leopold calls to something deeper within us even than our personal memories, an elemental awareness of Nature that resides in our cells and circulates with our blood. He does this in one of the few ways left that can penetrate the defensive shell of our unnatural civilization and reconnect us with the world outside—he does it by telling stories.

Aldo Leopold was a storyteller, and the source of his stories, his master teacher, was Nature. He admitted as much toward the end of his life, in "Wherefore Wildlife Ecology?": "I am trying to teach you that this alphabet of 'natural objects' (soils and rivers, birds and beasts) spells out a story, which he who runs may read—if he knows how. Once you learn to read the land, I have no fear of what you will do to it, or with it. And I know many pleasant things it will do to you."[2]

Most of the stories that Leopold tells are not long and formal like the history, recorded in *A Sand County Almanac*, of the celebrated lightning-killed oak he and his wife, Estella, sawed for firewood on his Wisconsin farm one crisp February day. That chronology, traced through the eighty annual rings traversed by the singing saw, took twelve pages to tell. More often, Leopold's stories are brief, as concise as poetry: "In the creek-bottom pasture, flood trash is lodged high in the bushes. The creek banks are raw; chunks of Illinois have sloughed off and moved seaward. Patches of giant ragweed mark where freshets have thrown down the silt they could not carry."[3] And some of his stories are shorter still, at least in their essential elements: "just as a deer herd lives in mortal fear of its wolves, so does a mountain live in mortal fear of its deer."[4]

The language that Leopold used is as elegant as it is effective. In our times, when television and networks of electronic communication require a ceaseless outpouring of words to stave off the new devil of silence, language often becomes a mere stitching together of stale phrases. Even a Dickens might have trouble maintaining inventiveness in the face of such an unholy demand for utterance. Against this drab background the words of Aldo Leopold stand out like a snow-covered mountain peak rising above a layer of smog. When he writes, "To build a road is so much simpler than to think of what the country really needs," we feel a fresh wind blowing.[5] We are invigorated not only because what he says makes sense, but because these seventeen words and only twenty syllables exercise the full healing power of English at its best.

Why are Leopold's words and stories so perpetually alive, his wisdom so enduring? I am not the first to recognize that there are two interdependent elements that mark this kind of great writing. First, we can only state with clarity the things we know well; and then we must find the right words to clothe our thoughts. I do not know where Leopold acquired his exceptional ability to clothe his thoughts in words, but I think I know where he discovered the meaning he conveyed so lastingly. He found it in Nature.

Aldo Leopold's genius included the gift of perceiving and untangling the myriad, interwoven, multicolored streams of story in the Nature that flowed unceasingly around him. He could read the landscape as easily as we read the words he wrote about it. Leopold first developed this ability in his earliest childhood days on the banks of the Mississippi River in Iowa and later honed his talents in places as widely separated as the wooded hills of central New Jersey and the forests of Germany and northern Mexico. He saw and understood Nature everywhere, not just in wilderness but along railroad tracks and roadsides, in cemeteries and in farmyards. Wherever he was, he was aware of the process and story in the life around him. In these, as in all stories, there is not only a present but a past and a probable future. Leopold wrote: "To see merely what a range is or has is to see nothing. To see *why* it is, how it *became*, and the direction and velocity of its changes—this is the great drama of the land."[6]

This essay will appear as the foreword in the forthcoming anthology The Essential Aldo Leopold: Quotations and Commentaries *edited by Curt D. Meine and Richard L. Knight. It is used here with kind permission of the University of Wisconsin Press, ©1999. The book will be available in December 1999; to order call 800-621-2736.*

Leopold weighing and measuring a woodcock after a hunt in the autumn of 1946.

Aldo Leopold was a storyteller, and the source of his stories, his master teacher, was Nature.

Thus the land told its stories to Aldo Leopold; he listened and he passed the stories on. Sometimes they speak in feelings:

> *The sadness discernible in some marshes arises, perhaps, from their once having harbored cranes. Now they stand humbled, adrift in history.*[7]

Sometimes they speak in music:

> *In the German forest—that forest which inspired the* Erlkönig*—one now hears only a dismal fugue out of the timeless reaches of the carboniferous.*[8]

Sometimes they speak in the metaphors of art:

> *The landscape of any farm is the owner's portrait of himself.*[9]

Always they show us Nature flowing through time, as stories do.

From stories comes understanding, from understanding, love. Aldo Leopold said it explicitly: "We love (and make intelligent use of) what we have learned to understand."[10] This is the message of his writing and the heart of his conservation philosophy. The land is safe with those who listen to its stories. ☾

David Ehrenfeld, a professor of biology at Rutgers University, is the author of The Arrogance of Humanism *and* Beginning Again: People and Nature in the New Millennium, *and the founding editor of the journal* Conservation Biology.

ENDNOTES

1. Leopold, Aldo "Marshland Elegy" (1937), *A Sand County Almanac and Sketches Here and There* (New York: Oxford University Press, 1949), p. 95.
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3. Leopold, "Illinois Bus Ride" (1949) *A Sand County Almanac*, p. 119.
4. Leopold, "Thinking Like a Mountain" (1949) *A Sand County Almanac*, p. 132.
5. Leopold, " Marshland Elegy" (1937) *A Sand County Almanac*, p. 101.
6. Leopold, *Game Management* (New York: Charles Scribner's Sons, 1933; reprinted, Madison: University of Wisconsin Press, 1986), p. 388.
7. Leopold, "Marshland Elegy" (1937) *A Sand County Almanac*, p. 97.
8. Leopold, "Wilderness" (1935) in Flader and Callicott, eds., *The River of the Mother of God*, p. 229.
9. Leopold, "The Farmer as a Conservationist" (1939) in Flader and Callicott, eds., *The River of the Mother of God*, p. 263.
10. Leopold, "Wherefore Wildlife Ecology" (1947) in Flader and Callicott, eds., *The River of the Mother of God*, p. 337.

Photo by Robert A. McCabe, from the R.A. McCabe Collection of the Writings of Aldo Leopold
Courtesy of the University of Wisconsin-Madison, General Library System, Dept. of Special Collections

A Place of Humility

by Terry Tempest Williams

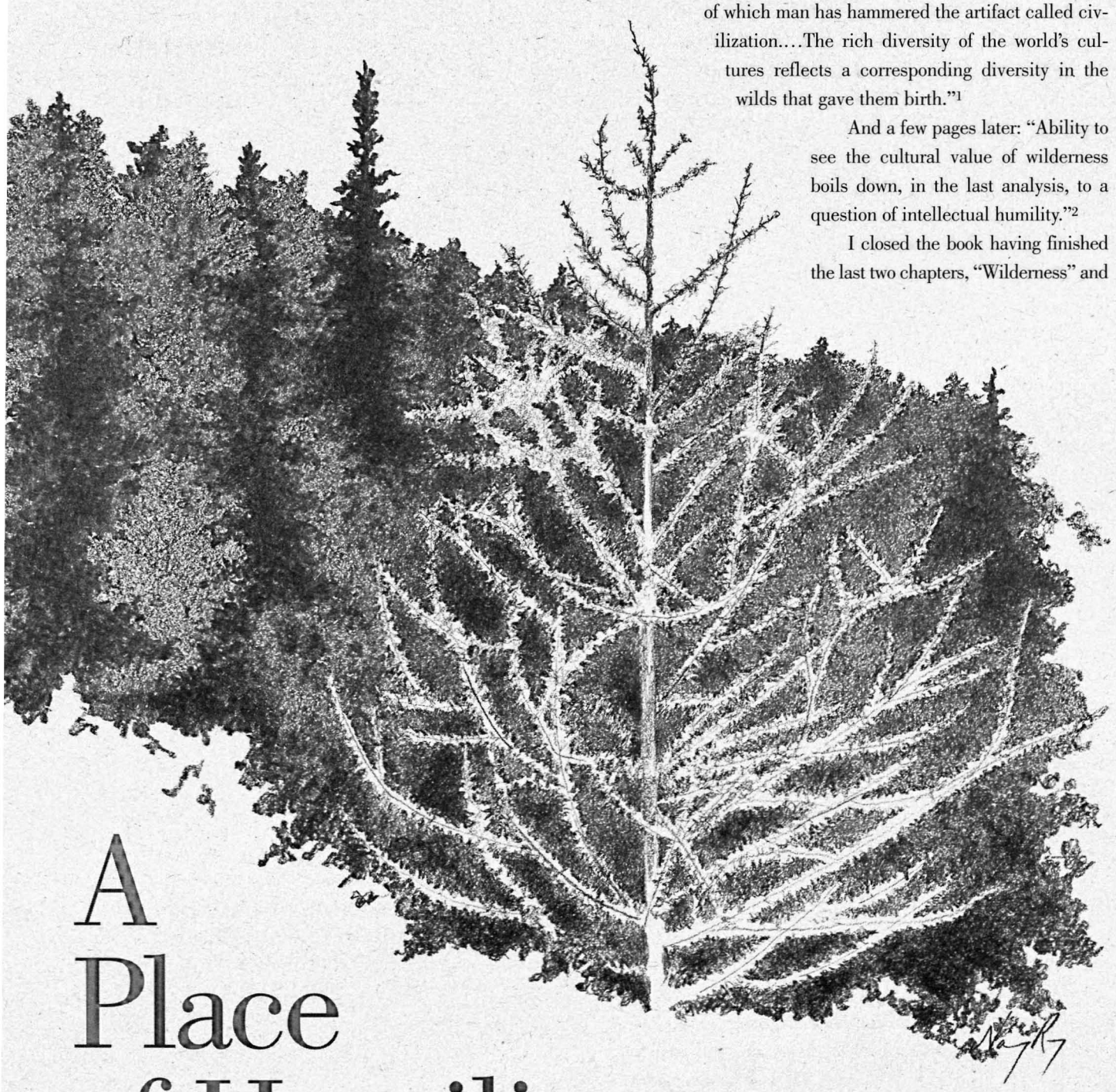
A Sand County Almanac changed my life. It is the only book that I can remember where and when I read it for the first time: Dinosaur National Monument, June 1974. My mother and grandmother were talking comfortably in their lawn chairs, my brothers were playing on the banks of the Green River, and I was sitting beneath the shade of a generous cottonwood tree.

Aldo Leopold spoke to me.

With a yellow marker in hand, I underlined the words: "Wilderness is the raw material out of which man has hammered the artifact called civilization....The rich diversity of the world's cultures reflects a corresponding diversity in the wilds that gave them birth."[1]

And a few pages later: "Ability to see the cultural value of wilderness boils down, in the last analysis, to a question of intellectual humility."[2]

I closed the book having finished the last two chapters, "Wilderness" and



tamarack by Nancy Roy

"The Land Ethic." I wanted desperately to talk to someone about these ideas, but I kept quiet and tucked Leopold into my small denim pack, not realizing what the personal effect of that paperback copy, with its flaming orange sunset over wetlands, would be.

I was eighteen years old.

Twenty-five years later, I can honestly say it is Aldo Leopold's voice I continue to hear whenever I put pen to paper in the name of wildness.

The essays of *A Sand County Almanac* were published in 1949. They were revolutionary then and they are revolutionary now. His words have helped to create the spine of the American wilderness movement.

The vision of Aldo Leopold manifested itself on the land in 1924, when he persuaded the United States Forest Service to designate 1200 square miles within the Gila National Forest as a Wilderness Area. That was forty years before the Wilderness Act of 1964 was signed into law.

Aldo Leopold perceived the value of wilderness to society long before it was part of the public discourse. He has inspired us to see the richness in biological systems and to hear all heartbeats as one unified pulse in a diversified world. He understood this as a scientist and land manager, and he understood it as a natural philosopher.

When Leopold writes about "the community concept" and states that "the individual is a member of a community of interdependent parts,"[3] he instinctively elevates the discussion above what one typically hears in wilderness debates—that the land is meant for our use at our discretion, that profit must dictate public lands policy.

And when he takes this notion of interdependent parts one step further and proposes that we "[enlarge] the boundaries of community to include soils, waters, plants, and animals, or collectively: the land," he challenges us.[4] In a politically conservative and theocratic state like mine (Utah), this kind of thinking may be regarded as grounds for heresy, evidence of paganism, the preemptive strike before black helicopters fueled by the United Nations move in to defend public lands against the people who live there.

But what I love most about Aldo Leopold is that he keeps moving through his lines of natural logic with eloquent rigor and persistence. Finally, he ruptures our complacency and asks simply, "Do we not already sing our love for and obligation to the land of the free and home of the brave? Yes, but just what and whom do we love?"[5]

Wilderness.

In the American West, there may not be a more explosive, divisive, and threatening word.

Wilderness.

The place of a mind, where slickrock canyons hold a state of grace for eons whether or not human beings make an appearance.

Wilderness.

The mind of a place, where perfection is found through the evolutionary path of a mountain lion slinking down the remote ridges of the Kaiparowitz Plateau like melted butter.

Roadless.

Ruthless.

Wilderness.

"A resource which can shrink but not grow."[6]...Shrink but not grow...Aldo Leopold's words echo throughout the wildlands of North America.

Why is this so difficult for us to understand? Why as we enter the twenty-first century do we continue to find the notion of wilderness so controversial?

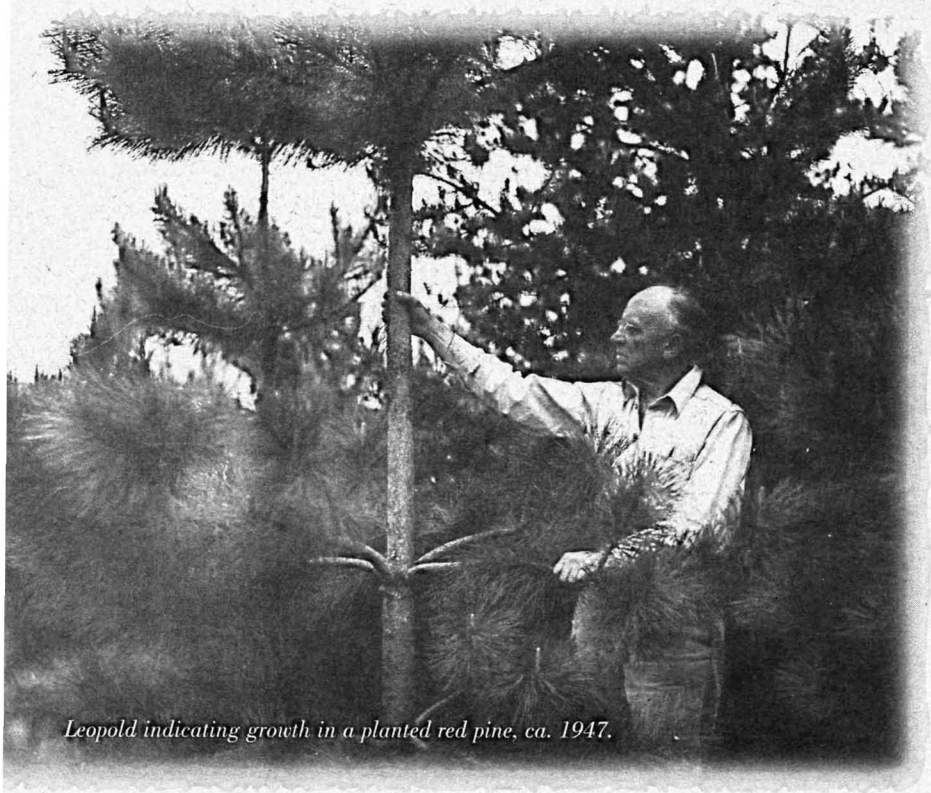
Perhaps Leopold would say wilderness is becoming more difficult to understand because there is less and less wilderness to be found.

Wilderness is threatening as a word because it is now threatened as a place.

How can we begin to understand what wilderness is if we have never experienced a place that is unaltered and unagitated by our own species? How are we to believe in the perfect mind of the natural world if we have not seen it, touched it, felt it, and found our own sense of proportion in the presence of wildness? If there is a greatness to the American spirit, a spirit aligned with freedom and faith, surely its origin is to be found in the expanse of landscapes that have nurtured us: coastlines, woodlands, wetlands, prairies, mountains, and deserts.

"Shall we now exterminate this thing that made us American?" writes Leopold.[7] The extinction of places we love may not come as a result of global warming or a meteor heading our direction, but as a result of our lack of imagination. We have forgotten what wildness means, that it exists, here, now. If we continue to cut, whittle, and wager it away, stone by stone, tree by tree, we will have turned our backs on bears, wolves, cougars, mountain goats and mountain sheep, martens, fishers, wolverines, caribou, musk oxen, otters, sea lions, manatees, alligators, Gila monsters, blue-collared lizards, roadrunners, song sparrows, milkweeds and monarchs, spring peepers and fireflies and the myriad other creatures with whom we share this continent.

Call their names. Remember their names. When Leopold speaks of silphium, sedge, leatherleaf, tamarack, buffalo, bluebirds, cranes, geese, deer, and wolves, one recognizes them as family. His language of landscape evokes an intimacy born of experience. And his experience in Nature, on the land, allowed



Leopold indicating growth in a planted red pine, ca. 1947.

We continue to learn from Leopold—that wilderness is not simply an idea, an abstraction, a cultural construct devised to mirror our own broken nature. It is home to all that is wild, "a blank place on the map" that illustrates human restraint.

him to test his ideas, change, grow, alter his opinions, and form new ones. We are the beneficiaries of his philosophical evolution.

In 1925, Aldo Leopold wrote in "A Plea for Wilderness Hunting Grounds":

> *There are some of us who challenge the prevalent assumption that Christian civility is to be measured wholly by the roar of industry, and the assumption that the destruction of the wild places is the objective of civilization, rather than merely a means providing it with a livelihood. Our remnants of wilderness will yield bigger values to the nation's character and health than they will to its pocketbook, and to destroy them will be to admit that the latter are the only values that interest us.*[8]

Brave words in an America on the verge of the Dust Bowl, the Depression, and the post-war build-up. Leopold held the long view in a country that was spoiled by its abundance of natural resources and whose native gifts were seen as infinite. He took his stand in and for the wilderness.

We continue to learn from Leopold—that wilderness is not simply an idea, an abstraction, a cultural construct devised to mirror our own broken nature. It is home to all that is wild, "a blank place on the map" that illustrates human restraint.

There are those within the academy who have recently criticized "the wilderness idea" as a holdover from our colonial past, a remnant of Calvinist tradition that separates human beings from the natural world and ignores concerns of indigenous people. They suggest that wilderness advocates are deceiving themselves, that they are merely holding on to a piece of American nostalgia, that they are devoted to an illusory and static past, that they are apt to "adopt too high a standard for what counts as 'natural.'"[9] These scholars see themselves as ones who "have inherited the wilderness idea" and are responding as "Euro-American men" within a "cultural legacy…patriarchal Western civilization in its current post-colonial, globally hegemonic form."[10]

I hardly know what that means.

If wilderness is a "human construct," how do we take it out of the abstract, and into the real? How do we begin to extend our notion of community to include all life forms so that these political boundaries will no longer be necessary? And whom do we trust in matters of compassion and reverence for life?

I come back to Leopold's notion of "intellectual humility." We are not alone on this planet, even though our behavior at times suggests otherwise. Our minds are meaningless in the face of one perfect avalanche or flash flood or forest fire. Our desires are put to rest when we surrender to a grizzly bear, a rattlesnake, or a goshawk defending its nest. To step aside is an act of sub-

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This essay will appear in the forthcoming anthology The Essential Aldo Leopold: Quotations and Commentaries *edited by Curt D. Meine and Richard L. Knight. It is used here with kind permission of the University of Wisconsin Press, ©1999.*

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mission; to turn back is an act of admission that other beings can and will take precedence when we meet them on their own wild terms. Our manic pace as modern human beings can be brought into balance by simply giving in to the silence of the desert, the pounding of a Pacific surf, the darkness and brilliance of a night sky far away from a city.

Wilderness is a place of humility.

Humility is a place of wilderness.

Aldo Leopold understood these things. He stepped aside for other wild hearts beating in the Gila National Forest, in the Boundary Waters, in the wetlands of the sand counties, and in the fields of his own home lands where he must have puffed his pipe in admiration as the sandhill cranes circled over him at the Shack.

When contemplating Aldo Leopold and wilderness, I believe we will need in the days ahead both intellectual humility and political courage. We will need humility to say we may not know enough to intrude on these wildlands with our desire for more timber, more coal, more housing and development. We might have to bow our heads and admit that our intellectual ceiling may be too low to accommodate the vast expanse above and inside the Grand Canyon. We will need political courage to say: we need to honor and protect all the wilderness that is left on this continent to balance all the wilderness we have destroyed; we need wilderness for the health of our communities, and for the health of the communities we acknowledge to exist beyond our own species. We will need both intellectual humility and political courage to say, for example, we made a mistake when we dammed Hetch-Hetchy and Glen Canyon; let us take down with humility what we once built with pride. Political courage means caring enough to explain what is perceived at the time as madness and staying with an idea long enough, being rooted in a place deep enough, and telling the story widely enough to those who will listen, until it is recognized as wisdom—wisdom reflected back to society through the rejuvenation and well-being of the next generation who may still find wild country to walk in.

This is wilderness—the tenacious grip of beauty.

In 1974, as a self-absorbed teenager, I was unaware of the efforts made twenty years earlier on my behalf by people like Howard Zahniser, Margaret and Olaus Murie, David Brower, and Wallace Stegner. They kept the Green River free-flowing through Split Mountain in Dinosaur National Monument. Nor did I realize as I sat by the river that summer day that it had been threatened by the Bureau of Reclamation's efforts to dam Dinosaur as part of the Colorado River Basin Storage Project. It was a history no one told us in Utah's public schools. All I knew was that I felt safe enough there to continue dreaming about wildness. Aldo Leopold was tutoring me sentence by sentence, showing how ecological principles are intrinsically woven into an ethical framework of being.

Historians have said the defeat of the dam on the Green River in Dinosaur National Monument marked the coming of age of the conservation movement. Conservationists of my generation were born under this covenant. The preservation and protection of wilderness became part of our sacred responsibility, a responsibility that each generation will carry.

In order to protect that which is original in the land and in ourselves, we can draw on the intellectual humility, the political courage, the wisdom and strength of character of Aldo Leopold. His lifelong respect for wilderness, revealed so compellingly in these words, inspires us not to compromise out of expediency and social pressure, not to consider lifestyles over lifezones. Rather, as Leopold states in "The River of the Mother of God":

> *In this headlong stampede for speed and ciphers we are crushing the last remnants of something that ought to be preserved for the spiritual and physical welfare of future Americans, even at the cost of acquiring a few less millions of wealth or population in the long run. Something that has helped build the race for such innumerable centuries that we may logically suppose it will help preserve it in the centuries to come.*[11] ☾

Writer and conservationist Terry Tempest Williams is the author of several books, including Refuge: An Unnatural History of Family and Place, An Unspoken Hunger: Stories from the Field, *and* Desert Quartet: An Erotic Landscape.

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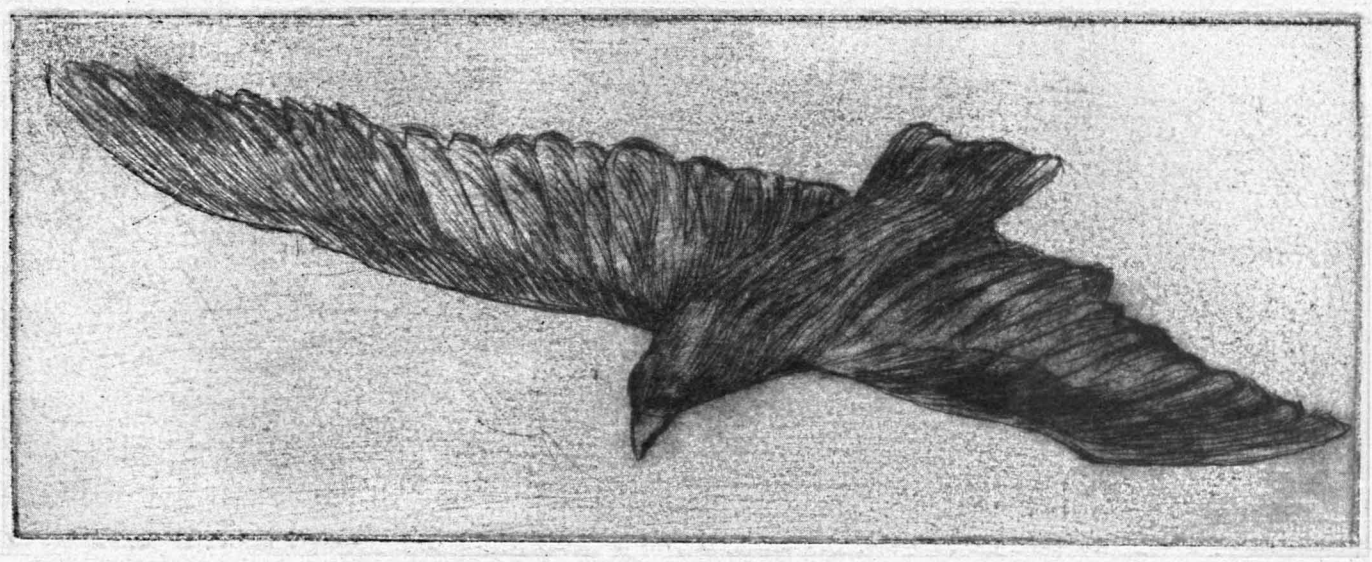

The Reach of Words

by Curt Meine

In September 1936 Aldo Leopold and a friend, Ray Roark, journeyed from Wisconsin to the Mexican state of Chihuahua for a two-week bow hunt in the Sierra Madre Occidental. This was, for Leopold, a return to the semi-arid mountain landscapes where as a young forester he first gained his professional footing as well as his ecological acumen. This was, however, his first experience of the Sierra Madre, and the comparison with forests on the American side of the border startled him.

Accustomed as Leopold was to southwestern forests marked by intensive grazing, loss of grass cover, accelerated rates of erosion, and other effects of recently intensified human use, he was struck by the beauty and integrity of the Sierra Madre. The hills, "live oak-dotted" and "fat with side oats grama," retained their soils and their associated biological diversity. Clear streams ran through streamside *bosques* of willow, cottonwood, and sycamore. Predator and prey populations seemed to interact in a normal fashion. Fires occasionally swept through the mountains with "no ill effects," maintaining the forests in a more open state than in neighboring Arizona or New Mexico. For Leopold the Sierra Madre came "near to being the cream of creation."[1] He would later write that in these hills he "first clearly realized...that all my life I had seen only sick land, whereas here was a biota still in perfect aboriginal health."[2]

Shortly after his return to Wisconsin, Leopold composed a brief but spirited essay in which he celebrated the distinctive voice of the Mexican mountains—the thick-billed parrot. "As a proper ornithologist," he felt obliged to describe the voice of the parrots: loud, chattering, riotous, "full of the salty enthusiasm of high comedy."[3] Leopold submitted the piece to a "proper" ornithological journal, *The Condor*, which immediately published it in its first issue of 1937.

illustration by Nanda Currant

Perhaps because he was dealing with universals—sky, rocks, soils, waters, plants, and animals; history's deep foundations; the poetry of place names and the irony of progress; human hubris and orneriness; our self-delusion and self-awareness; our capacity for plunder and for wonder, almost in the same moment—Leopold remains a steadfast reference.

Leopold, at fifty years old, was already well established as a leader in the conservation world. He had been among the nation's first trained foresters and served for twenty highly productive years in the US Forest Service. Beginning in the mid-1920s he had broken trail for the emerging profession of wildlife management. He was nationally recognized as a leading advocate for more effective wildlife conservation policies and for protection of the wild remnants of the nation's public domain. He gained an academic foothold when he joined the faculty of the University of Wisconsin in 1933. Yet, in 1937, Aldo Leopold had not yet even begun to think about the collection of essays through which millions of readers would come to know him, *A Sand County Almanac*.

Leopold already had a strong reputation as one of the conservation movement's most effective writers. His output of professional essays, technical reports, policy statements, editorials, and position papers had begun in earnest in the late 1910s and had never slackened. In 1933 he published his classic textbook *Game Management*, which provided not only technical definition but a conceptual foundation for the new field. Leopold's paper trail had crossed all the realms of his interest, from the protection of wilderness to the ecology of grouse, from the sociology of hunters to the economics of farming. And there was hardly an item in his body of published work that did not contain its share of ironic images, playful commentaries, and unexpected turns of phrase. For all of his output, however, Leopold had not yet fully developed the voice that would characterize the writer of *Sand County* fame.

Perhaps the "roistering flocks" of parrots inspired and liberated the proper scientist in Leopold. Perhaps Leopold had arrived at a secure stage in his career, and felt free to perform, like the parrots, "a sort of morning drill in the high reaches of the dawn."[4] Perhaps he had begun to sense a growing need to communicate not only with fellow professionals, but with the lay audience in whose hands, hearts, and minds he knew that conservation's success ultimately rested. In any event, with the publication of "The Thick-Billed Parrot of Chihuahua"—later revised and published in the *Almanac* as "Guacamaja" ("as the natives euphoniously call the parrot")—Leopold went public with this new and still tentative voice.[5] He would try it out later that same year when he published "Marshland Elegy," his powerful essay on cranes and wetlands, in *American Forests*.[6] And by the end of 1938 he had begun to produce regular short essays on wildlife topics for the *Wisconsin Agriculturalist and Farmer*, a biweekly publication that went out to the state's farmers. These writings were the seeds of the manuscript that, many stages of growth later, became *A Sand County Almanac*.[7]

Leopold's literary voice developed along with that manuscript. Its inflections would reflect ten years of further professional growth, experience, frustration, and accomplishment; a world war and the first rumbles of the postwar economic boom; the opinions of close friends and colleagues; seasoning in his professorial and public roles; and many a weekend, field excursion, and planting trip at the Leopold family's "shack" near Madison. Writing in the quiet predawn of his campus office, Leopold turned over and over and over again the phrases that would inform conservation novices, inspire fellow professionals, penetrate glazed eyes, challenge entrenched critics, and build political bridges—but, above all, that would record his own personal impressions and increasing self-awareness. Leopold was in fact a writer, and had been since his schoolboy days. As the essay collection grew, he began to think of himself more self-consciously in this role. And especially in the last several years of his life, he achieved the fullness of his voice.

That voice was not entirely new, and it was not simple. Many of the tones had long been present in Leopold's prose. Leopold

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wrote in varied modes over his lifetime, always with distinction and flair. He experimented, within the bounds of his professional outlets, throughout his career. With the more nuanced and evocative writing of his later years he was able to draw those qualities together, to mix them, to play them off one another. He is, at various times, sarcastic, ironic, wry, richly allusive, sober, bemused, intensely aural, wise, pithy, balanced, detached, biting, warm, rhythmic, metaphoric, measured, engaged, respectful. As in a well-aged wine, the component flavors came from the sun and soil and fruit; they seasoned within the vessel; they blended in the vintage prose of *A Sand County Almanac*.

Leopold's voice has endured remarkably well, given the accelerating pace at which knowledge has accumulated and prose styles have changed through the intervening decades. Occasionally his allusions sound more distant, his stances seem more awkward, a fact has become dated, edges of a thought have been frayed by time. But perhaps because he was dealing with universals—sky, rocks, soils, waters, plants, and animals; history's deep foundations; the poetry of place names and the irony of progress; human hubris and orneriness; our self-delusion and self-awareness; our capacity for plunder and for wonder, almost in the same moment—Leopold remains a steadfast reference. We sense a solid base here, in a writer who knew the workings of the natural world around him, and who made allowances for the behavior of his own complicated species within it.

And one more thing. Leopold was dealing with serious matters, literally of life and death—matters of contemporary ecological change whose profundity lies, like the sandhill crane's ineffable beauty, "beyond the reach of words."[8] And yet, Leopold's writing is suffused with understated humor and a plain joy. Just as Leopold did not like to think of being young "without wild country to be young in," perhaps he did not like to discuss even the darkest conservation dilemmas without offering a bit of the wild delight that wells from within.[9] It is that quality of Leopold's voice that may be the most enduring, and the most necessary, of all. ☾

Curt Meine is a conservation biologist, writer, and historian based at the International Crane Foundation in Baraboo, Wisconsin. He is the author of the biography Aldo Leopold: His Life and Work, *and editor of the collection* Wallace Stegner and the Continental Vision: Essays on Literature, History, and Landscape.

Leopold recording the morning's observations, August 3, 1942.

Photo by Irving Buss Courtesy Aldo Leopold Foundation

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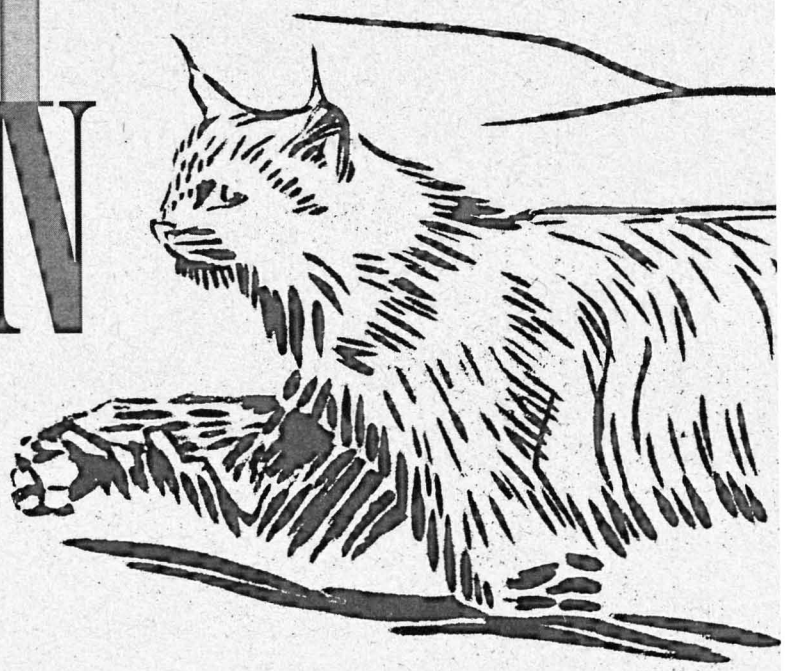
FOREST GREEN



How Private Money Saved Loomis Forest Wildlands by Mitch Friedman

Since achieving the goal of raising more than 13 million dollars (in less than one year) to save 25,000 acres of wilderness in Washington, I have been learning how many of my friends and colleagues privately thought it could never be done. My *modus operandi* has always been reckless optimism, so I had faith until the end that some billionaire would bail us out. Add me to the list of false predictors.

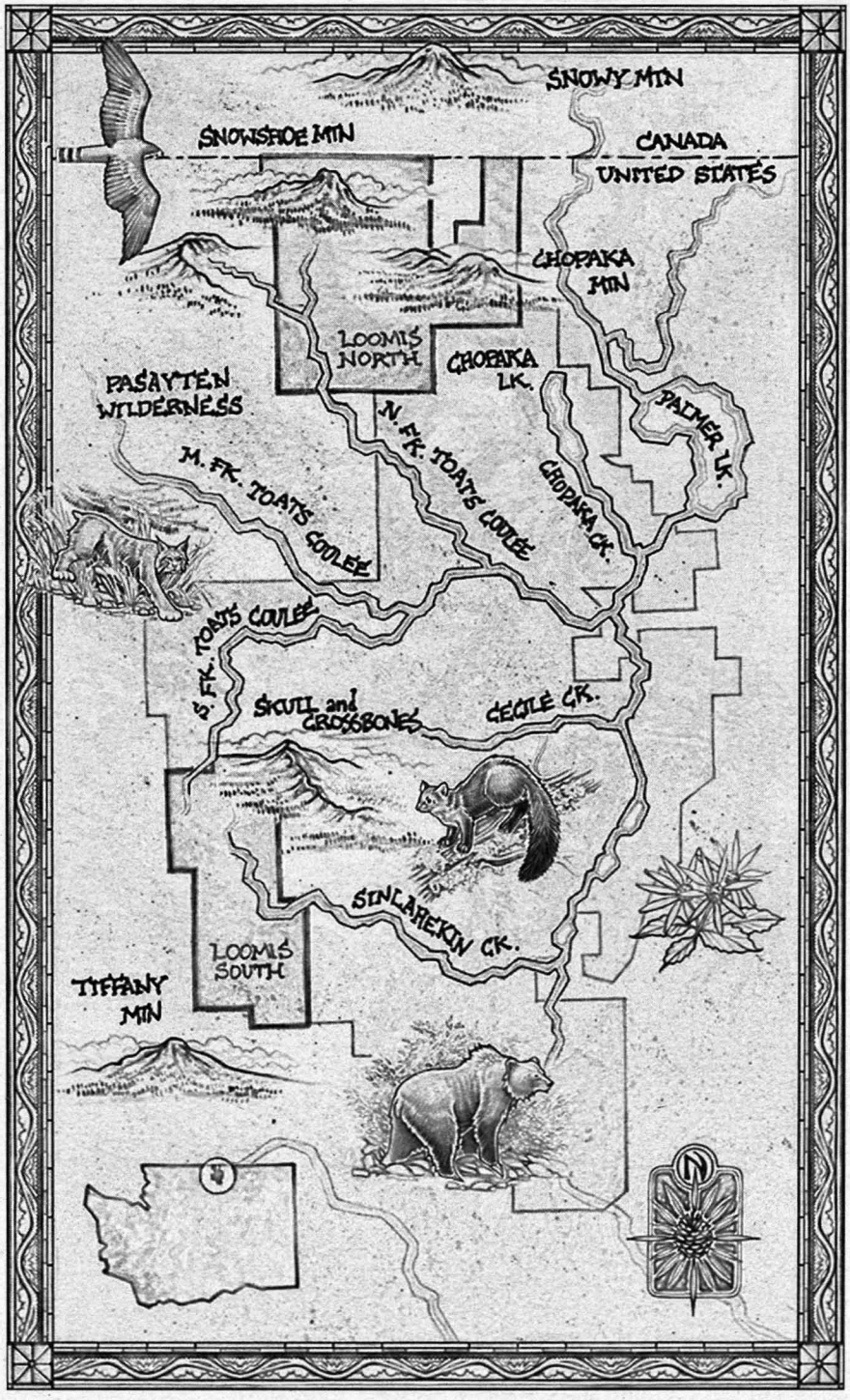
The Loomis Forest Fund, a coalition of more than 70 conservation groups and businesses headed by Northwest Ecosystem Alliance, raised over 13 million dollars without the help of Ted Turner, Paul Allen, Doug Tompkins, or any other heretofore recognized conservation funding titan. Even though Seattle now has more billionaires than almost any other town in the world, only Bill Gates weighed in for the Loomis, and at $250,000 his gift ranked about the tenth largest.

The Loomis Forest was saved not by billionaires. It was saved by 5000 people who gave until it hurt. Disregarding our top six gifts, all over half a million dollars, the average contribution was slightly more than $1000, even though more than 3000 of our donations were under $100. This means that a lot of people gave as much as they possibly could, and they did so because they cared. In every instance, donors were delighted and thankful to have the opportunity to give their money to such a great cause: saving wilderness.

The Loomis State Forest comprises the eastern flank of the North Cascades Range in remote northcentral Washington. It adjoins the extraordinary meadows and rock and ice peaks of the Pasayten Wilderness Area to the west, and drops off thousands of feet to arid range and orchard lands to the east. Between these extremes are the rounded peaks of the Loomis, covered with lodgepole pine forests at elevations mostly over 4500 feet. These conditions make the Loomis a critical linkage for forest carnivore populations in British Columbia and Washington's Cascades.

Americans want to protect wilderness. Americans have money. Let the two meet and wonderful things can happen.

lynx by Amy Grogan



The lodgepole forests of the Loomis and adjoining Okanogan National Forest lands harbor the healthiest known lynx population in the Lower 48. Several of the most credible recent sightings of grizzly bear in the North Cascades Ecosystem have been on or near the Loomis. And for the last three winters, fisher tracks have been documented on the Loomis—the only fisher sign in the state this decade. Moreover, the area harbors a stable pine marten population, nesting Goshawks, Boreal Owl, Golden Eagle, redband trout, northern bog lemming, and several rare plants. Clearly, the Loomis is an ecologically rich area of critical importance to protecting biodiversity at both local and landscape scales.

As unique as it is, the Loomis shares something in common with over 150 million acres of the West: it is trust land granted to a state by the federal government at the time that statehood was established. This enormous acreage rivals the expanse of our National Forest system, but has been managed even more tragically. Of the 134,000-acre Loomis Forest, less than 30,000 acres remain roadless and wild. Moreover, these are the only significant roadless lands left in Washington's entire estate of about three million trust acres, which have been logged, grazing, cultivated, and/or developed aggressively to provide revenues for public schools or other dedicated purposes.

Since 1990, the Northwest Ecosystem Alliance (NWEA) and Friends of Loomis Forest have led a fight to protect the remaining Loomis wildlands from abuse. We petitioned for Endangered Species protection for the lynx in 1991, and have since pursued every imaginable tactic—from ecosystem management citizen committees to timber sale appeals, from contracted scientific reports to lobbying the legislature, from forest planning participation to lawsuits. None of these tactics had a satisfactory foreseeable solution, because the states and courts interpret their trust obligations to mean that they have no authority or discretion to set aside trust lands without compensating the designated beneficiaries.

In 1997–98, we had an active docket of lawsuits against the state over proposed Loomis logging. The state was planning to build up to 300 miles of roads within ten years to clearcut virtually all the remaining wild forest. One suit alleged water quality violations; another argued that the new roads would lead to mortality ("take") of grizzly bears, illegal under the Endangered Species Act. We emerged from settlement negotiations in the spring of 1998 with an agreement that provided for permanent protection of two key areas, totaling 25,000 mostly roadless acres, if we could pay the market value. We were given 15 months to raise that amount, initially appraised at $13.1 million. This settlement agreement gave us an end-game.

map by Garth Mix

While ultimately conservationists must work to reform trust land policies that compromise the heritage of our children to pay for their education, only a conservation purchase could occur in time to save the Loomis. Until we succeed in having state lands recognized as a trust for all people, in the Public Trust Doctrine sense, they will continue to be managed as fiduciary trust only for schools, and hence more like private lands than public lands.

The agreement also gave us a philosophy: These wildlands are worth more standing than cut. The Loomis Forest, with rare wildlife, clean water, and inspiring wilderness scenery, has value far surpassing that of its skimpy lodgepole logs. We bet that this value could be converted on the market. While Loomis is a unique situation—having overwhelming natural values and underwhelming timber values—I suspect that with modern America's buoyant economy and pro-forest values, the market is a feasible tool for conserving many wildlands.

Running the Loomis Forest Fund was not a feat for the fainthearted. The campaign employed about a dozen staff, along with consultants for media, grassroots and major donor fundraising, direct mail, lobbying, appraisal review, economic forecasting, graphic design, and much more. We also managed a volunteer steering committee, comprised of core supporters, which was the key to accessing large gifts. Without experience in capital fundraising, we had to learn much of the game at each step along the way.

Pursuing large gifts is like peeling an onion from the inside out: You start with a dedicated core and move out one layer at a time. The key question is "who knows who?" While most capital campaigns are dominated by one or two gifts that cover as much as 80% of the total goal, the Loomis campaign was—by fate, not design—more populist in nature. We gladly would have taken $10 million from any single donor, probably even from Charles Hurwitz.

A few factors stand out as reasons for the campaign's success:

Media: We had extraordinary press coverage regionally and nationally. The first hook was the shear ambition of the campaign itself. The second groundbreaking hook was major support from the high-tech community. The third big hook was our progress. The fourth was the majesty of the land itself. Each played well in its turn.

Grassroots donations: Our goal was to raise about $600,000 from grassroots donors through direct mail, small parties in donor homes, and direct solicitations (phone and in-person) of mostly NWEA members. We raised $1.4 million. People's deep concern about the fate of this forest made a huge difference in the enthusiasm level of the campaigners and our big donor prospects.

The art of thanking: We thanked donors with premiums, personal cards, and other forms of recognition, which may have contributed to a trend of repeat donations. In fact, more than $5 million came as second (or third) gifts.

Also in our favor was that Loomis donors were offered a unique deal, for the gifts do double duty: donors could directly protect real wilderness—grizzly bear habitat—for just $500/acre, *and* their contributions would help build public schools, not pad a timber company or developer's bottom line.

Donations did not follow a linear pattern. Many times our account was stagnant and tension and despair were on the rise. News of another huge gift, many of which were anonymous, broke each of these plateaus. With just two weeks left before our deadline we remained four million dollars short. The money came.

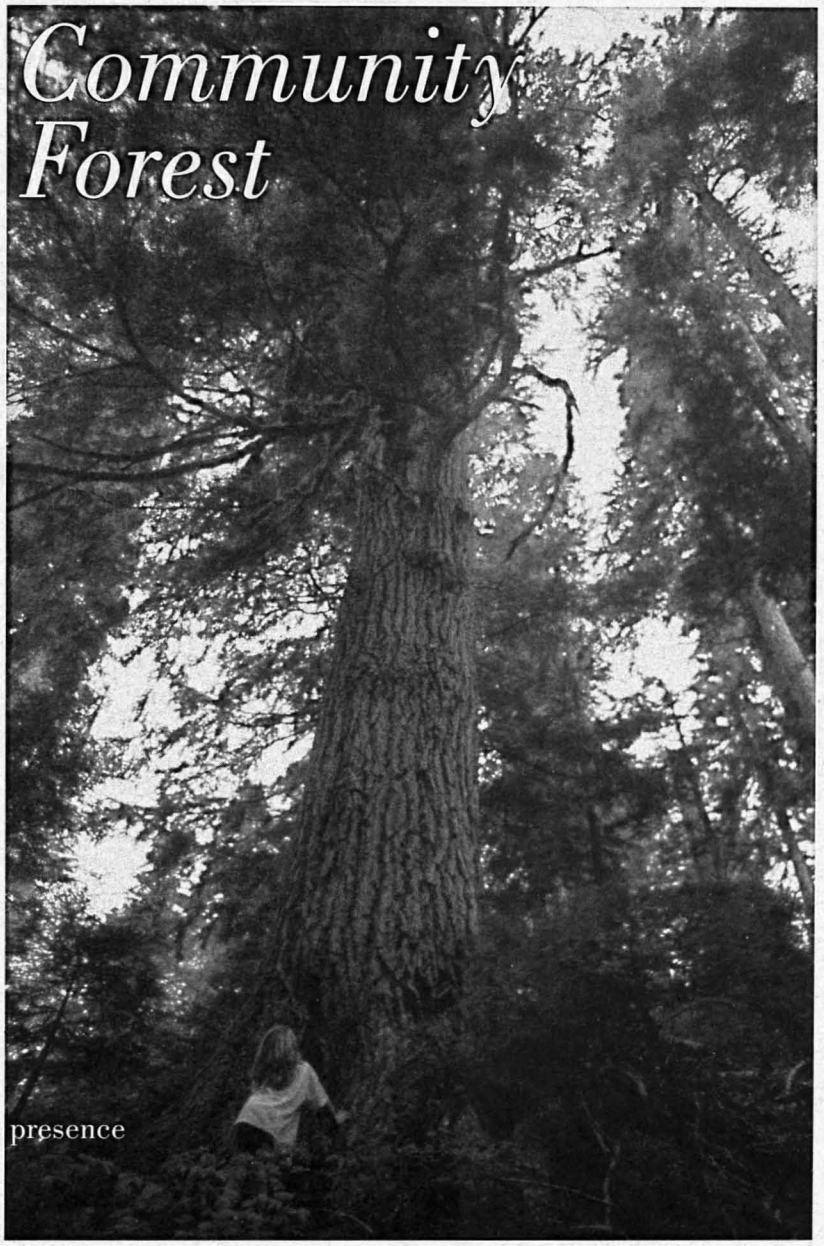
The staff, contractors, and volunteers of the Loomis Forest Fund performed brilliantly. All deserve much credit. The secret of our success, however, was the land itself: the Loomis was worth saving. Americans want to protect wilderness. Americans have money. Let the two meet and wonderful things can happen.

Not every capital campaign will encounter the same success as the Loomis Forest Fund. Clearly, Seattle's burgeoning wealth offered almost unmatched opportunities for fundraising. And the Loomis provides several socially motivating totems, such as lynx and grizzly, that many ecologically valuable areas lack. As always, we must pursue regulatory and management policies that can protect ecosystems without private cost. But where pragmatism allows and enables, the Loomis experience shows private dollars can be a workable option for conservation. Of course, these dollars should not be seen as a replacement for public funding, but an addition to it—there is overwhelming need for both publicly and privately funded land protection in every region of the country.

Perhaps the most immediate utility of the Loomis success for conservationists is that it communicates to elected officials and land managers that the American people value wildlands. We treasure our wild places and know that they are in ever-shorter supply. The Loomis experience proves to skeptics that we care enough even to spend our own dollars for the public good of healthy ecosystems and our wilderness heritage. ☾

Mitch Friedman is the executive director of the Northwest Ecosystem Alliance (1421 Cornwall Ave., Suite 201, Bellingham, WA 98225; mf@ecosystem.org; www.ecosystem.org; www.loomisfund.org).

The Creation of a Community Forest



Thousand-Year-Old Trees Protected

by Rand Jack

How long does it take to make the woods?
As long as it takes to make the world.
The woods is present as the world is, the presence
Of all its past, and of all its time to come.

—*Wendell Berry*

Midway through a seemingly interminable flight from Seattle to Santiago, Chile, I sat in the semi-darkened cabin of the airplane with a broad smile on my face. I was reading a somewhat technical report called "The Headwaters Old Growth of Canyon Lake Creek" by Professor James Agee of the forestry school at the University of Washington. The just-completed report, dated November 1993, described the structural and floral diversity of Washington's Canyon Lake Creek forest, with Alaska yellow-cedar trees over 800 years old: "The Canyon Lake Old Growth parcel is one of the oldest forest stands known in the Pacific Northwest [and] one of the largest intact stands of its age."

photo by Rand Jack

In 1992–93 the Whatcom Land Trust, at the invitation of Whatcom County, orchestrated a large, complex land exchange/purchase designed to bring several parcels owned by the Trillium Corporation of Bellingham into public ownership. Eventually, the deal involved Trillium, the State Department of Natural Resources, the State Parks Department, Whatcom County, the City of Bellingham, the Trust for Public Land, the Whatcom Land Trust, and thousands of acres of forest. While some land came into public ownership for conservation purposes, other parcels were exchanged to consolidate timberland holdings, including 350 acres of the Canyon Lake Creek old-growth forest, which moved from Department of Natural Resource to Trillium ownership.

When the Whatcom Land Trust expressed concern over the transfer of this forest from public to private ownership, Trillium pledged a good faith exploration of conserving the 350 acres of old-growth mountain hemlock, Pacific silver fir and Alaska yellow-cedar. At that point, little was known about this magnificent forest. Trillium and the Land Trust agreed to jointly hire a forestry expert to determine whether organisms or ecological processes found at Canyon Lake Creek would likely exist in a similarly situated second-growth forest. If so, the Land Trust would back off. The result was the Agee finding of the extraordinary antiquity of the forest, with its distinguishing old-growth characteristics, and my broad smile on a tiring flight to Chile.

After this, the forest sat quietly for several years, as it had for millennia before. Here, in the understory, a seventy-year-old mountain hemlock might have grown to only four feet tall; it waits patiently for a giant tree to fall, opening the canopy for energy-giving sunlight.

In 1997, Trillium announced that it was selling most of its timberland in Whatcom County, including the Canyon Lake Creek forest, to Portland-based Crown Pacific timber company. At this juncture, two pivotal events occurred. First, Trillium granted an option for the conservation purchase of the 350 acres of ancient trees acquired in the 1993 land trade. Second, the Whatcom Land Trust formed a partnership with the Trust for Public Land to pursue acquisition of the forest.

Crown Pacific immediately agreed to expand the option to include the full 750 acres of contiguous old growth in the upper Canyon Lake Creek basin. Our initial plan to have the forest purchased with federal money to become a Research Natural Area faltered when the US Forest Service declined interest in any parcel not adjoining federal land. In retrospect, this was disguised good fortune. Following this rejection, the Whatcom Land Trust developed the idea of the Canyon Lake Creek Community Forest, an ancient forest owned and cared for by the community. Protected by a conservation easement held by the Land Trust, the forest would be jointly owned by Whatcom County and Western Washington University.

The community forest concept combined compelling themes of conserving an old-growth forest and building community. It harkened back to the notion of a village commons, a geographical place that helped unify the community and give it a sense of pride and shared meaning. Public ownership could help educate the local people about the meaning and practice of stewardship. The community forest idea gave us a language with which to think about our project and communicate its richness to those from whom we would seek help.

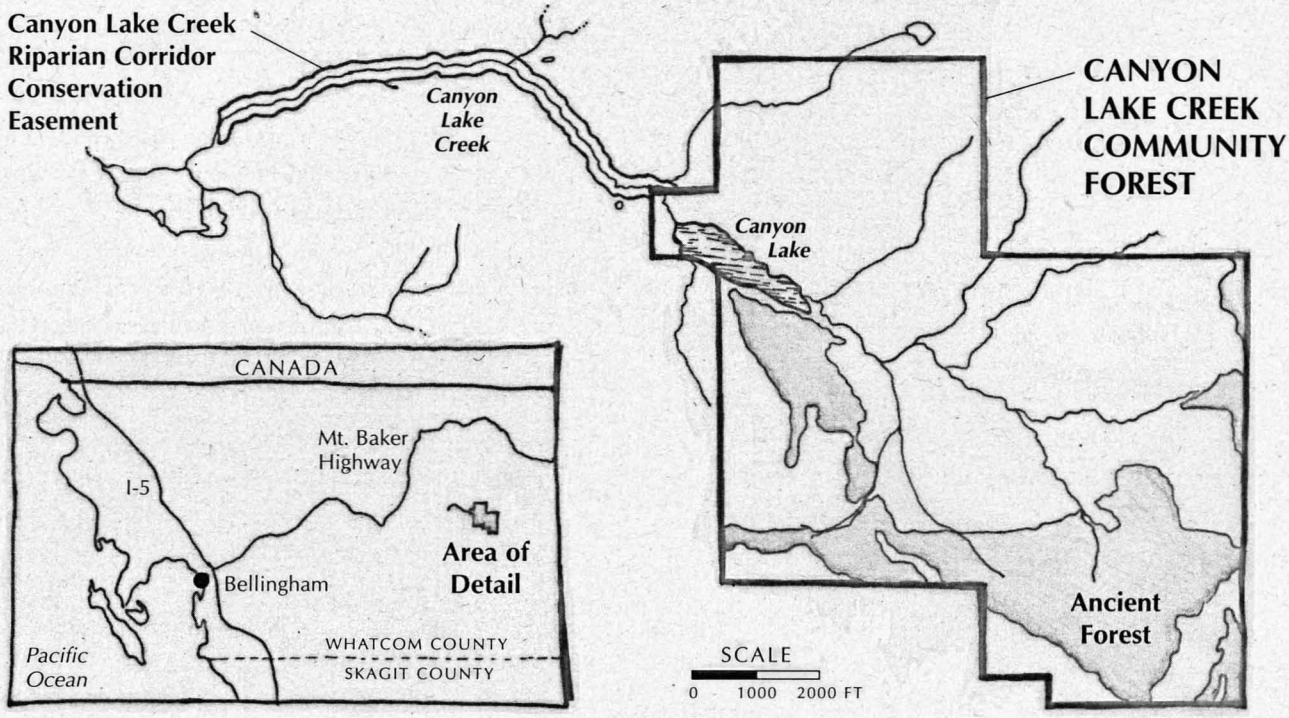
The Trust for Public Land brought Seattle's Paul G. Allen Forest Protection Foundation into the project. At a meeting in the forest, Bill Pope of the Foundation suggested that we were thinking too small. We should acquire the entire 2300-acre upper watershed, including its 45-acre lake, not just the old growth. Since much of this land had been logged within the past 15 years, the cost of adding 1500 acres was relatively small.

University of Washington forest ecologist Jerry Franklin confirmed that the whole upper watershed made a much more interesting and valuable project, particularly the opportunity to study the interface of old and new forests. He noted: "The forest and trees of Canyon Lake are extraordinary for their antiquity. Trees of this age have rarely been found and documented in the Cascade Range." Franklin also observed that almost certainly, yellow-cedars in the forest were over 1000 years old, and that if left alone, they would likely live another thousand years or so.

An appraisal of the 2300-acre watershed established a purchase price of $3,692,000, a daunting figure for a small, local land trust. With a population of 165,000 and half of its land in federal ownership, Whatcom County was not a likely place to raise that kind of money for forest conservation.

The daunting became possible at a July 8, 1998 press conference among the ancient trees when it was announced that the Paul Allen Foundation would make a gift of $1,846,000—half the purchase price—and an out-of-state anonymous donor, who had generously supported the Land Trust in the past, would pledge $1,000,000. With donations from the Flintridge and Panaphil Foundations (California and New York respectively), a $5000 local contribution, and a $146,000 price reduction by Crown Pacific, we were still $700,000 short, with time running out on the option.

At this point our best recourse was the Whatcom County Council and its Conservation Futures Fund, money raised through a special property tax levy and dedicated by law to the acquisition of open space and recreational land. Despite the



Community Forest being four-fifths paid for by private contributions, the Council was cool to the project for several reasons. First, the members were philosophically opposed to increasing government ownership of property. Second, despite proposed recreational, educational, and scientific use, the project smacked too much of wilderness preservation. Third, the Council wanted to do nothing to offend the local logging industry or diminish the tax base. Finally, the Whatcom Land Trust had just completed another transaction requiring the largest expenditure ever from the Conservation Futures Fund.

However, the idea of a 1000-year-old Community Forest became a powerful selling point. In addition to the environmental community, we gained support from the Chamber of Commerce, realtors, local loggers, the Bellingham City Council, building contractors, an investment firm, a grocery store chain, the local ARCO refinery, and the school board of the district in which the forest is located. Before voting, each council member gave reasons for opposing the project, but in the end, the vote was a unanimous yes. The daunting had become reality.

Giving substance to our stewardship commitment, Peter Stein of the New Hampshire-based Lyme Timber Company raised an additional $350,000 for the Community Forest from an anonymous California donor. Thus, we were able to purchase the property, place $275,000 in a Community Forest Stewardship Fund, and set aside $75,000 dedicated to monitoring the conservation easement. After the transaction closed, Crown Pacific granted a no-cut, riparian conservation easement 200 feet on either side of Canyon Lake Creek for two miles below the lake at the base of the Community Forest.

This successful effort to preserve a remarkable forest taught us three lessons. First, with the right kind of help, even small organizations in out-of-the-way places can make significant contributions to preserving wildlands. Second, the money to protect wilderness may have to come from afar. Other than the public Conservation Futures money, only $5000 of over $4,000,000 raised for the Canyon Lake Creek Community Forest came from Whatcom County. Philanthropic conservation funds are usually found in areas of dense population; wildland gems at reasonable prices are more likely found well beyond the wealthy suburbs. Third, how we think and talk about conservation property affects people's willingness to pay to protect it. Building community through owning and caring for a rare, ancient forest is an idea that reaches out and draws people in.

The preamble to the Canyon Lake Creek Community Forest Conservation Easement aptly describes what conservation philanthropy accomplished in the far northwest corner of Washington State: "The purpose of this Conservation Easement is to protect and preserve the old growth forest; to enhance the evolution of the second growth trees and manage the forest to maintain biological and structural diversity; to foster and protect the integrity of ecological systems, natural biological processes and native habitats on the Community Forest Property; and to provide opportunities for public recreation, scientific research, and environmental education consistent with the above purposes." ☾

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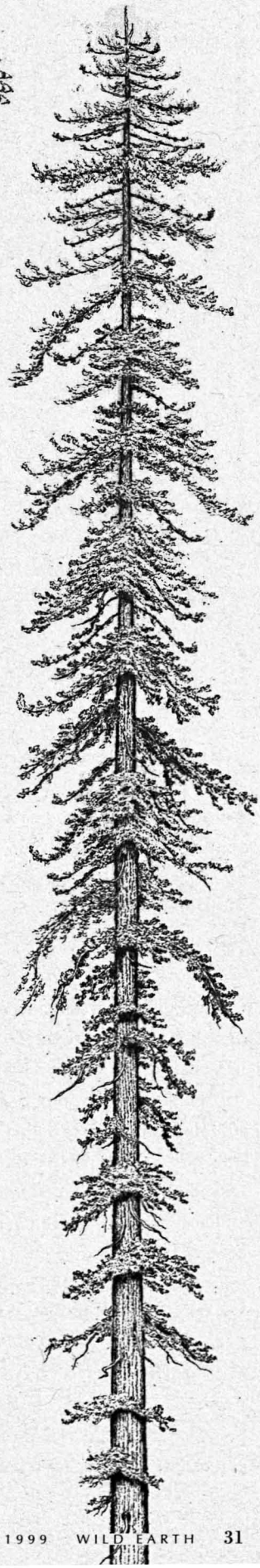
map by Allaire Diamond

Redwoods to Sea Conservation Corridor



Applied Wildlands Philanthropy Helps Unite Over 130,000 Acres of Forested Public Wildlands

by David Walsh

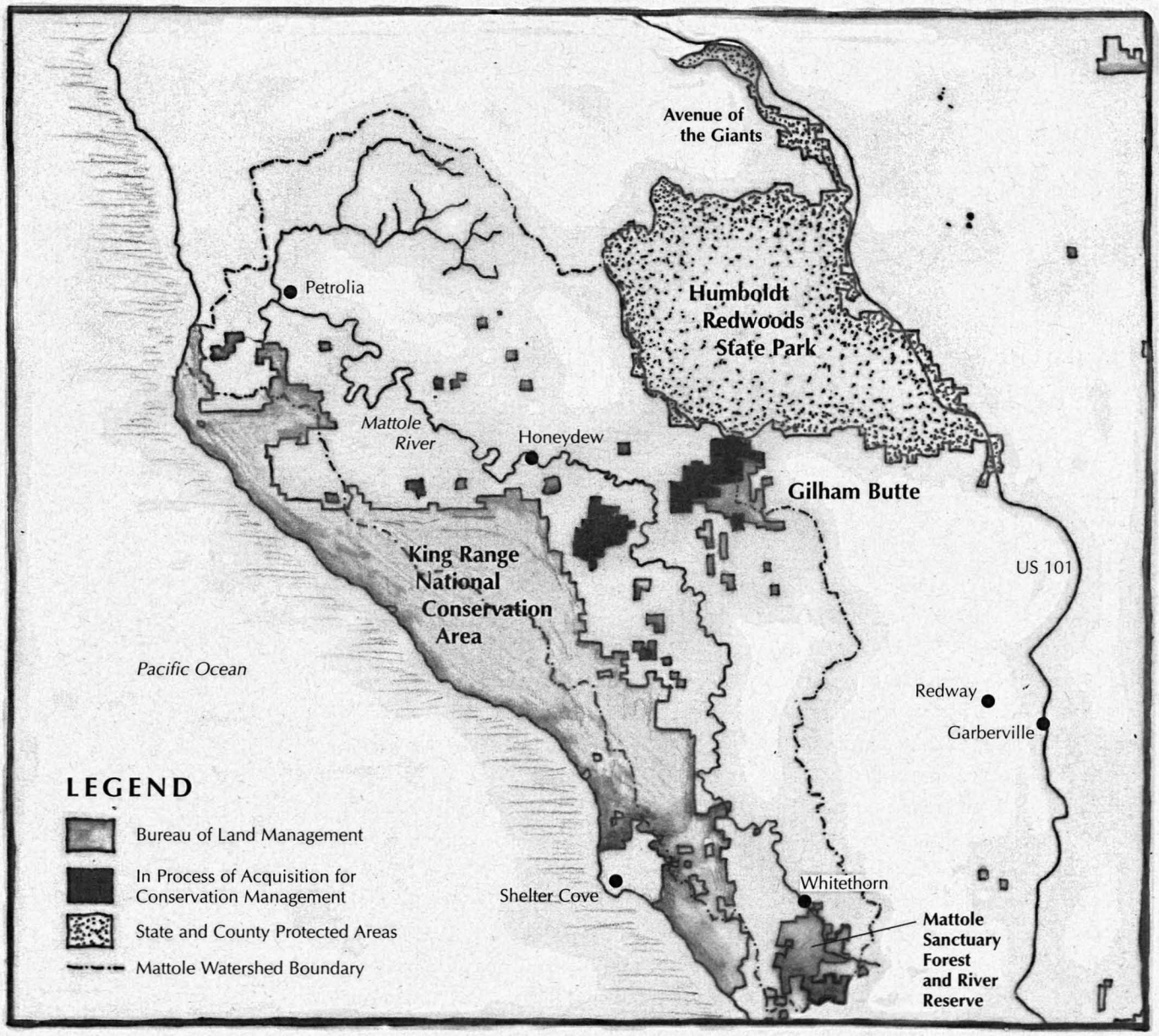
On the southern edge of the Pacific Northwest's temperate rainforest, pockets of redwood and Douglas-fir forests stand taller than any other living beings. It is a region where the politics of resource management are dominated by—and extraction methods dictated as a result of—insatiable industrial interest. Given the soaring values of stumpage, it's critical that conservationists work quickly and effectively to protect large undisturbed blocks of habitat. While northern California has been the site of some of the most politically charged forest preservation battles of recent years, the region's activist and academic community has continued to advocate, and has now quietly achieved, an unprecedented model of habitat connectivity reliant on core habitat protection and non-industrial, small landowner stewardship.

Spanning part of the same watershed as one of the most high-profile ancient forest protection campaigns in the country—the Headwaters Forest acquisition—only a few air miles to the south, an acquisition of similar acreage has wound its way to a noteworthy success. On June 28, 1999, Governor Gray Davis made available $2.6 million from the California state budget to match an equivalent sum raised from private sources. Ancient Forest International and our partner Save-the-Redwoods League exercised a purchase option on 3800 industrially owned acres in southern Humboldt County, thus protecting Gilham Butte and providing the stepping stones of a wildlife corridor linking Humboldt Redwoods State Park to the King Range National Conservation Area. Much of the land, purchased from Eel River Sawmills, had been approved for clearcutting by the California Department of Forestry.

After twenty years of successful litigation and advocacy waged by the Friends of Gilham Butte and the Environmental Protection and Information Center (EPIC) to save the old-growth Douglas-fir forests of Gilham Butte, the struggle needed one critical final element: an acquisition strategy. Ancient Forest International took up the reins to connect a fledgling concept with a feasible and important conservation opportunity.

As we commenced fundraising, we showed environmental foundations and large donors how, for less than one percent of the purchase price of the Headwaters transaction, the existing 2550-acre Bureau of Land Management Gilham Butte Late Seral Reserve could be consolidated with Humboldt Redwoods State Park, and a linkage could be extended to protect the forest tracts containing late-seral stand composition between these protected areas and the wilderness-nominated King Range Conservation Area. The 55,000-acre Humboldt Redwoods State Park contains the largest stand of intact ancient redwood forest on Earth, the Rockefeller Forest. About five miles south and west of the Park's boundary, BLM's 60,000-acre King Range National

illustration by Claus Sievert



Conservation Area and Sinkyone Wilderness State Park protect the wild mountains of the Lost Coast—one of the longest roadless coastlines in the lower 48 states.

Large tracts of primary forest are one of the rarest types of wildlife habitat on California's North Coast. This is particularly true of low-elevation coastal Douglas-fir forests, which are essentially unrepresented in California's Parks and Wilderness systems. Forest conservation in the redwood region over the last century has focused on the cathedral-like redwood groves along the river bottoms and freeways. The recent Headwaters Grove and the Gilham Butte acquisitions have been a divergence from that policy in that they are off-the-beaten-track old-growth remnants that are being conserved primarily for their habitat values rather than scenic or recreational potential.

The Gilham Butte/Redwoods to Sea acquisition is an integral part of the California North Coastal Basin Project, whose goal is to protect the health of the coastal forest ecosystem by maintaining a connection from Mendocino County through the industrial forest lands of Humboldt County, to the Klamath Knot bioregion of the Marble Mountains, Trinity Alps, and Siskiyou Wildernesses.

The Gilham Butte/Redwoods to Sea purchase spans an ecotone where three very different forest types—redwood, fir/mixed hardwood, and upland coastal—meet. The acquisition area covers a large variation in elevational gradients. Differences of temperature, aspect, moisture regime, and forest types provide diverse microclimates for species dependent on specific niches. The land purchase helps consolidate one of the largest blocks of wildlife habitat in coastal California, bridging two major watersheds: the Mattole and the Eel Rivers. Gilham Butte is one of the largest remaining unroaded, unharvested forest stands in the Mattole River watershed and is the nucleus of a wildlands mosaic of wilderness-managed public holdings and well-managed

map by Allaire Diamond

private lands. Forest composition and structure of the newly acquired reserve is dominated by an old-growth hardwood forest overstory of madrone, tanoak, and live oak, penetrated by emergent stands of ancient Douglas-fir, amid a few widely scattered meadows. Other tree species in lower densities include California bay laurel, chinquapin, and black oak.

Seven tributaries of the Mattole and three tributary creeks of the South Fork of the Eel have their sources on Gilham Butte. Both rivers and several of these streams are spawning grounds for threatened salmon and steelhead populations. The Mattole is one of the most southerly river systems in the Pacific Northwest where salmon have not been extirpated during the past century. The survival of the Mattole watershed's native salmon is due in large part to the visionary efforts of the Mattole Salmon Group. Started in the 1970s, it is one of the longest running citizen-based native salmon rearing and enhancement programs in the country. Also, because of its remoteness, the Mattole is one of California's waterways least impacted by genetic manipulation through state-run stocking programs.

Ninety percent of the old-growth forests in the Mattole were logged between 1945 and the present. That there are still remnants of this forest type today is a result of sustained conservation effort. In the 1980s the Mattole Restoration Council conducted an exhaustive inventory that mapped the distribution of remaining stands. Most of the headwater areas of the Mattole drainage are remote, and they still harbor significant stands of *protected* forest and, in the case of the North Fork of the Mattole, *unprotected*, unroaded, primary forest. Because of the existence of undisturbed forest in the 3500-acre "Sanctuary Forest" in the headwaters of the main stem and several other sub-watersheds, the Mattole continues to produce clear, cold water, giving the river's Chinook and Coho salmon a shot at viability.

Other rare, sensitive, or old-growth-dependent species in the Gilham Butte area include the Northern Spotted Owl, Goshawk, Golden Eagle, Pileated Woodpecker, red tree vole, and mountain lion. Also of interest are very rare carnivores including the Pacific fisher and the nearly extinct Humboldt marten. Marten and fisher tracks have been found in Humboldt Redwoods State Park, and the Gilham Butte area is considered prime mustelid habitat.

Pure stands of old-growth fir within the acquisition are most dense along the ridge-top corridor linking Humboldt Redwoods State Park and the BLM Late Seral Reserve, and in the very steep springs and draws. Most of the remaining old growth in the parcels is scattered along the east side of the Mattole River. A third parcel, the 1400 acres of cutover Four-Mile Creek, was secured on the west side of the river to serve as a stepping stone for wildlife migration. Since there is little old-growth habitat on this parcel, there is interest in conducting some future management. Prescriptions will possibly include fire hazard reduction and forest stand improvement to accelerate the development of late-seral structure.

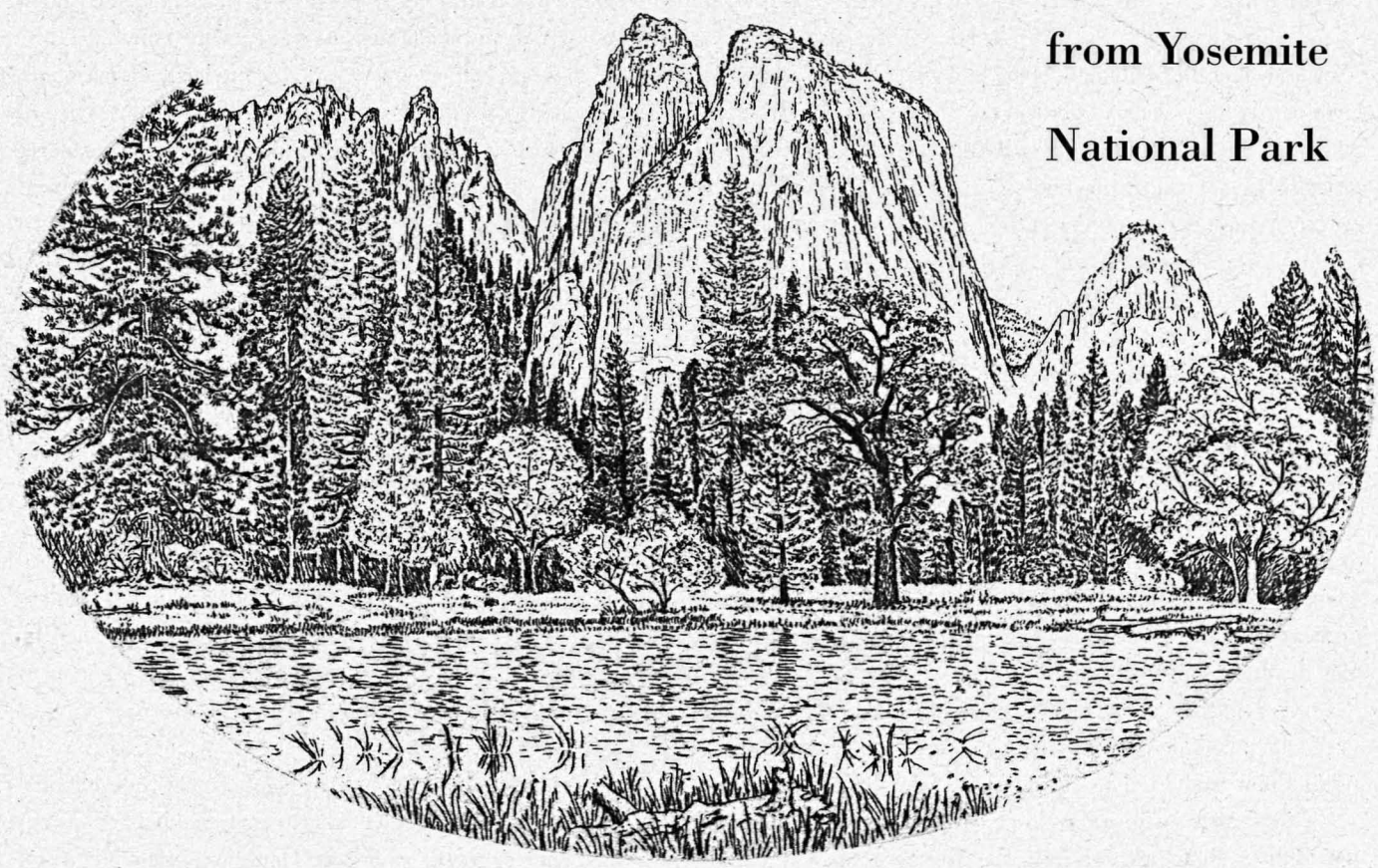
The acquisition of the old-growth core habitat from industrial interests is significant in itself, but our efforts to ensure landscape connectivity also involve an innovative program to help small non-industrial landowners continue practicing good stewardship while making a livelihood from their forestlands. Ancient Forest International is helping to coordinate a regional coalition of nonprofit organizations working to buffer the core habitat by enhancing conservation opportunities on private lands surrounding the reserves. This program will train local landowners in erosion inventory and control, wildlife identification and management, ecological forest management techniques, and assessment of aquatic habitat. Participants will develop watershed rehabilitation prescriptions and habitat protection agreements through conservation easements and forest management plans. The project goal is to protect and restore habitat and safeguard wildlife in the buffer area; the means is to provide landowners with technical conservation skills, an understanding of low-impact forestry methods, and needed assistance from forestry, wildlife, and fisheries restoration professionals. By helping to safeguard habitat continuity in the lowland forests of coastal California and create shared stewardship across the landscape, the Redwoods to Sea initiative is an excellent example of applied wildlands philanthropy that is informed by conservation science, instigated by opportunity, and fueled by the generosity of individuals and institutions who love the land. ☾

ACKNOWLEDGEMENTS Ancient Forest International would like to extend special thanks to the Columbia Foundation for their early support and visionary faith in this ambitious project. Special thanks also for the generous contributions of the Paul G. Allen Forest Protection Fund, the Richard and Rhoda Goldman Fund, the Compton Foundation, Giles and Elise Mead Foundation, Patagonia Inc., Foundation for Deep Ecology, the Rockwood Fund, the Strong Foundation for Environmental Values, Project Lighthawk, and many anonymous large donors.

David Walsh is project coordinator/administrative director of Ancient Forest International (PO Box 1850, Redway, CA 95560; www.ancientforests.org). He has worked on forest conservation projects in California, Ecuador, and Chile since 1989, and served as the project developer and primary fundraiser for the Redwoods to Sea project.

The Myth of the Humanized Landscape

An Example from Yosemite National Park



by Thomas Vale

Abstract *The once-popular vision of the preEuropean United States as "pristine," as a natural landscape, has been largely replaced by the view that the precontact country was "humanized" by Native peoples. While having merit, the contemporary emphasis on ubiquitous human agency is overstated: Large parts of the United States, particularly in the American West, may have been essentially natural, their landscapes characterized by processes of Nature rather than people. Yosemite National Park is used as an example to illustrate this point. The desire to see humanized landscapes in the preEuropean scene derives from social ideologies, rather than careful assessment of ecological facts. Furthermore, that ideology also monolithically stigmatizes wilderness enthusiasm as superficial. The model of the pristine landscape has merit—its applicability in any given locale being an empirically testable proposition—and it should remain as a guide for management of natural areas.*

Cathedral Rocks, Yosemite by Claus Sievert

A human society hewed from a state of Nature, from a wild landscape, from a wilderness—for two centuries, this vision had been central to the creation myth of the United States. Increasingly over the last decades, however, this image has been challenged, even rejected, and replaced by the conviction that the preEuropean landscape of the country, everywhere and entirely, was modified by Native Americans (Chase 1987, Pollan 1991, Pyne 1982, Budiansky 1995, Flores 1997). Tilling rows of maize and squash, raising houses of mud bricks or tree bark, constructing mounds and terraces, harvesting wild rice and acorns, hunting deer and rabbits, digging fern roots for fiber or cutting shrub stems for arrow shafts, igniting fires over prairie, chaparral, and forest—all of these activities are seen as having altered Nature, creating a humanized landscape. The old vision of the great American wilderness has been declared a falsehood, and to the degree that we continue to believe in such an ideal, we are told that we embrace a myth, the "myth of the pristine landscape" (Denevan 1992).

Certainly, the older wilderness imagery needed qualification—Native Americans did affect biodiversity across North America at the local scale and, in some areas, probably modified ecosystems at the regional scale. But to portray the continent at the time of European contact, from the Atlantic to the Pacific and from the Great Lakes to the Rio Grande, as a vast scene of agricultural fields, expansive villages, raised terraces, carefully tended plants, coppiced shrubs, depressed game numbers, and burned-over forest—in total, a landscape so altered that its characteristics were a consequence more of human agency than of natural process—is to engage in exaggeration of another sort. Lest we be labeled antiquarian for holding onto an *idee fixe*, perhaps we desert our former convictions too unequivocally in our rush to embrace too warmly and too uncritically this "idee nouveau." We have simply replaced the old myth with a new one: the "myth of the humanized landscape."

The replacement of one landscape vision by another is eased by the ambiguity of the critical, defining words (Haydon 1997). For example, "pristine" could mean no human effect or simply little human impact. It might generate a mental image of a landscape without any humans in view, or one with people but whose presence modifies the scene only minimally. It could stress either ecological criteria—have humans changed the characteristics of Nature?—or psychological/humanistic standards—does the landscape mean anything, regardless of the degree to which people have modified natural features, to those who interact with it? It could connote an objectified and distanced natural scene or a landscape of home. Endless debate reverberates among those with differing meanings in mind. Whatever the intellectual virtues of that debate, a common and casual definition will be pursued here: A state of Nature, a pristine landscape, a wilderness condition means, simply, that the fundamental characteristics of vegetation, wildlife, landform, soil, hydrology, and climate are those of natural, nonhuman processes, and that these conditions would exist whether or not humans are present. Given this criterion, a landscape might be judged, through empirical and scientific effort, to be, in whole or in part, pristine or humanized.

Honest assessments to understand where, how, and to what degree the preEuropean landscape was a product of people and their activities need to be undertaken, unencumbered by commitment to a preconceived notion of the ubiquity of human agency. For some areas this empirical assessment will be easier than for others; for many places serious ambiguities will remain. I would guess, nonetheless, that the evidence will suggest that the model of the pristine landscape will have applicability in certain locales, most likely (although not exclusively) in the western states, where, compared to the eastern parts of the country, smaller numbers of nonagricultural peoples inhabited landscapes more prone to lightning fires. More specifically (although not restrictively), I might further predict that the American wilderness will remain most appropriate as a vision in those very areas long admired for their perceived character as "natural," the units of the National Park System and the Wilderness Areas on the National Forests—disproportionately represented by landscapes of high elevation, of mountain and ice, of rock and canyon, of low biological productivity, of flammable vegetation, of only seasonal human occupancy. Whether they actually represent pristine conditions and whether landscapes of other characteristics truly were humanized are matters to be evaluated with scientific assessment.

Ecological Understanding: A Natural Yosemite?

A place to explore the applicability of the dichotomous views of "pristine" and "humanized" landscapes is one of the icons of protected Nature, Yosemite National Park. My purpose here is not to make a full assessment of Yosemite, declaring it to be natural; rather, it is to *suggest*, judging from existent knowledge, that the Yosemite landscape at the time of European contact could well have been mostly pristine, mostly a product of natural, rather than human, processes, or, at the very least, that its landscape was a mixture of pristine and humanized conditions.

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The contrary perspective, the belief that Yosemite of either 1492 or 1851 (the year of its formal discovery by outsiders) was a humanized landscape, has become the conventional wisdom. Olwig (1995), for example, talks of the "environmental stewardship" of "Indian gamekeepers" who regularly burned Yosemite Valley not only to improve habitat for certain mammals but also for "field games." (Olwig, then, makes Yosemite analogous to Three Rivers Stadium or Lambeau Field!) Similarly, Solnit (1992) describes the landscape of Yosemite Valley as "transformed" by the native Miwok people, who both "burned the meadows" and "gathered its largesse...there never was a wholly 'natural' landscape there." Perhaps Anderson and Nabhan (1991) express the most strident view:

> *These Yosemite landscapes [were] shaped by centuries of Indian burning, pruning, sowing, weeding, coppicing, tillage, and selective harvesting....Not only the Yosemite trails [John Muir] walked upon but the vegetation mosaic he walked through were the legacy of Miwok subsistence ecology.*

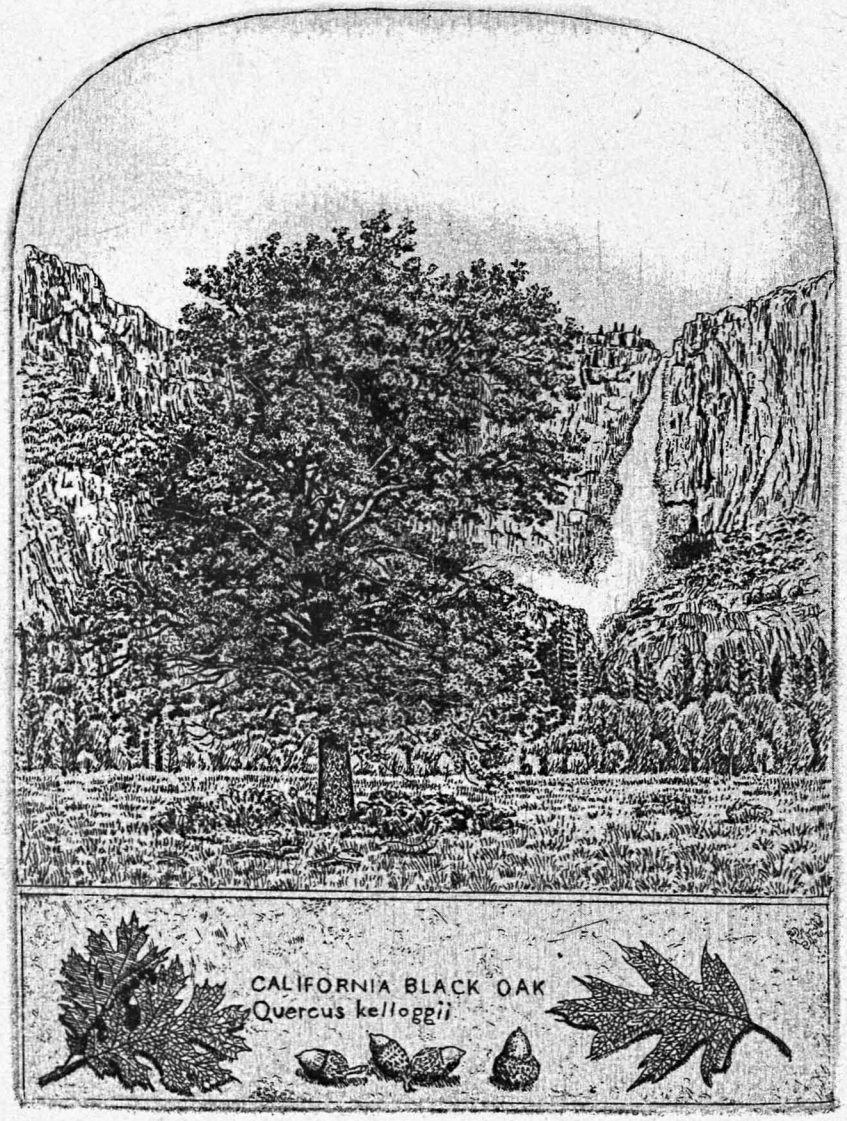
Native Americans themselves espouse the dogma; after describing former Indian villages in Yosemite Valley, a modern Miwok proclaims his people's devotion to "care of the land...the so-called wilderness was being looked after by the Indians for thousands of years" (Diringer 1997).

These assertions of widespread humanization are questionable. First, they all focus on the small valley called Yosemite, rather than the expansive mountainous landscape that surrounds it. The 1,813 hectares comprising Yosemite Valley—one of the few areas in the park where Indians occupied permanent settlements—are not characteristic of most of the 303,305 hectares of Yosemite National Park, through which Indians passed as transients or entered only seasonally; even if Indian activities "transformed" the valley, it is not necessarily the case that such transformation occurred elsewhere.

Second, the mere acts of "pruning" a big leaf maple (*Acer macrophyllum*) "so that it will produce straight, sienna-hued sprouts" or digging "rhizomes of a bracken fern" (Anderson and Nabhan 1991) do not necessarily mean that Yosemite Valley's fundamental ecological character or basic landscape appearance was altered from what would have existed in the absence of these subsistence people. On the other hand, a definition of wilderness that precludes any human imprint whatsoever, however modest, would render Yosemite Valley as humanized by these activities.

A third observation involves the reference to a human activity that is always the crucial cog in the humanized landscape argument—Indian burning. Clearly, the Miwok set fires in Yosemite Valley. To note this, however, is not sufficient to support the claim that such burning altered the fundamental character of the landscape, either in the Valley or in the park more generally. A more honest assessment should ask whether or not the human ignitions were in addition to, rather than a substitution for, natural ignitions, and whether or not fires set by Indians changed the landscape from that which otherwise would have existed.

For Yosemite, even a cursory look at appropriate ecological data suggests that the preEuropean fire regime in the National Park *might* be mostly attributable to natural factors. Almost two-thirds (61.2%) of the park area—the higher-elevation red fir (*Abies magnifica*) and lodgepole pine (*Pinus contorta*) forests, and all of the subalpine and alpine environments—burned rarely, if at all, in spite of fairly common lightning ignitions (Wagtendonk 1986); this absence of fire suggests that the condition of the vegetation—a natural factor—determined the fire regime, not the number or the source of ignitions. The lower-elevation chaparral and mixed conifer forest (totaling 37.8% of the park area) burned frequently, with return times of a decade or two documented for these vegetation types both in Yosemite and elsewhere in the Sierra Nevada (Rundel, Parsons, and Gordon 1977, Warner 1980, Wright and Bailey 1982, Wagtendonk 1986, Swetnam 1993). Over the last two thousand years, in the southern Sierra, tree ring analysis indicates temporal variability in these fire frequencies, with burning closely tracking weather conditions—an indication that natural factors, not humans, determined fire occurrence (Swetnam 1993, Caprio and Swetnam 1995). Over the last century, in Yosemite National Park, the formal record of lightning fires suggests that natural ignitions might account for the fire regime: For the period 1930–1983, in the lower-elevation vegetation types of the park, fires averaged 187 per decade (as mentioned above, ten years is the approximate return time for fires in these types); actual fires might have been more numerous, moreover, because of less sophisticated detection methods early in 1930s and 1940s (Wagtendonk 1986). Lightning fires in the National Forests adjacent to Yosemite's western boundary (the forests include the same vegetation types that occur in the park, although the proportion of low-elevation forest and brush is larger) add to the total number of ignitions that might have burned park land in the absence of fire suppression: 475 per decade for the Stanislaus NF and 977 per decade for the Sierra NF (US Forest Service 1972–1987). Even without fire suppression, not all of these ignitions would have resulted in large areas of burned landscape, with previously burned vegetation a critical constraint to the spread of fires (Wagtendonk 1986), a fact that again



California black oak by Claus Sievert

hints that natural factors determined the basic fire regime. Overall, then, the number of ignitions from lightning was high; whether or not ignitions caused by Native Americans altered the natural fire regime in Yosemite in a way that changed the fundamental appearance of the landscape, either regionally or locally, is, at the very least, a question.

Still, it may be possible that small areas were burned more frequently by the Miwok, resulting in local humanized landscapes; Yosemite and Hetch Hetchy Valleys would have been the most likely such locales. In a comparable valley in the southern Sierra (the Kings River canyon), Warner (1980) documented a presuppression return time for fires of 11.4 years and suggested that Indian burning was "at least partly responsible for the observed frequency" (even though his own analysis indicates one lightning fire every 5.7 years in the study area). Perhaps the valley bottom meadows and the surrounding forests, close to permanent settlements, burned more frequently as a consequence of Indian ignitions than did the regional vegetation; such a pattern of increased burning close to Indian villages would be consistent with at least some interpretations elsewhere (Russell 1983, Whitney 1994). As in other matters of Indian impacts, empirical work could help resolve the question of the spatial patterns of naturalness in the landscape.

Other Miwok activities may or may not have altered the basic character of the Yosemite landscape. The agricultural plots and constructed earthworks that characterized the native cultures in the Midwestern prairies and some of the eastern forests of the United States were not elements of the indigenous people of Yosemite. Their dependence upon the acorns of the oaks, especially those of *Quercus kelloggii*, is indisputable, although even if the Miwok planted and tended the oak groves, it was an activity restricted to a modest part of Yosemite Valley and perhaps a few other locales elsewhere. Local modifications to the forms of some shrubs or the occurrences of certain herbaceous species would similarly seem most likely near villages. The Miwok hunted deer and other mammals, but whether such harvesting changed the long-term numbers of animals or whether those altered populations in turn influenced the vegetation cover would be speculation.

An unequivocal alteration of the park landscape associated with native peoples was the building of settlement structures. Certainly, some villages were impressively substantial—bark-covered shelters in winter, cone-shaped brush shelters in summer, "large, semi-subterranean dance or assembly houses, forty to fifty feet in diameter, dug to a depth of three or four feet," circular sweathouses, granaries for acorn storage, and small conical grinding houses (Greene 1987). Such settlements were, nevertheless, restricted to a few locales in the lower-elevation environments of the park, particularly parts of Yosemite and Hetch Hetchy Valleys, Wawona, Big Meadow, and Lake Eleanor (Bennyhoff 1956, Hull and Mundy 1985, Greene 1987, Hull 1989). Even within Yosemite Valley, village sites seem to have been highly localized: the largest was "below Yosemite Fall and stretched southwest for three-fourths of a mile"; other settlements lay just to the east, "in the largest tract of open, level ground...at the mouth of Indian Canyon" (Greene 1987).

Away from these village sites, occupancy was ephemeral. Archaeological surveys have found artifacts, typically projectile

points, other rock tools, and features associated with seed grinding, in many locales elsewhere in the park. Bennyhoff (1956), in his classic survey of the archaeological resources of Yosemite, identified former Indian camp sites, occupied only temporarily and seasonally, by the presence of obsidian flakes on the ground surface and the lack of numerous mortar holes (which for him suggested a house or village); he documented 188 such "camp" sites in the park, mostly in the higher elevations. The total area represented by all of these 188 sites was less than 260 hectares, compared to about 187,800 hectares of high-elevation terrain in the park; these Indian camp sites may be comparable to the area used by campers in the Yosemite backcountry today. Moreover, the environmental alteration of most of these camping locations was modest: Two-thirds of these sites necessitated a "lengthy search...to obtain any sizeable sample of obsidian flakes," indicating to Bennyhoff a "small camp" used infrequently. In sum, humanized settlements, whether villages or camp sites—however important from an archaeological perspective, however effective in evoking a sense of the Miwok past—were obviously extremely localized.

In total, the map of Yosemite National Park reflects a mixed picture of "pristine" and "humanized" landscapes. Village sites were substantially humanized by the everyday life of Indians; groves of oaks or stands of bracken fern may have been modified in form or extent, for variable lengths of time, by Native peoples; some areas of low-elevation meadows and forests could have been altered by Miwok burning, although lightning fires seem adequate to account for the preEuropean fire regime; the middle and higher elevations, by contrast, were changed only superficially by Indian peoples. Even given the most generous interpretation of what was "humanized," much of the park was "natural"—in the sense that its landscape characteristics were determined by natural processes. With a more conservative interpretation of "humanized," most of Yosemite was natural, was wilderness.

Overall, then, the model of primeval Nature—a Nature molded by nonhuman forces—seems realistic for at least part, and perhaps much, of Yosemite National Park. In other landscapes, it may or may not be applicable. The landscapes of villages and agricultural fields in parts of the East and Southwest clearly were humanized—the characteristics of such areas were substantially modified from what would have existed in the absence of humans (Chapman, Delcourt, and Delcourt 1989). So, too, for the tallgrass prairie and savanna of the Upper Midwest, where the frequent burning essential to the maintenance of those systems seems to have required Indian ignitions (Curtis 1959). The pine forests of the Southeast, where lightning fires are more common than in the Northeast, present a more

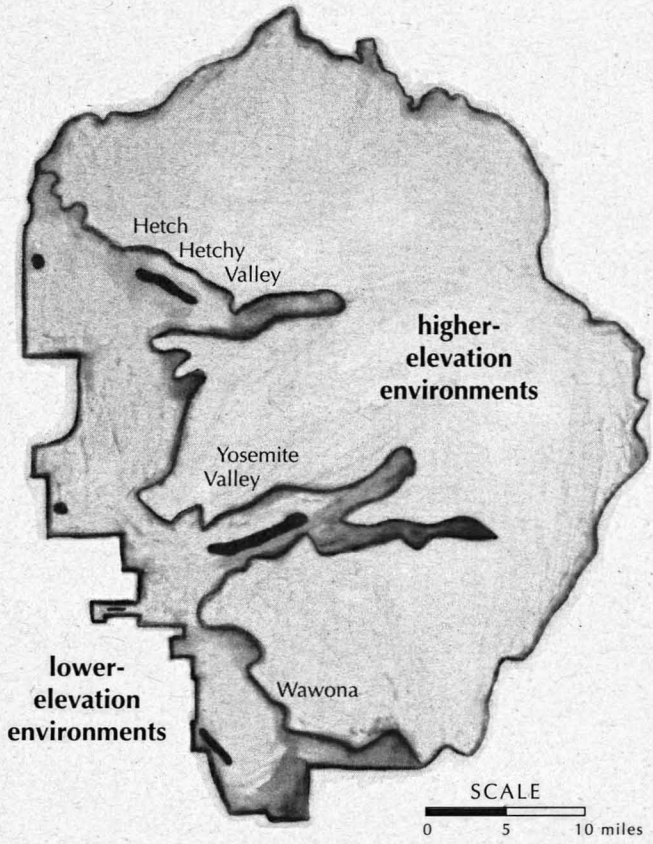


Figure 1 Yosemite National Park, before European contact or settlement, was a mosaic of landscapes both natural (where essential characteristics were determined by nonhuman processes) and humanized (where fundamental characteristics were altered by native peoples). The small dark areas represent frequent fire sites surrounding villages.

ambiguous situation—might the preEuropean fire regime have been controlled by natural processes, or was it partly influenced by Indian burning? Other parts of the eastern forests may have been changed from what would have existed in the absence of Native Americans (Cronon 1983, Olson 1996), but the impacts of indigenous peoples "were still localized....[with large areas] almost devoid of Indian activity" (Whitney 1994). The grasslands on the Great Plains existed even before the arrival of humans on the continent (Holliday 1987), indicating that the basic ecosystem structure of that large area was not a consequence of Native American activity. Within the nonagricultural, sparsely-settled forests of the West, the fire regimes—whether very infrequent crown fires or more common ground fires (Vale 1982, Barbour and Billings 1988)—easily might have been a consequence of natural, rather than human, processes. The same seems likely for the West's vast shrubby vegetation types. The general point, then, is that the preEuropean landscape of the United States was not monolithically humanized, not "a managed landscape, much of its look and ecology the product of

map by Allaire Diamond

the human presence" (Flores 1997), but, rather, a patchwork, a mosaic, at varying scales, of pristine and humanized conditions. A natural American wilderness, an environment fundamentally molded by Nature, did exist. Just where and how much is an ecological question, subject to empirical investigation.

Social Ideology: Rationale for the Humanized Landscape

The desire to see a humanized landscape in the preEuropean scene, whether in Yosemite or elsewhere, may be prompted by commitment to a certain social ideology. Several concerns manifest that commitment. First, to envision the impacts of Native Americans as ubiquitous and fundamental is to grant them their basic humanity, to make them one with other people, particularly those who have transformed the country's landscapes over the last two hundred years (White 1985, Limerick 1987). Second, to see indigenous Americans as modifiers of the landscape of 1492 also incorporates them into history, recognizing their presence and completing the view of the past (Cronon 1983). Third, this historical inclusion legitimizes the Native peoples' claims, both legal and emotional, to the land (Morehouse 1996). Fourth, the assertion that preEuropean peoples humanized the landscape reinforces the argument favoring active ecosystem manipulation and undermines "natural regulation" (Budiansky 1995).

A fifth intellectual stance asserts that native Americans—whether preEuropean or contemporary—and nonnatives view the wild landscape in distinctive ways. These differing perspectives, sometimes characterized as polar opposites, contrast through the seeing of a detached, objective wilderness—a landscape of recreation—and, through the viewing of personal, subjective home—a landscape of everyday living. Such a polarity frames many modern issues involving people and Nature: the absence of "land wisdom" among those in modern society and the "stewardship" among indigenous peoples (Callicott 1985); the seeing of Nature only in wilderness, which remains distant and apart, and the ignoring of Nature in the familiar and everyday (Cronon 1995); the culturally learned aesthetic reaction to place—associated with the visual sense, public symbolism, and scenes that command human attention—and the personally experienced "field of care" reaction to place—linked to various senses, private familiarity, and settings that evoke individual affection (Tuan 1979).

Modern Wilderness—A Landscape for Recreation or as Home?

For some observers, the concerns stemming from social ideology so dominate the interpretation of contemporary wilderness that any enthusiasm for the pristine or the natural suggests superficiality, relegating that enthusiasm to the impulse for recreation rather than for everyday living. But such characterization belittles the diversity of the modern experience. The contemporary visitors to Yosemite, for example, include those for whom the wild landscape, through all the senses, is intimately known and emotively valued (do I dare allege with as much "spirituality" as the Miwok experienced?). Examples from written sources, even in just the last few years, abound. Ranger-naturalist Will Neeley reflects that "the mountains have become familiar and have revealed pattern and form...never before have I felt so at ease with them....I was intoxicated with [them]" (Shields 1994); his fellow naturalist Carl Sharsmith developed "a love of nature so cultivated, so refined, so carved by wind and shined by dew that it has become a treasure" (O'Neill 1988). Yosemite artist Steven Lyman "knew the value of time in a place...to be comfortable in the adversity of the elements, which he saw as natural processes to experience and embrace" (Snyder 1996). Concessionaire-worker Howard Weamer "wondered last night, watching the ridge go black and white in the dusk, whether I had seen it too often...[but] it's still very exciting, just familiar" (Weamer 1996). Long-time Yosemite author Shirley Sargent, thinking back to her childhood, formed a multi-sensed image of a distant landscape of affection:

> *It was felt in the cool July breeze, seen in the expansive, river-cut meadows...heard in the sound of rushing water, bird-cry and wind...scented in the pine-needled image of the Sierra.* (Sargent 1993)

Summer visitors from a variety of non-Indian cultures similarly express the warmth that comes from knowing the Yosemite landscape; a volunteer laborer "having been enriched by Yosemite many years...[found] it was a pleasure 'to give something back'" (Sanford 1995), and a journal writer found herself "reminiscing about the mountain terrain that our group has moved through—and that has moved through me" (Rabkin 1995). Can John Muir's knowledge of, and bonding to, the Yosemite landscape be ignored? Or David Brower's (1990)? Might I include my own familiarity with and love of this special place (Vale and Vale 1994)? The failure to recognize such reactions stigmatizes unfairly contemporary people, leaving the wilderness landscape forever removed from intimate human knowledge and warmth, leaving the wilderness visitor forever "a person who does not belong, a stranger in Paradise" (Solnit 1992). Such omission creates a stereotype no more valid than that of the uncaring savage: For at least some, perhaps many, Americans, even those lacking an Indian heritage, wilderness is a part of home.

A Middle Ground

The preEuropean landscape of North America was both pristine and humanized, varying through space and time, varying in degrees of conformity to the extreme conditions of the purely naturalistic and the purely anthropogenic. Similarly, the present-day wilderness is both a landscape for "the stranger in Paradise" and a home place, a "field of care." It is intellectually dishonest, pragmatically divisive, and more than a little silly, to treat the two dichotomies of pristine/humanized and stranger/homebody as if they were categorically exclusive, as if we were choosing up sides for a game of kick ball. Decisions about the management of our natural areas should involve a thoroughness of context that honestly recognizes the ecological models of both the pristine and humanized landscapes, and attempts to disentangle the applicability of each through ecological assessment—as well as the humanistic reactions—in all of their varied richness, whether in the past or the present—to wildness, to naturalness. We need more than blind and unthinking allegiances to ecological myth or social ideology. ☾

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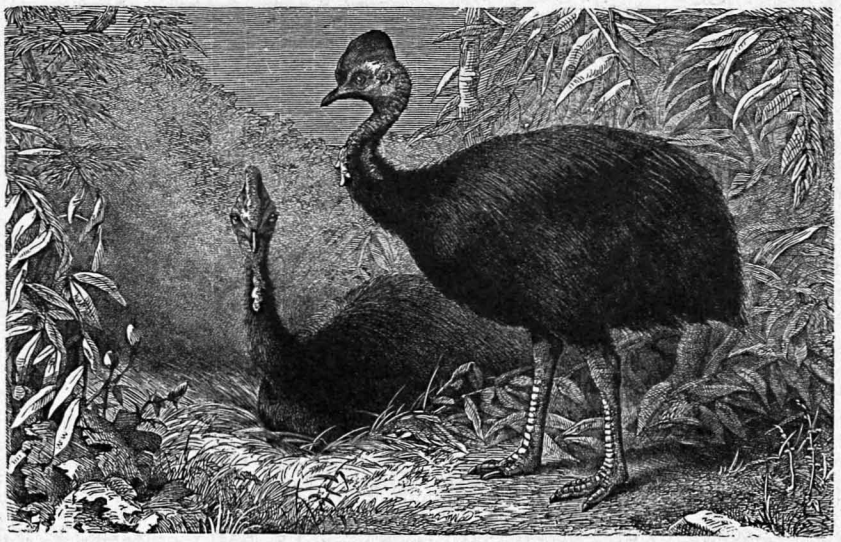
Indigenous Knowledge and Conservation Policy in *Papua New Guinea*



by William Thomas

Although slogans like "Cultural diversity equals biological diversity" may seem to be intuitively true, very little research has documented the connection between traditional lifestyles and the conservation of biodiversity. Various studies have documented the depth of indigenous knowledge and the importance of biodiversity to local people. However, much research into indigenous environmental knowledge has obvious economic motivations, and, not incidentally, the potential to harm traditional cultures. While the search for new medicines and crop varieties is important, science still knows very little about the effect of indigenous people on the resources they exploit (Stearman and Redford 1992). The extent to which indigenous lifestyles can become templates for conservation has not been established.

Although it may seem almost heretical to question a traditional society's ability to live in harmony with its surroundings, mounting archaeological and historical evidence suggests that these societies are capable of dramatically altering ecosystems. In the face of mounting global extinctions, the uncritical acceptance of the notion that tribal societies balance their needs with those of the countless other organisms in their environment will amount to ratifying an updated version of the "noble savage" stereotype. The early reports on the ability of indigenous cultures to conserve their homelands after being incorporated into park management schemes are not encouraging. For example, consider the concluding comments by the editors of the 1991 volume *Resident Peoples and National Parks*: "We suspect that the international conservation movement is in for a second major revolution based on shock therapy in the face of harsh reality. It is not quite so easy to harmonize natural protection, cultural preservation and true rural development for residential peoples" (West and Brechin 1991). Since these wildlands represent humanity's last chance to save a significant portion of the planet in its natural state, it is vital that they are not sacrificed to political correctness.

The realization that human activities can be compatible with biological diversity has often made allies of conservationists and indigenous people. The practice of conserving land by removing the residents has protected only fragments of our natural heritage. To date, preserving land in park and reserve systems has conserved only 4.9% of the planet's terrestrial area (Ryan 1992). Very few of these parks—particularly in the tropics—are ecologically or socially viable. Moreover, there has been a growing recognition that a policy of evicting an area's original tenants is shortsighted (West and Brechin 1991). Humans may be an integral component of the ecology of these remaining areas. In fact, we now understand that some of the landscapes park planners sought to conserve have actually been shaped by human activities. Ecologists now realize that fires set by native Australians, once thought to be harmful to wildlife, encourage the biological diversity and wildlife assemblage

cassowaries engraving

that is associated with wild Australia. Likewise, Maasai cattle grazing, when interwoven with elephant browsing, produces a mosaic that is more biologically diverse than parks that separate humans from wildlife (Western 1997). These findings have helped conservationists to gain a greater appreciation for the role humans have played in shaping the landscape. However, it remains to be seen whether traditional land-use practices such as these are sustainable, or can be employed as blueprints for biodiversity conservation in the face of growing human populations.

As an anthropologist who studies the potential contributions of traditional societies to the conservation of their homelands, I have conducted over ten years of research near the headwaters of the Strickland River in Papua New Guinea's Central Range. This is one of the most remote wilderness areas on Earth. In 1993, the government of Papua New Guinea (PNG) and conservation organizations including the World Wildlife Fund and The Nature Conservancy conducted a national Conservation Needs Assessment. They described the Central Range as "unexplored" and listed this area as the second highest conservation priority for the nation (Swartzendruber 1993). The most rugged area of the Central Range, stretching from the spine of New Guinea to the Sepik foothills, is the homeland of the Hewa (pronounced Heywa), a tribe so remote and little-known that they are still accused of cannibalism by their neighbors.

The focus of my research has been the effect of traditional activities on biodiversity. Although New Guinea contains some of the largest tracts of tropical forest in the world, all of this forest is the homeland to one of the thousands of cultures that inhabit the island. Most of these areas are difficult to squeeze into the US definition of "wilderness." While humans do not control these forests, their activities help to shape the diversity of organisms found there. Most researchers expect that indigenous knowledge (IK) will be an effective tool for conducting biological inventories in these areas. However, while IK is seen as rich in understanding individual components of an ecosystem, ecologists often describe IK as weak in understanding ecological processes (Baines 1993).

Nevertheless, I believe that in addition to developing biological inventories, IK can be directly translated into conservation action. The same knowledge and observation skills that allow informants to hunt and garden successfully can be tapped by researchers to identify the underlying dynamics of the forest and provide the basis for sound conservation planning. To date, my research has concentrated on the Hewa knowledge of birds. Birds are one of the most studied and best understood taxa on Earth. Since birds are considered the primary agents of seed dispersal in New Guinea's forests, they are especially important to conservation (Beehler et al. 1986). The Hewa knowledge of bird behavior is producing a dynamic portrait of one of the most biologically diverse regions in PNG. More important, the Hewa are providing a link between human activity and biodiversity that may enable us to combine cultural and biological preservation.

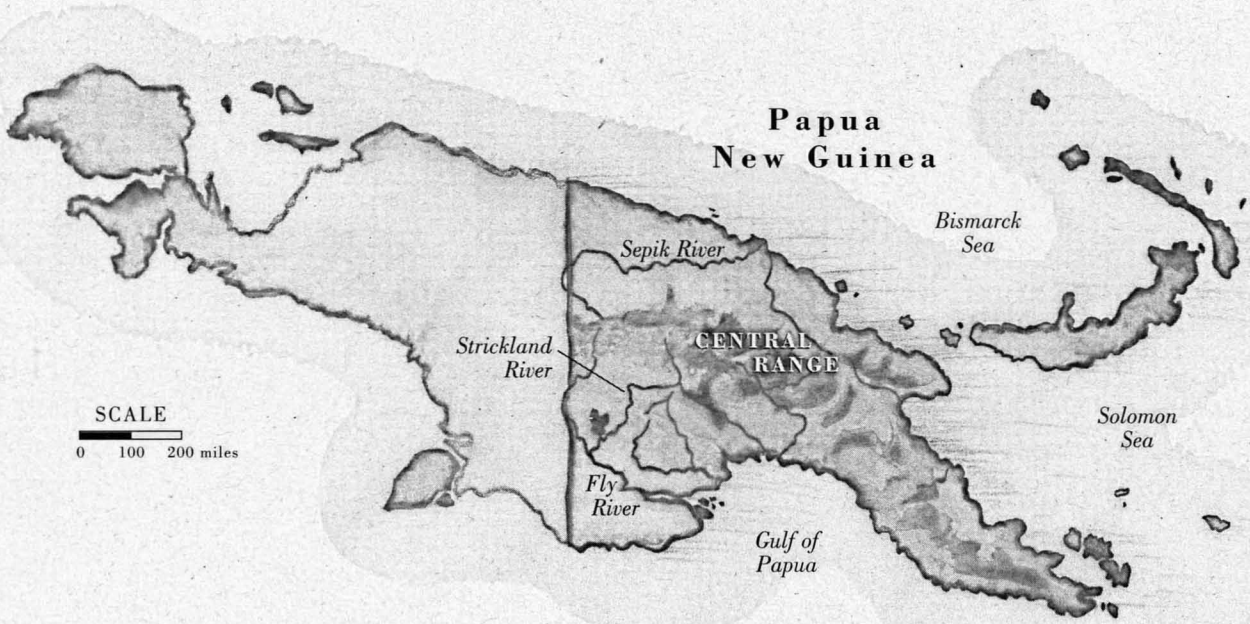
Conservation in Papua New Guinea

New Guinea is the world's largest tropical island and contains some of the most extensive wildlands on Earth. Although in area the largest nation in Melanesia, it contains a population of less than four million people and much of the island remains unexplored. More than 70% of the country is covered with rainforest. These forests contain many endemic species, as well as tree-dwelling kangaroos, ostrich-like birds known as cassowaries, the world's largest pigeons and butterflies, the world's longest lizard, nearly three thousand species of orchids, and 10,000 species of flowering plants. With at least 1000 languages spoken in New Guinea, it is also one of the last bastions of cultural diversity on the planet.

Papua New Guinea comprises the eastern half of the island of New Guinea and also includes the Admiralty, Bismarck, Trobriands, Louisiade, D'Entrcasteaux and northern Solomon archipelagos. PNG is in many ways unique among the world's developing nations. While the forests and other natural resources in many countries are considered state property, PNG has decided to legally recognize traditional land rights and resource-use patterns. The constitution of PNG "vests local people with the ownership of these resources, irrespective of any documentation or registration" (Swartzendruber 1993). Today, 97% of its total land area remains in traditional hands (Swartzendruber 1993).

PNG has not, however, escaped the pressure to exploit natural resources for development. Logging, mining, and commercial agriculture are beginning to transform the landscape. Landowner groups are demanding action to remedy the erosion, water pollution, and loss of species that accompany some forms of resource extraction. In order to short-circuit the cycle of habitat and biodiversity loss that grips much of our world, the PNG government requested in 1993 that the United States Agency for International Development conduct a Conservation Needs Assessment (CNA) of the country.

The CNA made it clear that Papua New Guinea, as one of the world's most significant centers of biodiversity, represents a globally significant opportunity for conservationists (Swartzendruber 1993). Within PNG, the Central Range—which contains an array of habitats ranging from lowlands to subalpine forest and considered to be a national hotspot of ter-



restrial biodiversity—was singled out as one of sixteen biologically unknown areas (Swartzendruber 1993). From the mountains of the Central Range spring the headwaters of the Fly and Sepik rivers, the country's largest watershed. This "major terrestrial unknown" was targeted for exploration and conservation action by the authors of the CNA (Swartzendruber 1993).

The Hewa Project

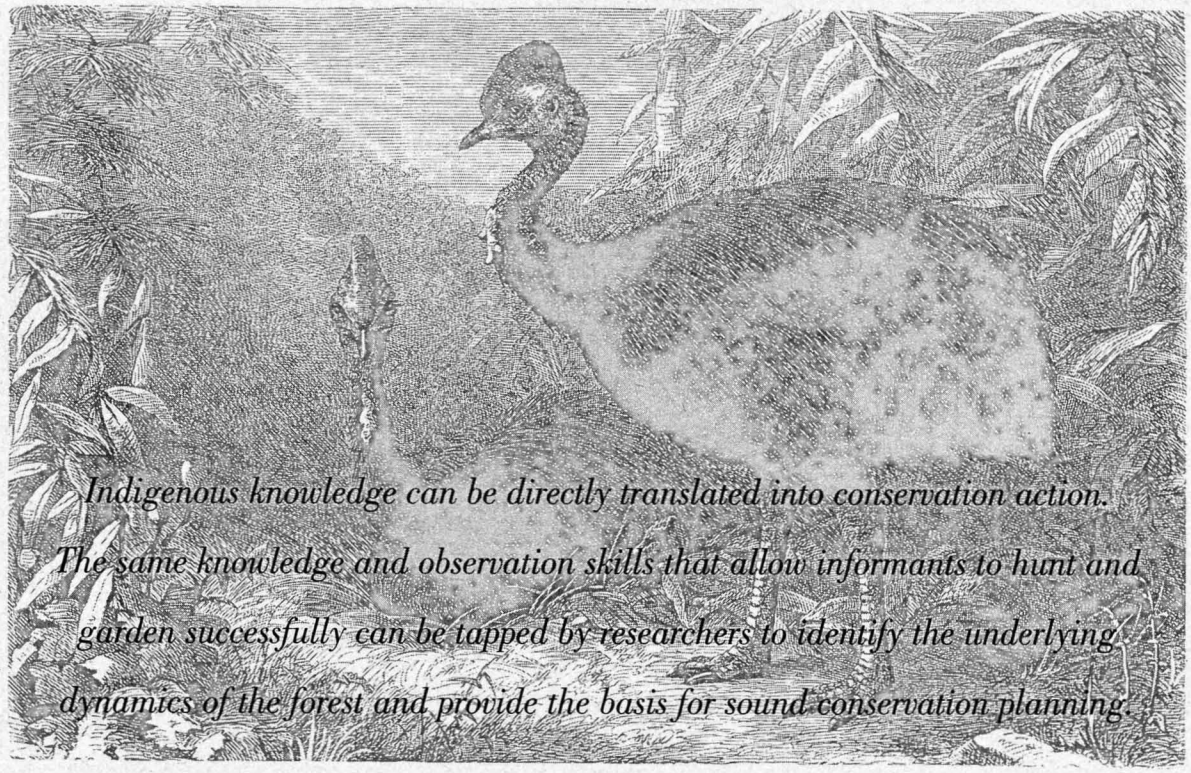
My research was conducted in PNG's Central Range, at the headwaters of the Strickland River (142°30′E, 5°10′S: elevation 500–3000 meters). This is the infamous limestone country avoided by the colonial era expeditions sent to penetrate the Central Range. Although the Conservation Needs Assessment describes the Central Range as "wilderness with low human population," it is the homeland of the Hewa (Swartzendruber 1993). There are no roads into this region and no bridges span the Strickland, the Om, or the Lagaip rivers in the Hewa territory. Although in 1992 Lutheran missionaries cut the first air strip in the area, the continuing isolation of the Hewa presents an excellent opportunity to explore the relationship between traditional lifestyles and wildlands conservation.

The mountainous terrain has isolated the Hewa and dramatically slowed the pace of cultural change that has greatly affected other societies in New Guinea. Today, the Hewa remain subsistence-oriented swidden horticulturists. The estimated 2000 Hewa live in scattered households separated by a walk of thirty minutes to one hour. Their territory is extensive, covering the northernmost portion of PNG's Southern Highlands Province and extending to the Sepik basin. With no police or schools and until recently, no western medicine, indigenous knowledge is still an important aspect of the Hewa culture.

The Hewa affect biodiversity in several ways. They hunt birds, mammals, and reptiles for food, adornment, and exchange. They are swidden horticulturists, engaging in a cycle of cutting gardens and allowing each garden to lie fallow for 20–25 years. Like many forest gardeners, the Hewa prefer to cut secondary forest for gardens. Once an area has been cleared—preferably a site between 700–1000 meters above sea level—the Hewa will continue to make gardens on the same land. This practice short-circuits the process of forest regeneration; that is, under ideal conditions the land is not allowed to return to primary forest. Although these gardens eventually become patches of secondary forest while in fallow, secondary forest in New Guinea is generally poorer in avifauna than primary forest (Schodde 1973). Research elsewhere also indicates that while managed or semi-wild gardens may be repositories of agrodiversity, they are less diverse than both secondary and primary forests, especially with regard to wildlife (Padoch and Peters 1993).

PNG has accepted the idea that human activity and conservation can be compatible and is committed to incorporating traditional forms of land management into conservation of its resources (Swartzendruber 1993). Therefore, the Hewa were the logical starting point for this project. The Hewa are especially knowledgeable about birds; they hunt birds for food and adornment and have an encyclopedic knowledge of the trees birds utilize for nesting and foraging. Faunal conservation in New Guinea is linked to vegetative conservation (Schodde 1973). Because birds are the primary agents of seed dispersal in New Guinea, the forest is as dependent on the birds for survival as the birds are dependent upon the fruits and seeds produced by the trees. The greatest human impact on the Central Range is the forest clearing to create and maintain gardens. It is this

map by Allaire Diamond



Indigenous knowledge can be directly translated into conservation action. The same knowledge and observation skills that allow informants to hunt and garden successfully can be tapped by researchers to identify the underlying dynamics of the forest and provide the basis for sound conservation planning.

dynamic—people's need to garden for survival, the resulting cultivation practices, and its effect on avian diversity—that most directly affects biodiversity conservation efforts.

So far, my research has recorded 128 Hewa categories for birds (three of which I have yet to identify), corresponding to 171 species. Like western ornithologists, the Hewa associate species with altitude and habitat. Experience has also taught them that some species can live only in primary forest, while other birds can make use of only primary forest and the oldest secondary growth (i.e., forest that has been growing for 20 years or more). According to the Hewa, cutting primary forest will eliminate 56 species of birds found here; that is, once the forest is cut and the gardening cycle begins, 56 species will not return to the secondary forest even after the 25-year fallow. Shortening this fallow period is predicted to eliminate another 42 species. In all, 57% of the species of birds native to this area are thought to be intolerant of human disturbance. During my research, I conducted transect counts to determine the accuracy of my informants' data. The data obtained through these counts corresponded with my informants' observations of bird habitat and altitude preferences.

Of particular interest to conservationists is the effect of gardening on fruit- and nectar-eating birds. New Guinea's forests have twice as many fruit- and nectar-eaters as are found in the Peruvian rainforests (Beehler 1986). According to the Hewa, their gardens create an environment that is hostile to most species of fruit-doves (*Ptilinopus sp.)* and lorikeets (*Charmosyna sp.*). Both are thought to be vital to forest regeneration. Perhaps as important, even when accompanied by a fallow period of 20 years, gardening eliminates many of the species that are identified with New Guinea's forests. The Vulturine Parrot, Pheasant Pigeon, Blue-collared Parrot, Brush-turkey, Hornbill, Flame Bowerbird, and Purple-tailed Imperial Pigeon are just some of the species that will find secondary growth incompatible with their needs.

Consequences for Conservation

Conservation is primarily a political process. Adopting a policy of including indigenous people in the conservation of their lands makes perfect sense—politically. However, much of the enthusiasm for the inclusion of indigenous societies in the conservation process is based on the perception that they have developed the ability to balance their needs with those of biodiversity conservation. Yet, the simplest interpretation of the information provided by the Hewa is that their activities are a source of ecological disturbance, not an attempt to maintain ecological balance. Still, research indicates that biodiversity is in part a product of disturbance (Reice 1994). On a small scale, swidden horticulture actually increases the diversity of this landscape. By cutting small plots of forest and allowing them lie fallow for over 20 years, the Hewa are creating a mosaic that is more diverse than the original landscape. The primary forest has been transformed into a patchwork of old growth, various stages of regrowth, and gardens. This mosaic represents a greater diversity of species and environments than the original forest. However, the aim of these gardeners is to scratch a living out of an otherwise inhospitable forest, not to encourage biodiversity. As far as the Hewa

are concerned, most of their food comes from the least biologically diverse environment—their gardens. In this case, biological diversity is the by-product of gardening by a small, scattered human population and not a strategy for the maintenance of biodiversity. With one of the largest tracts of tropical forest on Earth at stake, we cannot afford to assume that the Hewa manage their land with the intention of conserving biodiversity.

Nothing I uncovered indicates that the Hewa have developed traditions that will effectively limit the scale of human disturbance if their population increases. The Hewa do not attempt to limit gardening in either primary or secondary forest, taboos do not prohibit the consumption of birds, and kinsmen may cut as many gardens as they need on clan lands. There are no sacred lands that cannot be cut for gardens. I was unable to find an area the Hewa deemed sacred that was larger than a pool of water or a grove of bamboo. Areas this small would provide sanctuary for only the smallest organisms and would not meet the minimum requirement for a viable population of any bird species.

Presently, the limiting factor on human disturbance is population size. Fecundity is constrained by the traditional postpartum taboo and high mortality; an estimated 70% of Hewa children die before their second birthday. Although there are no birth records for the Hewa, average life expectancy for men and women in the surrounding Southern Highlands communities was 36 years in 1970 and had only increased to 41 years by 1980 (Gillett 1991). The postpartum taboo requires that couples do not engage in sex while the mother is breast-feeding the child; this can effectively space births by two to three years. Historically, these factors have combined to keep the population below 2000 individuals in PNG's second largest wilderness area.

Conservation agencies hope that by involving the inhabitants in the conservation of their homelands they will be able to tap traditional knowledge for clues to preserving both traditional societies and the lands that sustain them. The Hewa are providing data on the effects of their activity on birds that will be vital to conserving the forest. More important, the Hewa's situation provides a general prescription for combining cultural and biological conservation: We must not only conserve the processes that produce diversity, but also the *scale* of these processes. This presents a dilemma for conservationists. The traditional gardening techniques employed by the Hewa are likely sustainable and diversity-enhancing when practiced by a small, mobile population scattered over a large area. These practices were developed in a precontact state; they may well be untenable in the future for an expanding population facing a shortage of arable land.

Neither the Hewa nor the government of Papua New Guinea will accept a conservation program that requires the Hewa to remain frozen in this precontact state. It will be up to conservationists to design a new system that will limit human disturbance without denying the Hewa some of the benefits of modern life. The Hewa would like to see the government establish a school and medical aid post in their territory. They also want a source of income, such as government-sponsored trail maintenance.

Although the Conservation Needs Assessment has made the conservation of this area a priority, I would recommend that PNG emphasize the economic value of the watersheds that originate in the Central Range, rather than appealing to its value as a biodiversity reserve. These mountains are the headwaters of the Fly and Sepik rivers, the two largest watersheds in PNG, and the source of fresh water for many New Guineans. These rivers feed very productive coastal fisheries that are worth millions of dollars to PNG. For a small investment in wages, schoolbooks, medical supplies, and birth control, the government of PNG could employ the Hewa as "guardians" of their territory. With this national investment and a financial stake for the Hewa in practicing conservation, there is a good possibility that the area can be saved. However, any policy that relies on the ability of the Hewa to balance their needs with biodiversity conservation, while ignoring the potential for traditional activities to simplify the environment, will ultimately destroy both the Hewa culture and the landscape it was intended to conserve. ☾

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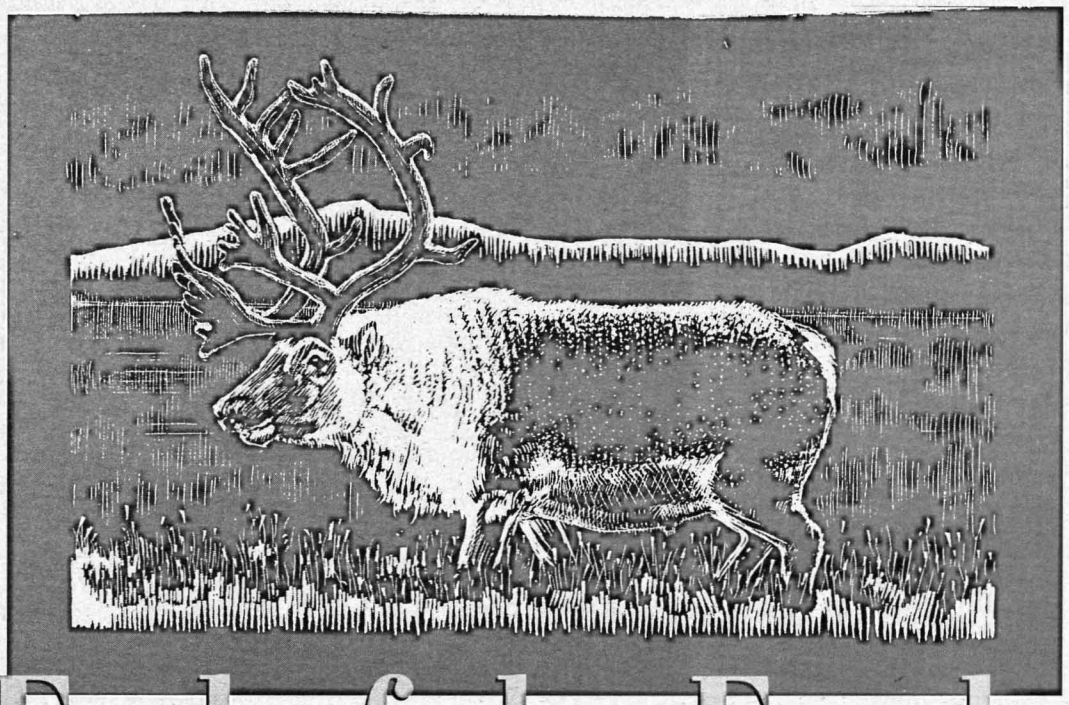


The End of the Earth

Threats to the Yamal Region's Cultural and Biological Diversity

by Bruce Forbes

Northwest Siberia is undergoing large-scale industrial development at a rapid pace. The Yamal-Nenets Autonomous District, although home to one of the largest untapped sources of natural gas in the world, has only recently been introduced to the outside world via major coverage in the popular and business/finance media (Specter 1994a, b, Fuhrman 1995, York 1997, Deutsche Morgan Grenfell 1998, Montaigne 1998). Russia has been designated a "Cooperation Partner" country within NATO, and Western oil companies and the World Bank have pledged billions of dollars to develop the resources of the Yamal Region (Greenhouse 1993, Specter 1994b, Anonymous 1997). The Yamal gas development is easily as controversial (albeit much less known) as its closest analog, the battle over petroleum exploration in Alaska's Arctic National Wildlife Refuge. A series of pipelines are planned that would eventually dissect the east central Yamal Peninsula (see map). An alternative plan is to ship the gas out by tanker/icebreaker convoys via the Northern Sea Route (Golovnev et al. 1998). The regional state-controlled petroleum company Nadym Gazprom has been actively pursuing this $40-billion project since the 1960s (Golovnev and Osherenko 1999)—the last of the Soviet-style mega-projects (Deutsche Morgan Grenfell 1998). In summer 1996 Gazprom and its former American partner Amoco (since merged with BP) called a 5-10+ year moratorium on further construction on the Yamal development, one of several major projects underway here and in the adjoining East European Arctic.

The regional scale of habitat destruction in northwest Siberia, including the Yamal Peninsula, was recently summarized by Vilchek and Bykova (1992, see also Vilchek 1997). They observed that plant cover is already completely destroyed on over 450 km² within gas and oil fields and on 1800 km² along the main pipelines. They estimate the total area of destroyed vege-

illustration by Sarah Lauterbach

tation to be about 2500 km². If the overland pipeline is built, Vilchek and Bykova (1992) assert that the area of explored gas and oil fields will increase to 16,200 km² and the portion with completely destroyed vegetation will increase to 5500 km². (If the gas is shipped out by tanker, only short pipelines will be built to the coast near Bovanenkovo [see map]; however, this will still require completion of the road/railway and the combined result will be considerable habitat destruction.) The aforementioned figures are likely to be low estimates because they do not include the further degradation that is expected to occur due to overgrazing by reindeer or cumulative impacts such as altered hydrology and blowing sand/dust from roads and quarries (e.g., Forbes 1995). The three most widespread types of disturbance are off-road vehicle traffic, exploratory drilling, and sand excavation (Vilchek 1997, Khitun 1997). Assisted revegetation programs designed to control erosion on affected areas have met with limited success due to their immense expanse and the prevalence of nutrient poor, well-drained, and highly erodable sands, in conjunction with the cold, dry climate (Forbes and Jefferies 1999).

This region is the homeland of the largest remaining nomadic pastoralist group in the Arctic, the Yamal Nenets. The basis for their indigenous economy is the seasonal exploitation of extensive tundra "pastures" by their reindeer. However, natural gas exploration has resulted in the direct withdrawal of large areas of tundra for infrastructure development, and associated disturbances have led to cumulative impacts on thousands of additional hectares of land. The land withdrawals have pushed an increasing number of reindeer onto progressively smaller parcels of pasture, causing excessive grazing and trampling of lichens, bryophytes, and shrubs and, in many areas, erosion of sandy soils via deflation (Khitun 1997, Vilchek 1997). Furthermore, cumulative negative effects of an as-yet-unfinished year-round road/railway corridor to facilitate movement of materials and people are already manifesting themselves in southern Yamal (Forbes 1995, 1997, Forbes and Jefferies 1999). The moratorium on further development, if it holds, may provide opportunities for more detailed baseline scientific research and to marshal political support for the Nenets should either the pipeline or sea route project proceed as planned. It cannot, however, erase the damage of three decades of gas/oil exploration with few attempts at mitigation of impacts.

Traditional Economy and Ecology in a Modern Context

In the Nenets' own language, "Yamal" means roughly "the end of the earth" or "land's end." The Nenets have survived for centuries (Golovnev and Osherenko 1999) through perseverance and pride and, during this century, in the face of demands imposed by the communist regime. Even while forced to attend Russian schools, the Nenets have retained their language and culture and have made consistent efforts to be good stewards of the land and its wildlife despite decades of active mismanagement under the collective system.

The so-called brigade system is an artifact of the Stalin era, when everything was "collectivized." The Soviets attempted to break the Nenets' system of reindeer management, with its clan-based ownership, by enforcing the collective ethic and state ownership. The Nenets were expected to provide reindeer meat to the Russian "market." When the communist regime collapsed in 1991, the subsidies for meat distribution disappeared and the artificial market was exposed. About half the animals have since returned to private ownership, but many herds are still operated as collectives with Russian (nonnative) managers. Nenets must now barter directly, with either fish or "ponti"—the velvet covering the reindeers' antlers that is coveted as an aphrodisiac in Southeast Asia—for goods like tea, bread, sugar, jam, and other items available at the few regional trading posts. An export market has quickly developed and can be highly lucrative for greedy Soviet-era regional managers who maintain control over the collection (by helicopter) and distribution of the "ponts."

From an ecosystem perspective, the most damaging aspect of the enforced collectivization has been the establishment of rigidly bounded (but not fenced) brigade routes and the utilization of virtually every square kilometer of available tundra for reindeer grazing. There are no reserve or "fallow" pastures. For many decades, each brigade's annual migration of several hundred kilometers has taken place along the same path. This has robbed the Nenets of their traditional ability to alter the routes accounting for changes in pasture conditions and climate, thus exacerbating the grazing impacts. Unfortunately, the regional authorities are resistant to dismantling the ecologically and culturally destructive brigade system.

At present, the total number of semi-domestic reindeer in public (collective) and private ownership in the entire territorial division or *okrug* is about 460,000, including 180,000 on the Yamal Peninsula. Massive outright land withdrawals by Gazprom and exploration and development activities—particularly at the Bovanenkovo Gas Field where 127,000 hectares (1270 km²) of tundra comprising reindeer pasture land had been lost by 1990 (Martens et al. 1996)—have pushed a relatively consistent number of animals onto increasingly smaller areas of tundra. It is now estimated that the number of semi-domestic reindeer on Yamal is already 1.5 to 2 times greater than the optimum for the region (Vilchek and Bykova 1992, Martens et al.

1996). Overgrazing and industrial development combine to create a scale of actual and potential surface disturbance not found anywhere else in the tundra biome.

Reindeer Biology

As a species, *Rangifer tarandus* has a circumpolar distribution. North American caribou are mostly wild, whereas the Eurasian reindeer comprise an abundance of both semi-domestic and wild types. Various subspecies occur in the eastern and western hemispheres (Syroechkovskii 1995, Pruitt 1996). Reindeer have been introduced in many places around the globe, occasionally on islands, but nearly always with disastrous consequences for the target ecosystems that either evolved without them (see Leader-Williams 1988 for a fine review) or have not been exposed to any grazing for several generations (e.g., Nishi 1993).

According to Podkoritov (1995) and Haakanson (1996, pers. comm.), supplemental winter feeding does not occur on Yamal as it does in Finland, where it helps to maintain herds at artificially high (and damaging) levels. However, this may not prevent ecosystem dysfunction. As Manseau et al. (1996) have discovered in northern Quebec, *Rangifer* spp. can depress the plant productivity of their summer range even in the presence of wolf populations not subject to human control. Caribou and reindeer can have a significant effect directly on plant biomass and indirectly on the distribution of the food source at the landscape level. In winter they feed mostly on carbohydrate-rich lichens, as well as senescent leaves, shoots, and twigs of vascular plants, but switch to protein-rich grasses, shrubs (dwarf willow and birch), leguminous herbs, and sedges in late spring and summer. They are also extremely fond of mushrooms. Excessive grazing over many years tends to favor graminoids and ruderal (weedy) mosses at the expense of lichens and certain preferred dwarf shrubs and is an ecologically important limiting factor in the regeneration of many vascular plant species, thus altering the course of vegetation change on areas recovering from disturbance.

Viable Wildlife Populations

Substantial populations of terrestrial wildlife inhabit this region, but some fur-bearing species are subject to hunting and trapping. Pelt output—a very rough measure of population dynamics—is available from 1962 to 1988 (Vilchek 1992) for wild (not farmed) arctic fox, fox, ermine, wolf, squirrel, otter, wolverine, sable, muskrat, and hare. Although the dangers of using such data to estimate actual populations are well-known, the pelt output trends for some mammals reveal steep declines. Brown bear and moose are both very rare on the tundra. Polar bear and walrus, both protected, may come ashore in places in late summer (Chernov 1997). Three types of ptarmigan or grouse (*Lagopus* spp.) occur, along with wild ducks and geese, and these are hunted for sport and game by nonnative and native populations, respectively. Raptors include a variety of owls, eagles, and hawks, all of which are common in the tundra zone except the peregrine falcon (Chernov 1997).

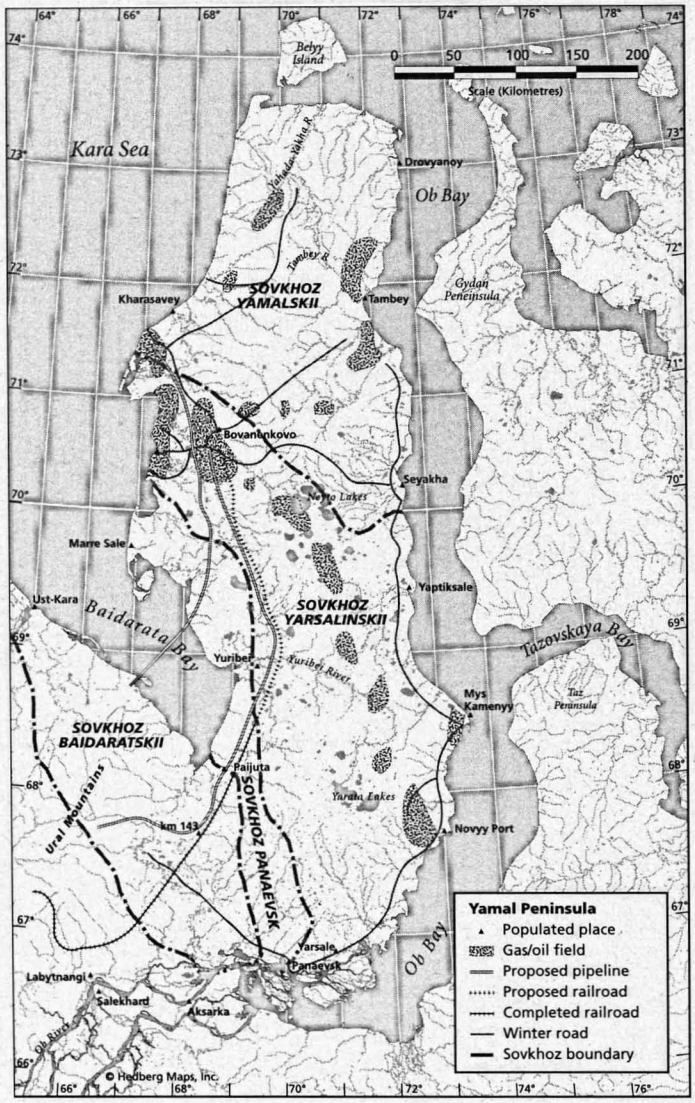
Women rounding up the reindeer at a Nenet camp in winter. Note coats, boots, rope, and "chum" (tent) coverings—all from reindeer skin.

photo by Bruce Forbes

Wolves (*Canis lupus albus*) are distributed everywhere, but population densities are somewhat higher on the so-called southern tundra (central Yamal) compared to the northern tundra (northernmost Yamal) and the forest-tundra. Hunting from helicopters peaked after World War II (413 animals taken 1948–58), but then eased up and populations had recovered by the 1970s. The total population for the Yamal-Nenets Region was recently estimated to be about 500 wolves, with densities ranging from about 0.7 individuals per 1000 km² in the forest-tundra to 1.5/1000 km² in the tundra (Korytin et al. 1995). Most wolves depend on reindeer for their sustenance and therefore follow their annual migration to a great extent. But for wolves in the far north and along the coast, ptarmigan are also important in their diet.

Although wolverines also range throughout Yamal Peninsula, population densities are much lower than wolves, as is the case elsewhere in the circumpolar North. They are slightly more numerous in the southern tundra and forest-tundra. The density for the region is estimated to be 0.05 individuals per 1000 km² (Korytin et al. 1995). They sometimes prey on reindeer, taking only weakened or sick adults and calves, but Nenets do not consider them a threat to the herds. It is more common for them to feed on carcasses left by wolves, though they also prey on smaller mammals and birds and consume hoards of berries in season. When they are hunted, it is usually by non-Nenets seeking their extremely valuable pelts. Wolverine pelt outputs vary greatly—from a high of 148 in 1969 to a low of seven as recently as 1983—with no clear pattern (Vilchek 1992).

The arctic fox is considered to be particularly at risk. The number of arctic fox pelts produced between 1962–64 ranged from



Map of the Yamal Peninsula in Northwest Siberia, showing the locations of the railway/road corridor, known gas deposits, and proposed pipeline routes. Also indicated are the "sovkhozy," lands managed by the combined collective/private reindeer breeding units. The annual reindeer migration begins at treeline, along the Ob River delta, and moves north onto the tundra in the spring. After utilizing the tundra as summer pasture, the Nenets and the reindeer return to the south in the fall, except for in the Yamalskii sovkhoz, which exists entirely within the tundra region.

23,324 to 32,406; in 1988, the number was 4334 (Vilchek 1992). In the early phases of intensive gas field development, 13% of fox dens were substantially or totally destroyed during the construction of roads, facilities, and quarries, in addition to uncontrolled off-road traffic by tracked vehicles. Since then the pace of development has increased substantially, as has poaching by crew workers, and there is concern for the long-term viability of the central Yamal arctic fox population (Dobrinskii and Sosin 1995).

The full suite of this region's indigenous wild animals has survived in the context of reindeer herding for several centuries—despite increasingly intense hunting, trapping, fishing, and industrial pressures from non-Nenets in the last several decades. Still, it is likely that most mammal populations are less robust as a result of habitat loss and reindeer grazing. Industrial development threatens to degrade more habitat and negatively affect wildlife.

The Future of Yamal's Nature and Culture

Although this ecosystem is extensively manipulated by humans and seemingly overrun by semi-domesticated animals, the region retains viable populations of wolves, wolverines, eagles and other wildlife indicative of wildlands (many of which survive on the ample semi-domestic fodder). Wilderness devoid of humans is largely nonexistent outside of Antarctica, and the concept is alien to indigenous northern cultures (Klein 1994). Humans have long been—and remain—a major part of the most productive arctic landscapes, and are thus integral components affecting ecosystem structure and function. Conservationists can benefit from acquainting themselves with those places where humans live in relative harmony with the natural world. The Yamal Nenets certainly qualify on this score, and, as good stewards of their lands, they deserve whatever support the outside world can muster in the face of massive industrial development.

According to Gazprom's plans, the Yamal gas development project is to be constructed in stages. The "last and most expensive" (i.e., damaging) stage, which they estimate at $18 billion, is not scheduled to begin until around 2005, and the actual petroleum reserves are not "needed" until beyond 2010, possibly later (Deutsche Morgan Grenfell 1998). This potentially buys some time, but not much. If BP-Amoco or some other Western company returns, pressure can be brought to bear where it counts most, in the media and the marketplace—an unfortunate scenario, but one that could bring necessary attention to this often overlooked, but ecologically and culturally rich, arctic region. ☾

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~ They Tell about the Woman who Married a Bear

that he came to her like a man
led her to the best berry patches
helped fill up her basket and when
she had lost track of time
he fired up her dark with a heat too delicious (and too late)
to question

they picture her floating on the crest of winter
like a small ship safe in the harbor of his cave
imagine how she learned to live on memory and sleep
the way bears do
how furred children thickened inside her
how the gods of people and bears struck bargains for magic
and sealed their secrets away for good

when fever streaks through camp like a fox
and stored meat runs low
men of the tribe wake at the wrong hours
from dreams of the bear entering her
everything they have seems old and lost then
like dried nuts rattling in their shells

what they don't know is how she
entered him
how he opened to her like a blood drumming sky
how she could play his thunder from inside the heart
and then how she learned to roar
they don't see as the sun turns at the solstice
these two rise to fill the cave the mountain the entire night
woman moon bear moon
full to bursting vanishing into root substance
spilling into beads of light

there in the snow a pool of gold a chrysalis of spirit
out of which nothing ever known will be born

—Miriam Dyak

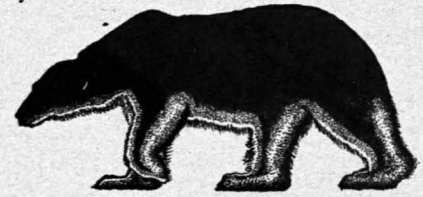
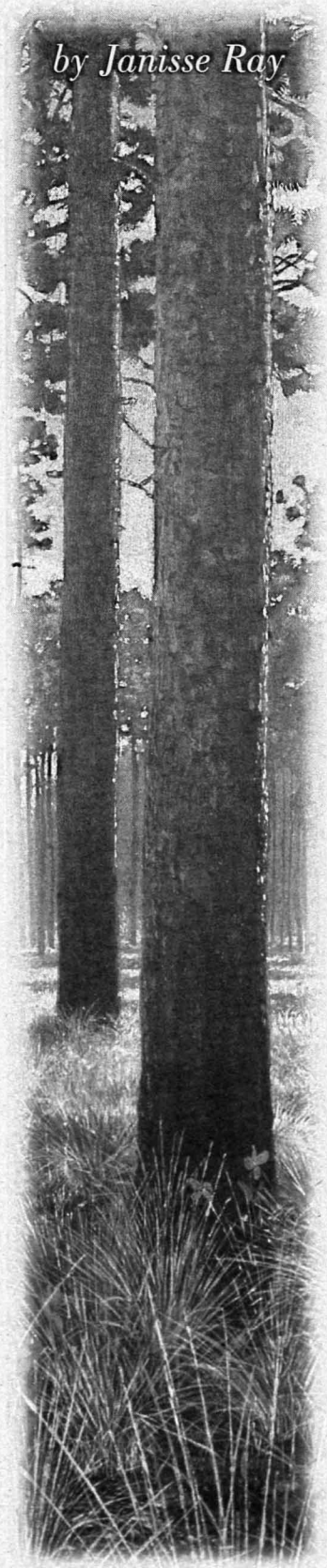


illustration by Sarah Lauterbach

Land of the Longleaf

by Janisse Ray



Below the Fall Line

THE LANDSCAPE THAT I WAS BORN TO, THAT OWNS MY BODY: the uplands and lowlands of southern Georgia. The region lies below what's called the fall line, a half-imaginary demarcation avouched by a slight dip in the land, above which the piedmont climbs to the foothills of the Blue Ridge, then up that mountain chain to the eastern continental divide. The fall line separates the piedmont from the Atlantic coastal plain—a wide flat plateau of pineywoods that sweeps to a marble sea.

My homeland is about as ugly as a place gets. There's nothing in south Georgia, people will tell you, except straight, lonely roads, one-horse towns, sprawling farms, and tracts of planted pines. It's flat, monotonous, used-up, hotter than hell in summer and cold enough in winter that orange trees won't grow. No mountains, no canyons, no rocky streams, no waterfalls. The rivers are muddy, wide and flat, like somebody's feet. The coastal plain lacks the stark grace of the desert or the umber panache of the pampas. Unless you look close, there's little majesty.

It wasn't always this way. Even now in places, in the Red Hills near Thomasville, for example, and on Fort Stewart Military Reservation near Hinesville, you can see how south Georgia used to be, before all the old longleaf pine forests that were our sublimity and our majesty were cut. Nothing is more beautiful, nothing more mysterious, nothing more breathtaking, nothing more surreal.

Longleaf pine is the tree that grows in the upland flatwoods of the coastal plains. Miles and miles of longleaf and wiregrass, the ground cover that coevolved with the pine, once covered the left hip of North America—from Virginia to the Florida peninsula, west past the Mississippi River: longleaf as far in any direction as you could see. In a longleaf forest, miles of trees forever fade into a brilliant salmon sunset and reappear the next dawn as a battalion marching out of fog. The tip of each needle carries a single drop of silver. The trees are so well spaced that their limbs seldom touch and sunlight streams between and within them. Below their flattened branches, grasses arch their tall, richly dun heads of seeds, and orchids and lilies paint the ground orange and scarlet. Purple liatris gestures across the landscape. Our eyes seek the flowers like they seek the flashes of birds and the careful crossings of forest animals.

You can still see this in places.

Forest historians estimate that longleaf covered 85 of the 156 million acres in its southeastern range. By 1930, virtually all of the virgin longleaf pine had been felled. Now, at the end of the twentieth century, about two million acres of longleaf remain. Most is first- and second-growth, hard-hit by logging, turpentining, grazing, and the suppression of fire.

This essay combines three chapters from Janisse Ray's forthcoming book Ecology of a Cracker Childhood *(Milkweed Editions, ©1999 by Janisse Ray) and is used with kind permission of Milkweed Editions (www.milkweed.org).*

longleaf pine and wiregrass (detail) by David Williams

Less than 10,000 acres are virgin—not even 0.001 percent of what was. There's none known in Virginia, none in Louisiana, none in Texas, none in South Carolina. About 200 old-growth acres remain in Mississippi, about 300 in Alabama, and almost 500 in North Carolina, in four separate tracts. The rest survives in Georgia and Florida. An estimated 3000 acres of old growth in Georgia lie on private land, precariously, and the largest holding of virgin longleaf, about 5000 acres, belongs to Eglin Air Force Base in Florida.

In a 1995 National Biological Service assessment of biological loss, ecologist Reed Noss classified the longleaf/wiregrass community as "critically endangered." Ninety-eight percent of the presettlement longleaf pine barrens in the southeastern coastal plains were lost by 1986, he said. Natural stands—meaning not planted—have been reduced by about 99 percent.

Apocalyptic.

This was not a loss I knew as a child. *Longleaf* was a word I never heard. But it is a loss that as an adult shadows every step I take. I am daily aghast at how much we have taken, since it does not belong to us, and how much as a people we have suffered in consequence.

Not long ago I dreamed of actually cradling a place, as if something so amorphous and vague as a region, existing mostly in imagination and idea, suddenly took form. I held its shrunken relief in my arms, a baby smelted from a plastic topography map, and when I gazed down into its face, as my father had gazed into mine, I saw the pine flatwoods of my homeland.

Forest Beloved

MAYBE A VISION OF THE ORIGINAL longleaf pine flatwoods has been endowed to me through genes, because I seem to remember their endlessness. I seem to recollect when these coastal plains were one big, brown-and-tan, daybreak-to-dark longleaf forest. It was a monotony one learned to love, for this is a place that, like a friend, offers multiplied loyalty with the passing years. A forest never tells its secrets but reveals them slowly over time, and a longleaf forest is full of secrets.

I know a few of them.

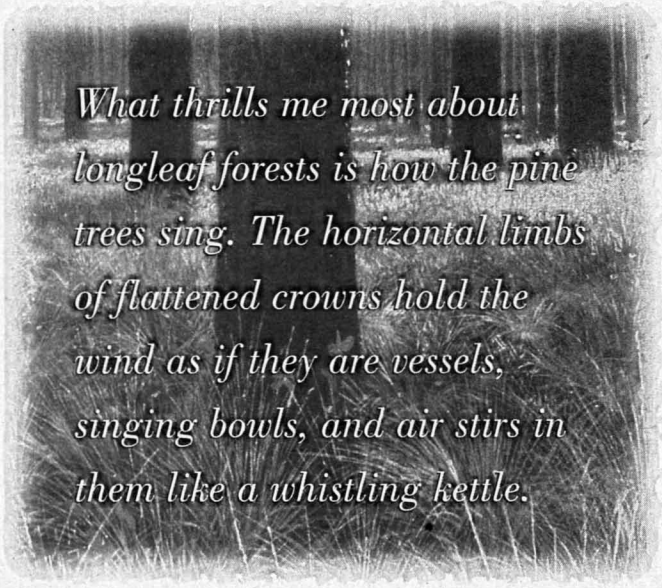
Longleaf pines are long-lived, reaching ages over five hundred years. As trees mature, their heartwood becomes so heavy and thick with resins that saw blades bounce away from it, and if saw teeth manage to enter the grain, they quickly gum up and dull. Heartwood mills a strong everlasting timber the color of ripe amber that earned longleaf the name "heart pine." Parcels of the tree, especially stumps and the area of the heart, are more heavily tamped with resin, and that wood is called "fat lightered," though people use the two names interchangeably, "heart pine" and "fat lightered," and sometimes they say only "fat," as in "Put another piece of that fat on the fire." It is so rich with concentrated, cured sap that it burns like a flare and has long been used, in very small pieces, as kindling; the resinous knots were early lanterns.

In the heart rests both the tree's strength and its weakness. After about ninety years, pines often are infected with red heart, a nonmortal fungus that makes the heartwood softer, more porous, and more flammable, and that often hollows out the pine and makes of it a refuge.

YOU DON'T THINK ABOUT DIVERSITY WHEN YOU LOOK AT longleaf. In a fully functioning longleaf woodland, tree diversity is low. A single species of pine reigns in an open monologue of tall timbers (except on sandhills where occurs an understory of turkey, post, and bluejack oak). The trees grow spaced so far apart in pine savannas, sunshine bathing the ground, that you can see forever; they are as much grassland as forest. The limbs of longleaf pine are gray and scaly and drape as the tree matures, and its needles are very long, up to seventeen inches, like a piano player's fingers, and held upright at ends of the limbs, like a bride holds her bouquet. In 1791, naturalist and explorer William Bartram, in his *Travels,* called the southern pinelands a "vast forest of the most stately pine trees that can be imagined."

The ground cover, a comforter laid on the land, contains the diversity. *Wiregrass* dominates—it's a flammable, thin-leaved, yellowish bunchgrass that grows calf-high and so thick it resembles a mop head. From this sinewy matrix of wiregrass all manner of forbs, grasses, and low shrubs poke up. At every step, another leaf shape or petal form begs examination and documentation.

Meadow beauty. Liatris. Greeneyes. Summer farewell. Bracken fern. Golden aster. Sandhill blazing star. Goat's rue. Yellow-eyed grass. Purple balduina. Beautiful pawpaw. Pineland hoary pea. Wireleaf dropseed. Hair grass. Little bluestem. Lopside Indian grass. Toothache grass. Britton's beargrass. Gopher apple. Dwarf live oak. Low-bush blueberry. Blackberry. Runner oaks. Splitbeard bluestem. Honeycomb head. Croton. Clammey weed. Dog tongue. Rayless goldenrod. Narrowleaf sunflower. Black-eyed Susan. Dwarf wax myrtle. New Jersey tea. Inkberry. Dwarf chinquapin. Cooley's meadowrue. Chaffseed. Sandhills milkvetch. Spurge ipecac. Wireweed. Sandwort. Blue lupine. Winter-flowering pixie-moss. Clasping warea. Pigeon wing. Toothed savory. Hairy wild indigo.



One hundred ninety-one species of rare vascular plants are associated with longleaf/wiregrass, 122 of these Endangered or Threatened.

When John Muir conducted what he termed his "floral pilgrimage" to the Gulf in 1867, somewhere on the fall line between Thomson and Augusta, Georgia, he described "the northern limit of the remarkable longleafed pine, a tree from sixty to seventy feet in height, from twenty to thirty inches in diameter, with leaves ten to fifteen inches long, in dense radiant masses at the ends of the naked branches."

"The wood is strong, hard and very resinous," he wrote. "It makes excellent ship spars, bridge timbers, and flooring." Later he added, "I thank the Lord with all my heart for his goodness in granting me admission to this magnificent realm."

What thrills me most about longleaf forests is how the pine trees sing. The horizontal limbs of flattened crowns hold the wind as if they are vessels, singing bowls, and air stirs in them like a whistling kettle. I lie in thick grasses covered with sun and listen to the music made there. This music cannot be heard anywhere else on the Earth.

Rustle, whisper, shiver, whinny. Aria, chorus, ballad, chant. Lullaby. In the choirs of the original groves, the music must have resounded for hundreds of miles in a single note of rise and fall, lift and wane, and stirred the Red-cockaded Woodpeckers nesting in the hearts of these pines, where I also nest, child of soft heart. Now we strain to hear the music; anachronous, it has an edge. It falters, a great tongue chopped in pieces.

SOMETHING HAPPENS TO YOU IN AN OLD-GROWTH FOREST. At first you are curious to see the tremendous girth and height of the trees, and you sally forth, eager. You start to saunter, then amble, slower and slower, first like a fox and then an armadillo and then a tortoise, until you are trudging at the pace of an earthworm, and then even slower, the pace of a sassafras leaf's turning. The blood begins to languish in your veins, until you think it has turned to sap. You hanker to touch the trees and embrace them and lean your face against their bark, and you do. You smell them. You look up at leaves so high their shapes are beyond focus, into far branches with circumferences as thick as most trees.

Every limb of your body becomes weighted, and you have to prop yourself up. There's this strange current of energy running skyward, like a thousand tiny bells tied to your capillaries, ringing with your heartbeat. You sit and lean against one trunk—it's like leaning against a house or a mountain. The trunk is your spine, the nerve centers reaching into other worlds, below ground and above. You stand and press your body into the ancestral and enduring, arms wide, and your fingers do not touch. You wonder how big the unseen gap.

If you stay in one place too long, you know you'll root.

I drink old-growth forest in like water. This is the homeland that built us. Here I walk shoulder to shoulder with history—my history. I am in the presence of something ancient and venerable, perhaps of time itself, its unhurried passing marked by immensity and stolidity, each year purged by fire, cinched by a ring. Here mortality's roving hands grapple with air. I can see my place as human in a natural order more grand, whole, and functional than I've ever witnessed, and I am humbled, not frightened, by it. Comforted. It is as if a round table springs up in the cathedral of pines and God graciously pulls out a chair for me, and I no longer have to worry about what happens to souls.

Hallowed Ground

THE FIRST TIME I SAW A RED-cockaded woodpecker was the first time I saw a real longleaf forest. I was grown. It was an April dawn in the biggest tract of virgin longleaf left anywhere, a private quail-hunting plantation embedded in the Red Hills of southwest Georgia. The light was dim beneath the pines, the wiregrass rinsed in spring dew. There were no mid-story shrubs, just acres of widely spaced pines of all sizes scattered across the landscape like children on a soccer field. Most of the trees were of a diameter of a size twenty dress, circumscribed by a rug of wiregrass, on and on.

Birds sang: Bachman's Sparrow, Pine Warbler, Carolina Wren. As I walked I came to openings in the forest where a tree had fallen after being struck by lightning, and in those patches, new pines regenerated.

longleaf pine and wiregrass (detail) by David Williams

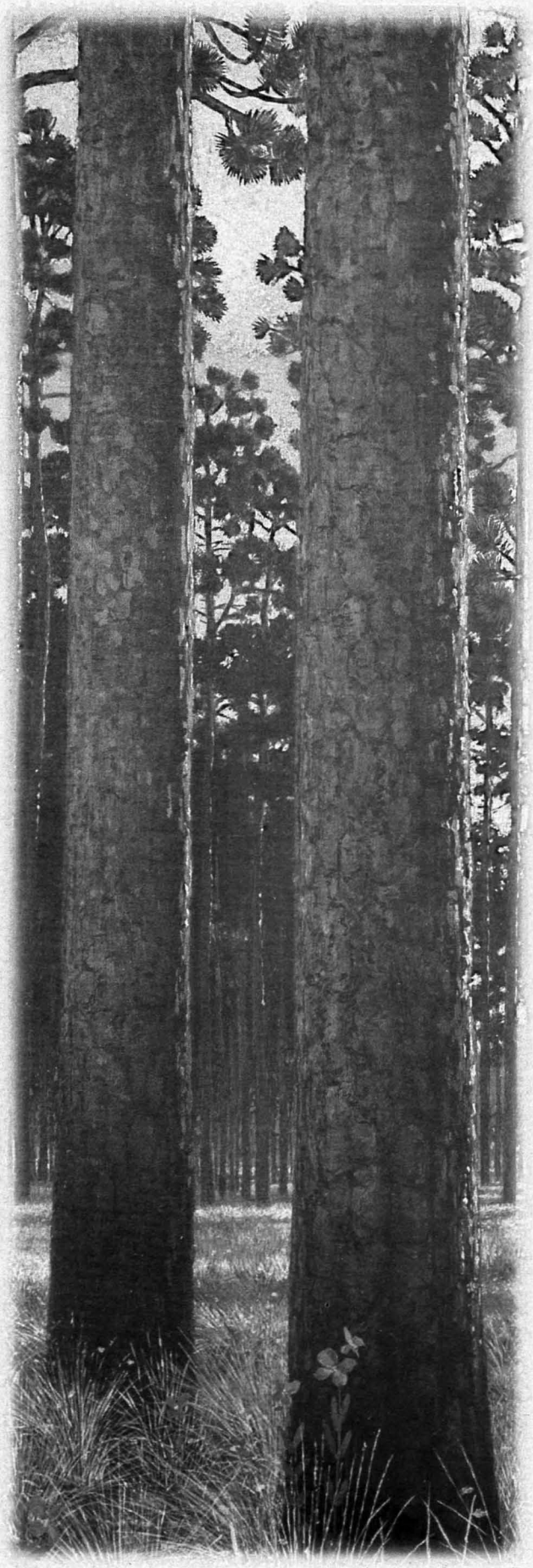
I was looking for the creature most connected with this forest, the Red-cockaded Woodpecker, which survives best in old-growth longleaf pines. As mature pines and extensive pine barrens have become fragmented and rare, so have colonies of the once-common bird, plummeting from perhaps 500,000 in a historic range that spanned from east Texas to Florida and as far north as Missouri, Kentucky, and Maryland, to some 4500, mostly in Florida.

Largely eliminated on private land, it remains on a few National Forests and military bases in the Southeast. Although federally listed as Endangered in 1970, in the 1980s the bird declined by 20% and it continues to decline, despite the efforts of dozens of researchers working to save it. If forest fragmentation and conversion of natural forests to pine plantations persist, scientists warn, recovery will not happen. This, as ecologist Bruce Means passionately writes, "is another chapter in the sorry tale of the unbridled exploitation of our nation's natural resources."

Where the light was brighter, I stopped and looked up at a pine with a hole thirty feet up. I knew it immediately to be a Red-cockaded Woodpecker cavity. I could tell by the swath of white resin that had dried like a dripping candle beneath the hole. Cavity trees, in fact, are referred to as candle trees. After excavating a cavity, the woodpecker worries the reddish sap wells around the opening until they ooze fresh resin that dries opalescent, forming a scabby quagmire that helps protect the woodpecker nest from rat snakes and other predators. If a cavity tree is inactive, the sap dries, turns yellow or gray; it can be reactivated by the bird's pecking at resin wells.

Unlike most woodpeckers, which nest in dead trees, called snags, Red-cockadeds excavate nesting holes twenty to fifty feet above ground in live Southern pines. They will use several species of pine—loblolly, shortleaf, and slash at least seventy years old and longleaf over ninety. Cavity building is slow, hard work; whittling chip by chip, this woodpecker may spend over a year and sometimes several years on its cavity. For this reason, Red-cockaded Woodpeckers prefer to nest in old-growth longleaf infected with red-heart, which does not kill the tree but does make the heartwood softer. Once complete, the cavity is not readily surrendered or abandoned. Woodpeckers may occupy a cavity for decades if they can successfully deter the Pileated Woodpeckers, fox squirrels, and Wood Ducks, who would enlarge the hollow and move in. Once enlarged, cavities are rarely used by Red-cockadeds. In a typical colony, some cavities are under construction, some are active, and some are abandoned.

A family group, or clan, consists of a breeding pair and sometimes one or more helpers, typically young males that don't leave home. In this social system, two to seven of the birds live-



longleaf pine and wiregrass (detail) by David Williams

together in clusters of cavity trees—colonies—within an area of ten to twenty acres in the forest, where they defend territory and communally raise young. When young females (and some of the males) go forth to seek unmated birds, they prefer not to travel far, usually only a couple of miles. Red-cockaded Woodpeckers are territorial, highly allegiant to place. They do not migrate. Mating birds bond for life, until one of the pair dies. And for such petite birds they're long-lived, often surviving for eight years or more.

The birds roost one to a cavity at night. If holes are in short supply, they will roost in scars in pine trees, cavities between limbs, or in holes in dead trees.

Red-cockaded Woodpeckers are sociable and gossip with clan members a spell before beginning the day's harvest of roaches, ants, butterfly larvae, and spiders, found by scaling bark and digging into limbs. Food supply on pines is limited, so a clan requires a foraging territory of 100–1000 acres, depending on the quality of habitat. On occasion they eat blackgum or wild cherry fruit or even enter fields to devour corn earworms. Clans forced into smaller foraging areas have difficulty raising young.

As ornithologist Todd Engstrom puts it, Red-cockaded Woodpeckers have three levels of need: tree, for roosting and nesting; forest, for foraging; and landscape, for exchange of clan members. Smaller clans farther apart make it difficult for single woodpeckers to find mates. When one member of a group dies, an individual from a nearby group can fill the gap, maintaining social structures. For this reason Red-cockaded Woodpecker researchers recommend protecting longleaf on the level of landscape.

Tall Timbers Research Station near Tallahassee, Florida, where Todd works, manages this old-growth forest I am in. Endowed by a northern industrialist and excellent naturalist, Henry Beadel, Tall Timbers is most famous for its research in fire ecology, especially in the longleaf pine ecosystem. Much of the Red Hills surrounding the station is in vast plantations kept by wealthy northerners as hunting preserves, and the intactness of the longleaf ecosystem there can be attributed to that self-serving but tremendously effective method of preservation, sport hunting by the well-off.

Scientists gloat about the ecological community surrounding Tall Timbers and consider this particular old-growth forest a blessing. A miracle. It is burned on a regular rotation, obvious from the blackened boles of trees, and here researchers study forest regeneration, fire regime, wildlife and plant diversity, methods of restoration, and so forth in longleaf pine. The research station continues to make strides in ecological research. Not long ago folks there discovered that wiregrass can be regenerated from seed, an insight that solves what was once a big problem for restorers of the pine system.

"You have to spend a lot of time in longleaf to appreciate it," Todd had said to me, his cerulean eyes gone dark. "This is my twelfth year studying it. You have to see it at different times of the day and of the year, different seasons, different weather. Then you understand what a truly extraordinary forest it is."

A VELVET HEAD PAUSED AT THE CAVITY HOLE MOMENTARILY, then dashed out into the morning. Because I was below, the bird moved away posthaste, but Red-cockadeds chattered nearby.

In that short glimpse, I'd seen it was just a bird, *zebra-backed,* as Peterson's field guide had promised, about seven inches long with a black cap and white cheek. *The tiny red cockade of the male is hard to see.* No flashiness. Nothing about it could be said to be high-profile or charismatic. Not spectacular. It was a working-class sort of bird, trying to make ends meet in a failing avian economy, depending on its clan, and in these ways and also in the way history binds it to place, it reminded me of my Cracker kin. The bird was special in the manner a molecule of oxygen is special to air.

I leaned against the stout trunk of a longleaf, its bark flaking nibs into my hair, wondering at the tree's age. It had to be a few hundred years. Core samples had been taken from the trees, and some were more than four hundred. Four hundred years: these trees had been alive in a.d. 1593. In every direction I looked I could see nothing but virgin grove.

Here was tree. Here was forest. Here was landscape. If left alone, it would function like the children on the soccer field, spaces closing and opening on a slow-ticking biological clock—a centuries-long game. A tree would fall and in its vacancy in the puzzle of sky, a sapling would sprout.

The sun was rising on another day: Bachman's Sparrow, Eastern Bluebird, Pine Warbler, Brown-headed Nuthatch, Yellow-breasted Chat, Red-headed Woodpecker, Eastern Kingbird, Common Ground Dove, quail. There was work to do, back in town. Walking out of the forest, I stopped at a downed tree to rest, startling a coyote that went bounding away into what seemed like eternity. ☾

Naturalist, writer, and environmental activist Janisse Ray grew up in a junkyard in rural Georgia. She is a cofounder of the regional conservation group Altamaha Riverkeeper (PO Box 2642, Darien, GA 31305; 912-437-8164; stewards@altamahariverkeeper.org), which is working to restore the Altamaha River watershed. Her new book, Ecology of a Cracker Childhood, *from which this essay is excerpted, will be published in November.*

WHY IS CRATER LAKE

National Park Service Fire Policy in the Post-Yellowstone Era: Part Three of Three

INTRODUCTION

"The stirring up of conflict is a Luciferian virtue in the true sense of the word. Conflict engenders fire, and like every other fire it has two aspects—that of combustion and that of creating light."

— C.G. JUNG,
FOUR ARCHETYPES

The first two parts of this essay asserted that the National Park Service (NPS) is making good progress in restoring fire as an ecosystem process in many of its parks. I looked at Sequoia/Kings Canyon (*WE* fall '96) and Grand Canyon (*WE* summer '97) National Parks, where innovative fire programs continue to undo the consequences of a failed federal fire policy of full suppression. This final installment deals with a once-strong program that has suffered a reversal.

This essay is critical of some aspects of NPS management. Since it concerns a program I know well and a landscape that I love above all others, composing it has been painful. I have been accused by some of personalizing the issues. I plead guilty to taking Crater Lake's management personally. I waited 13 years for the Park Service to take action on behalf of Crater Lake, then spent three more years gathering the depressing details of the story sketched here. What follows is my opinion buttressed by a wide variety of perspectives and experiences of others intimately involved in these events. I interviewed all the key players who would consent to speak with me, with one exception. I did not try to contact Bob Benton, Crater Lake's superintendent from 1983–1992, whose role I consider a matter of historical record. Those who feel my assessment of his administration is inaccurate are free to offer counter arguments.

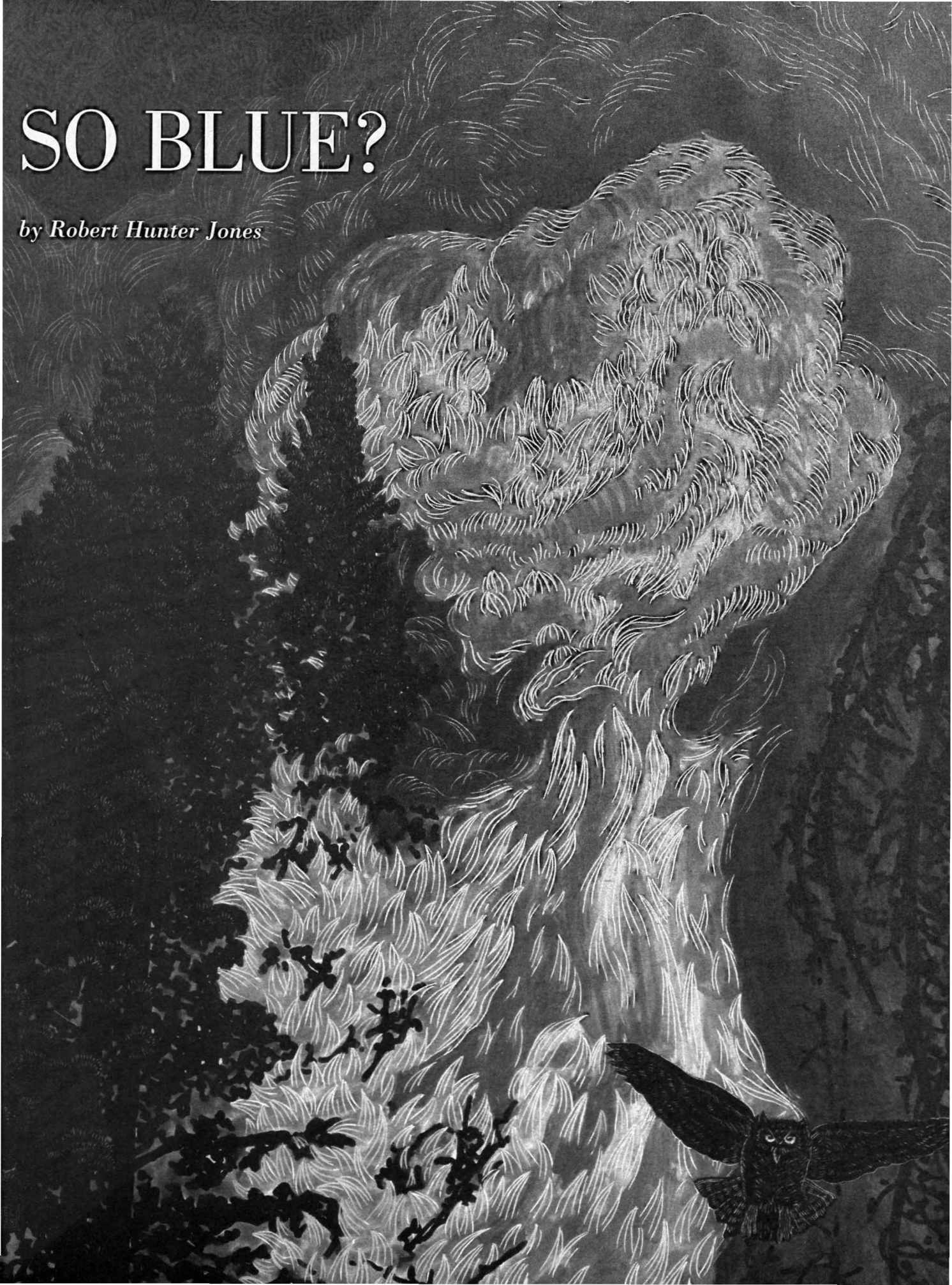
I've been asked why it is necessary to discuss actual managers. My answer is simple: We are bearing witness. The first installments of this essay celebrated NPS success stories. This one aims to critique a failed program in order to call attention to agency problems and suggest remedies. Without specifics to illustrate alleged weaknesses there can be no sound basis from which to advocate change. Accountability is a major problem across all federal agencies. It is the responsibility of citizens to create it where it doesn't exist.

Finally, I would not like to leave the impression that Crater Lake is, or has been, entirely bereft of quality management over the past 15 years. During my tenure at the park I worked with many outstanding stewards of the public trust who fought—often risking their careers—to blunt the effects of a sometimes stifling and mean-spirited management structure. For this group especially I attempt to answer the question posed in this essay's title. When we cease to be passionate about those places we love, then we deserve the world our polite silence creates.

illustration by Evan Cantor

SO BLUE?

by Robert Hunter Jones



DRIVE-BY MANAGEMENT MEETS THE PETER PRINCIPLE

Every National Park has its list of clichéd questions that interpreters are repeatedly asked. At Oregon's Crater Lake National Park, site of America's deepest lake, one such question is: Why is Crater Lake so blue? I pose that question here in an entirely new context. This is not a story about water quality, lake depth, and absorbed light, but about a languishing fire program and the reasons for it.

In his book *World Fire*, historian Stephen Pyne says of the Yellowstone fires of 1988: "The real ecological tragedy [of the fires] was the loss of marginal programs and the damage to prescribed burning that was experienced outside the Greater Yellowstone Area." Pyne maintains that the infamy generated by the Yellowstone fires hampered the efforts of well-meaning managers elsewhere in the country. Reality, I would suggest, is more nuanced.

Many fire programs have been strengthened by needed institutional reforms undertaken because of the Yellowstone fires. In some cases, though, the events of '88 have provided convenient political cover for managers who do not support fire as an ecosystem process or who lack the expertise to confidently integrate fire into their programs. If Yellowstone taught these timid public employees anything, it is that fire is risky and may damage career ambitions. In parks with once-viable fire programs where such "managers" have been larded into the system in significant numbers, real setbacks have occurred. Crater Lake National Park, I believe, is one such example.

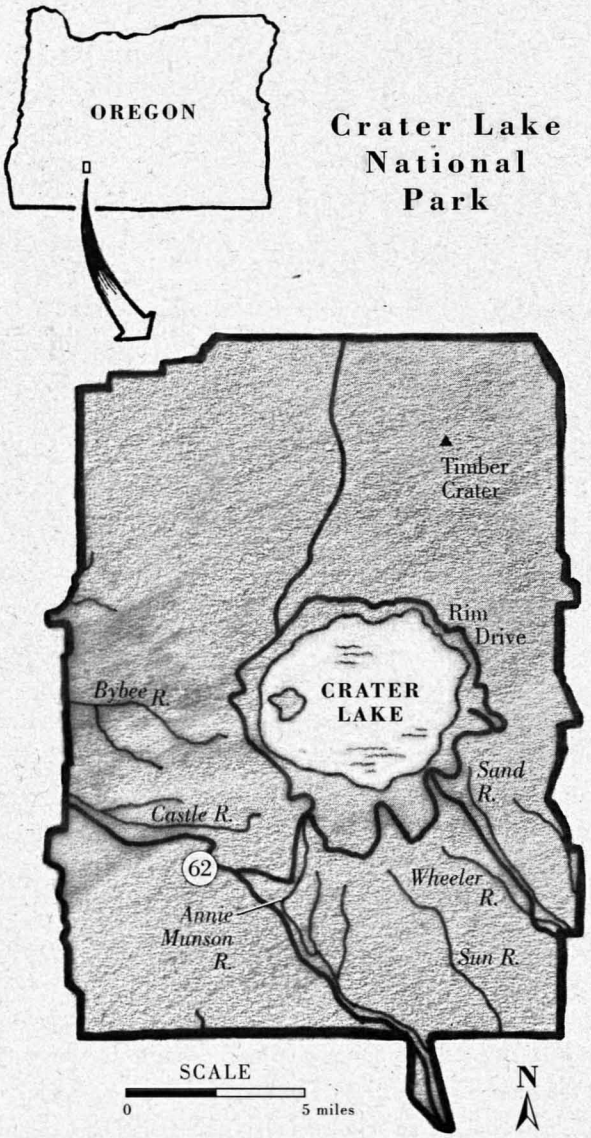
While interviewing Interior Secretary Bruce Babbitt in 1996, I used the term "drive-by management" to describe problems caused by the preferred method of climbing the career ladder in the Park Service. Oversimplified, the system works like this: In order to move up within the NPS, you have to move around. Many view positions at mid-sized parks like Crater Lake as stepping-stones on the journey to a "destination" park. There is little incentive in the present system for a manager to remain long term at a mid-sized park, learn the resource needs of the landscape, and thus have a real basis for management decisions. Even excellent managers need time to establish themselves, and their management priorities often do not accord with those of their predecessors, nor are their priorities always picked up by those who come later. The result is what one of my sources called "management by personality," a disoriented approach that produces a variety of reinvented wheels, often at great environmental and fiscal expense.

Babbitt was not keen to take up this issue. "I think you've framed this one right," he said. "I'm just choosing to disassociate myself from it." He commented vaguely that the NPS system was "derived from the military model" and that it had advantages and disadvantages, which is certainly true. When it works well it infuses a park's management with fresh ideas, blunting the group-think typical of bureaucracies dominated by head-down, long-term plodders. Crater Lake benefited from forward-thinking managers prior to the onset of its present malaise.

But this coin has another side. You may recall the book *The Peter Principle*, which argued that managers rise to the level of their own incompetence, then stall there or go into lateral drift. Over time, parks with a run of bad hiring decisions can be dominated by those who lack the abilities to move on. Absent an evaluative process to move them out, they lodge there like obstructions in the arteries of a once healthy organism. If there are administrative remedies, they require implementation by the very people who would be threatened by them. You begin to get the picture.

This is Crater Lake's recent history, but it hasn't always been this way.

illustration by Evan Cantor



PAST PERFECT

I first encountered fire in the Crater Lake backcountry while running an 18-mile loop around Timber Crater in the park's northeast corner in August of 1980, the first of 11 summer seasons I'd spend in the park. The Timber Crater Trail was one of a series of fire roads gouged into the backcountry during the 1930s and 40s. These trails weren't originally for hiking access, but to allow motorized attack on that putative bane of natural systems: wildfire.

By 1980 Park Service management at Crater Lake had begun using these trails as preexisting fuel breaks to contain management ignited prescribed fires (MIPFs) or prescribed natural fires (PNFs), including the western flank of the fire I'd just stumbled upon. Called the Sharp Peak Fire, this large prescribed burn had been ignited two months earlier along a stretch of the park's eastern boundary and would eventually underburn 1500 acres of ponderosa and lodgepole pine. It was the second major fire aimed at restoring Crater Lake's largest stand of old-growth ponderosa pine. The Northeast Corner Burn, the park's first large-scale prescribed fire, had been ignited in June of 1978 and sent low-intensity fire beneath 2000 acres of the pine stand just north of the Sharp Peak unit.

Dr. Jim Agee, a prominent fire ecologist from University of Washington, had been collaborating with Crater Lake's management team since 1975 under the auspices of an arrangement called The Cooperative Parks Studies Unit, a kind of scientific joint venture between the Park Service and academia. Agee's 1994 book, *Fire Ecology of Pacific Northwest Forests*, draws extensively from his 15 years of research at Crater Lake, and the fire management program he helped develop at the park became the model for other Northwest National Parks.

The prescribed fire program at Crater Lake focused on three particular landscape goals: to restore the ponderosa/white fir forests of the park's so-called Panhandle/Sun Creek zone; to reintroduce fire to the ponderosa forests of the park's northeast corner; and, most controversial, to allow naturally ignited fire its role in maintaining forest ecosystems in more remote sections of the park.

Prescribed fire was used primarily near park boundaries. Besides its immediate benefits, this program aimed to provide a buffer of reduced fuels for future free-ranging natural fires to bump into, greatly reducing the chances of landscape-scale fires in forests regularly visited by lightning. Park managers understood that a mosaic of burns in the park's interior would provide further checks against potential future wide-ranging catastrophic fires. In the summer of 1978 park managers instituted the third part of their strategy, declaring a lightning fire on the flank of Crater Peak a prescribed natural fire—the first in the Pacific Northwest.

Named the Goodbye Fire, the blaze was celebrated by park managers as the return of a critical natural process. Crater Lake's fire program, while facing considerable disdain from some of its Forest Service neighbors, was touted by the park's interpretation team as an example of visionary wildlands management: interpretive displays told of the consequences of fire exclusion and the promise of its reintroduction; regular evening interpretive programs discussed this theme; and the park even stationed an interpreter at a roadside overlook with a view of the Goodbye Fire to explain park policy to the public.

These were heady times at Crater Lake, and they would continue unabated for another five years. The cooperation between Dr. Agee and the NPS team at Crater Lake stands in stark contrast to the history of obstruction, bullying, and deceit that has typified Crater Lake's management structure since the arrival of Bob Benton as superintendent in 1983.

THE UNCOOPERATIVE PARK STUDIES UNIT

Legend has it that senior members of Crater Lake's staff received a sympathy card from Benton's previous post. True or not, the reasons for the story soon manifested themselves. During his nine-year tenure at Crater Lake, Benton set about dismantling a successful management structure. Whether this was by design or simply a by-product of his personality is difficult to say. We are left to poke through the wreckage for clues.

For several years the fire program carried on more or less unchanged, a testament to a management team committed to its implementation, but new Benton appointees meant incremental losses. The arrival of Kent Taylor as Chief of Interpretation meant the end of fire-related interpretive displays and of the evening program focused on the role of fire in park ecosystems, but for awhile the prescribed burns in the Panhandle continued. In 1986 that too began to change.

On August 4th of that year a typical summer lightning storm passed over the park and ignited a series of fires along the west side. Four fires burning in remote locations were managed as prescribed natural fires under the park's fire management plan (FMP). By any measure, the 1986 season was a major fire-management success at Crater Lake. Using the old system of fire roads looping through the backcountry as preexisting fire breaks, a relative handful of fire personnel held 2500 acres of fire within preordained perimeters with little need of intervention. Nonetheless, a policy shift blew across the park like a wet winter wind. In a recent interview Dr. Agee recalled Benton's role in dismantling Crater Lake's fire program. "After the '86 season," Agee said, "I think [Benton] felt that he had done enough [with fire] on his watch, and he made sure that [nothing more] happened."

In June of 1987 Benton tried to cancel a burn in the Panhandle on which a key part of Agee's research depended. After regional intervention, a ten-acre remnant was carved from the 50-acre unit to allow Agee's research to go forward, but this was the last prescribed fire allowed in the Panhandle. In a 1988 published research report co-authored by Agee and research assistant Michael Swezy, they sounded an unambiguous warning on the consequences of Benton's actions:

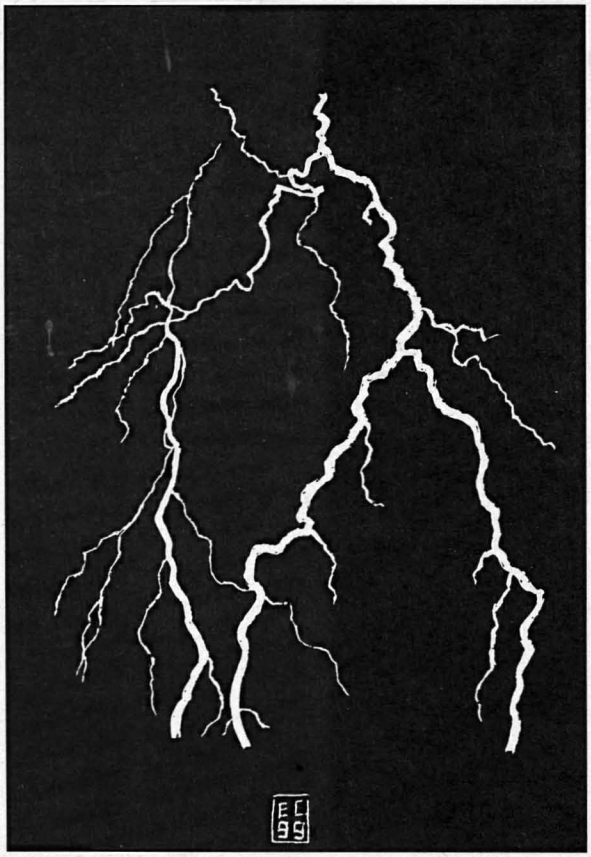
> *The mixed conifer forests of the Panhandle and the nearby Sun Creek area stand as important relatively undisturbed remnants of a forest ecosystem whose range was once extensive. Fire suppression policies in this century have seriously altered forest structure and composition such that some management action is required to perpetuate the presence of ponderosa pine. The use of prescribed fire to achieve these aims is not only the most viable option, it is an important ecosystem process, critical to the maintenance of a 'natural' forest.... Suspension of the fire management program would mean continued development of a highly flammable white fir-dominated forest, and the end of open ponderosa pine-dominated forests in Crater Lake National Park.*

Pressure was applied at the regional level to force Benton to abide by Crater Lake's fire management plan, which meant allowing fires that met certain criteria to be managed accordingly. In 1988, a year in which most of the west was pounded by lightning, Crater Lake had just one natural start. Called Prophesy, the fire was declared a PNF and allowed to burn, though it was only a mile from the park's eastern boundary. Prophesy started with a strike to a small mountain hemlock on a north-facing slope and took a week to creep through its first shady acre. The fire eventually worked its way into heavier fuels and after four weeks had grown to 350 acres.

On August 22nd, with events in Yellowstone and dry east winds at Crater Lake ratcheting up the political stakes daily, the park invited a team of fire behavior specialists from neighboring National Forests to visit the Prophesy Fire. The team, headed by Gene Rogers, a respected fire behavior specialist, subsequently gave the Prophesy Fire a less than five percent chance of leaving the park, but a wind shift began pushing the fire east toward stands of beetle-killed lodgepole pine, which carried it beyond the park's boundaries: by noon of the next day, Prophesy pushed across the line along a quarter-mile front with flame heights in excess of 150 feet. In the end Prophesy burned some 2000 acres, roughly half of it on Forest Service land, becoming the largest fire in Crater Lake history.

When Prophesy left park land on August 23rd, 1988, it took Crater Lake's fire program with it. As with many of the fires of that critical season, Prophesy reminds us of the ambiguities of fire reintroduction. Some argue that Prophesy illustrates the need for a full suppression program. To me it illustrates the danger of fuels going unmitigated when science-based management is absent, and reminds us that natural forces do not respect political boundaries.

Following the Yellowstone fires of '88, all parks were required to revise their fire management plans to integrate lessons learned from that season. At Yellowstone, where a million acres burned (and where Prophesy would barely have qualified as a spot fire), the park was doing some limited burning by



1990 and its fire program was fully in place by 1992. The same is true of Yosemite, Grand Canyon, and Sequoia/Kings Canyon, among others. An astounding 11 years later, Crater Lake is only now coming on line with a fire management plan. Here's why.

PRESENT TENSE

Superintendent Benton's administration did not so much end as go to seed. When he retired in 1992, his progeny remained in a number of key posts. Four positions are important to this discussion.

The Chief of Interpretation educates the public (or fails to) about the need for fire use. Kent Taylor, a Benton appointee, curtailed an excellent fire ecology interpretive program when he arrived in the mid-1980s. There are signs that this may be changing, so perhaps Taylor senses a shift in the political winds.

The Chief Ranger hires and supervises the fire management officer (FMO) and so is responsible for what happens (or fails to) in the entire fire program. Following the Yellowstone fires of 1988, all parks were required to revise their fire management plans, usually the FMO's responsibility. The absence of such a plan at Crater Lake for 11 years is the heart of this discussion.

The Chief of Resources Management must work with the US Fish and Wildlife Service (USFWS) under the Endangered Species Act to provide documentation that the park's fire plan won't adversely affect listed species. At Crater Lake these species include the Northern Spotted Owl, bull trout, Peregrine Falcon, Bald Eagle, and an assortment of rare plant species. Without such "compliance" documentation a fire management plan cannot be approved.

All of the above positions are supervised by the Superintendent, who must sign off on the Fire Management Plan before it is sent to the regional office for final approval and implementation.

GEORGE BUCKINGHAM BECAME CRATER LAKE'S CHIEF Ranger in 1989 and remains there today. Unlike his predecessors, he has not been an advocate of fire use in the park. Buckingham hired Al Augustine as his new Fire Management Officer in 1992, an inexperienced manager from a nearby National Forest. After working with Augustine in '94, my view is that he landed a job beyond his capabilities, but one he might have grown into under more nurturing circumstances.

Augustine's most positive act, taken shortly after his own appointment, was hiring Chris Chiverton, an experienced and outspoken fire manager from the Southwest who would act as Assistant Fire Management Officer and supervise the day-to-day operations of the fire crew. Chiverton soon emerged as a critic of the management team he found himself mired under. He has put his career at risk to call Crater Lake's problems to the attention of his superiors outside the park. A father of four and someone low on the Park Service food chain, how Chiverton emerges from this fiasco will for me determine the integrity of a federal agency which so loves to wear the white hat.

I met both Augustine and Chiverton in 1992 and made plans to return to the fire crew for the '94 season. Benton's retirement raised hopes, but his replacement, incoming Superintendent Morris, proved at best neutral regarding fire. In the absence of leadership the status quo won out and the program remained stagnant.

Crater Lake's revolving door kept spinning. In June of 1994, Mac Brock became the new Chief of Resources Management. Shortly after the '94 season, the revolving door spun again—Superintendent Morris was gone, Superintendent Al Hendricks tumbled in to replace him, and the latest cast of Crater Lake's dysfunctional soap opera was in place.

WHEN I INTERVIEWED MAC BROCK IN THE SUMMER OF 1996, he made it sound as though no one was more eager than he was to revitalize Crater Lake's fire plan. He said the right things about returning fire to the park and spoke of the dangers to which suppression activities exposed wilderness ecosystems. He then admitted to me that he had only "dabbled in fire" at his

illustration by Evan Cantor

previous posts and laughed nervously when I suggested that he could gain some good fire experience at Crater Lake. As was soon evident, he had other plans.

"I'll be quite frank with you," Brock said, "as I have been with everyone else who has asked about it. We still have to convince the US Fish and Wildlife Service that there will not be significant adverse effects to listed species because of the [fire] plan." His tone sounded ominous, as though USFWS was intent on foiling the park's fire plan. Several sources have suggested to me that Brock used the consultation process with USFWS to hold up fire plan approval.

Once Al Hendricks arrived as superintendent, the power structure within the park changed. Brock and Hendricks had worked together at another park and may have decided between them to delay approval and implementation of the fire management plan for as long as possible. With a compliant chief ranger and a fire management officer in over his head, the stage was set for epic foot-dragging. I began interviewing outside experts to test the validity of this thesis.

Linda Kerr works for Tom Nichols at Pacific Great Basin Support Office in San Francisco. Nichols coordinates National Park Service fire management issues for the Pacific West Region. I interviewed Kerr after speaking with Nichols, but chronologically her part of the story precedes his. When Chiverton pushed Crater Lake's fire management issues onto the regional radar screen in early 1996, Nichols sent Linda Kerr north to visit the park and instructed her to offer fiscal incentives to get the program moving forward. At a meeting attended by Brock, Augustine, and Buckingham, Kerr "flipped open the checkbook, figuratively speaking, and asked them what they needed." Most parks, being perpetually cash-strapped, will embrace such incentives to move their resource goals forward. Kerr recalls Brock's reply: "[Brock] basically said, 'No. This is going to be done my way.'"

As part of a carrot and stick strategy, Nichols had authorized Kerr to suggest that the park could lose the funding for its fire management officer (Augustine's position) if the program continued to "lack complexity." That prospect apparently accorded with Brock's plans. Kerr recalls, "Brock turned to Augustine and said, 'I'm sorry, Al. I don't care if I lose the FMO position.'" Brock's bluster didn't stop there: "[Brock] told [Augustine and Buckingham] right up front: 'You know, at my old park the fire management officer was friends with the superintendent, so he got his way, but this is going to be different here.'"

illustration by Evan Cantor

And things have been different indeed. During the Benton years the fire program was able to limp ahead because the ranger and resource divisions were united in their desire to bring science-based management to the park. But with the chief of resources apparently united in a belligerent pact with the superintendent, the cost to Crater Lake of "management by personality" became brutally apparent. (Brock vehemently denies any memory of the comments quoted above and having any sort of "pact" with Hendricks. Linda Kerr, under heavy pressure from Brock to revisit her memory of these events, stands by her comments.)

I asked Nichols how this charade could continue for as long as it has. He said that Augustine and Brock both kept saying that a plan was coming, and that even the illusion of progress will forestall consequences for a long time. Several sources claimed that Brock was slow to supply required information to Fish and Wildlife, including locations of owl nest sites, and that turnaround times for various requests were stretched out as long as possible on the park's end. A source close to this process told me on condition of anonymity that the Fish and Wildlife ploy was a commonly used stalling tactic: "Fire managers are often told that 'you can't do that with fire because Fish and Wildlife won't let you.' [Some] resource managers use [compliance laws] as power tools to frustrate fire managers. That's what Brock is doing. He is using these laws to control the program." I asked Nichols about the stories of delays caused by Fish and Wildlife. "I hear one thing from Fish and Wildlife and another from the park," Nichols said. "I have a hard time figuring out what's going on."

When I called Dave Peterson of USFWS, who was working with Brock on compliance issues, he told me: "We're not the hang-up. We support the program." In a subsequent e-mail, Craig Tuss, Peterson's supervisor, went into more detail. "I really wish I could understand what this issue is about. From the very beginning we have been telling the park that we support fire [use]. We have never told them that we oppose what they want to do."

Brock's apparent foot-dragging on compliance documentation was only part of a pattern of obstruction too lengthy to be detailed here.

As for the one-two punch, Superintendent Hendricks had to sign off on the revised fire plan itself before it could move toward implementation, and he was in no hurry. Though Hendricks artfully avoided speaking with me, both Augustine and Chiverton told me that the superintendent would hold the latest version of the plan on his desk for months before returning a marked-up draft with suggestions for changes. Augustine spoke of the superintendent's fondness for "crossing t's and dotting i's," an apparently never-ending process, for at last count the plan had gone through 22 drafts, which, according to both Chiverton and Kerr, has created a document hopelessly compromised by authors more concerned with politics than science.

As for Chief Ranger Buckingham, his insecure fire manager was serving him just fine. Buckingham had no interest in seeing a plan implemented and could just sit back while everyone blamed everyone else. According to Chiverton, Buckingham's favorite expression was: "There's always next summer."

Dr. Agee summed up this sorry chapter in Crater Lake's history: "All of this in concert means that nothing gets done up there in terms of fire, which is really disheartening to me. Everyone at the park blames everyone else....I don't care whose fault it is."

"Of all the parks I've worked with in the Pacific Northwest," Agee continued, "Crater Lake has the most potential. We've gone beyond the problems of '88 now. The politics will support a fairly wide range of fire activity. We need to have a management plan and a management team put in place that can realize that potential."

Agee made these comments more than a year after a meeting he attended at Crater Lake with Nichols and other top fire minds. Hendricks, Brock, Augustine, and Buckingham were there to represent the park. Superintendent Hendricks promised the group to have a plan in place no later than January 1, 1997. As of this writing in August 1999, Hendricks has been removed from his post, and there is still no approved fire management plan at Crater Lake.

ENDGAME

Things have changed recently at Crater Lake, and more changes are likely. Superintendent Hendricks has been transferred to another park because of his treatment of a couple of seasonal whistle-blowers. Brock is applying elsewhere. Buckingham's endless refrain of "next summer" ends this year with his retirement. When Augustine moved to a smaller but more fire-friendly post, Nichols made good on his threat to retract funding for the fire management officer at Crater Lake, but later relented, hopeful that yet another change of leadership in the park may usher in responsible management.

"I have a lot of parks clamoring for FMOs," Nichols said last summer. "After ten years without a fire plan at Crater Lake, you have to ask yourself if you want to put another person in there and let them get chewed up by the process."

Whether the park's new FMO, Craig Letz, prospers in his post is largely up to Crater Lake's new superintendent, Chuck Lundy, and his superior, Deputy Regional Director of the Pacific

West Region, Bill Walters. Bill Walters told me it is his job to intervene in situations where management disputes threaten professional working relationships or resource values, as he apparently has done at Crater Lake. Several sources have described Walters as a forceful behind-the-scenes advocate of the fire program who has made it clear to Brock and others that the program will be revived. While Walters would not discuss the sudden transfer of Hendricks, he did laud Hendricks's successor as someone who would move the fire program ahead: "Chuck Lundy, the [new] superintendent at Crater Lake, knows exactly what our desires are, and I think you're going to see him make sure that [they are achieved]."

My April 1999 interview with Lundy seemed to underscore Walters' confidence. I recalled for Lundy the situation in 1986 that may have caused Benton to pull the plug on the park's fire program—four fires burning in the backcountry, sending smoke columns into otherwise blue skies for months on end—and asked him how he would handle the public and institutional pressures that might result from such future fires.

"You have to have confidence in the people running your program," he said, "which is why I am interested in having a strong Fire Management Officer." He said the park's interpretive division should play a strong role in educating the public, lauding as "vital" the innovative program Crater Lake had in place prior to Benton's regime. Lundy made clear that all divisions within the park would support implementation of the new fire plan. "Come up to the park this summer," he invited, "and I hope we can stand on the road together and watch the smoke rising."

But that may or may not happen. Lundy's June deadline for a signed plan has come and gone, making his stated goal of getting fire on the ground this summer less likely. In a very positive sign, Lundy returned my query about the fire plan's status to say that it reached his desk on August 9th for his review and signature. He said he hoped to read and sign it in the days to follow, then send it on to Walters for his signature. Once that is done, the very real challenges of implementation will begin.

According to Deputy Director Walters, a 1995 streamlining of the National Park Service bureaucracy ceded more discretionary powers to park superintendents, which will allow them to take controversial steps to advance resource goals. Recent leadership shown by Grand Canyon's superintendent in support of his proactive fire program is one such example. Like any superintendent, if Lundy wants a successful fire program, he can create conditions that will lead to one. How should he go about it?

In our 1996 interview, Secretary Babbitt argued that the most important tools to ensure capable resource management are clear management plans buttressed by unambiguous position descriptions for each manager, laying out goals to which career advancement is linked. "The beginning of accountability," Babbitt said, "is to have standards, and standards are [set forth] in management plans. Secondly, we've got to do a better job [of letting managers know that they] will be rewarded for [managing fire] well, rather than being ignored or penalized for it. We recognize that there are some risks, but [those] who are willing to acknowledge those risks and move forward must in fact be rewarded," Babbitt said.

I asked if he was saying that managers ought to be hired to implement an approved plan and promoted solely on their success in doing so. "Amen!" he said. "Amen, amen!"

Babbitt was careful to remain on the positive side of these issues, but strong disincentives must be put in place to discourage chicanery as well. Repeated failure to meet expected standards, or arrogant disregard of those standards, should result in demotion or reassignment. Lundy can take this approach at Crater Lake by building fire-related goals into the position descriptions of his underlings and insisting that they do likewise for those they supervise.

The alternatives to this type of approach are manifested in Crater Lake's recent history. Says Chiverton, Crater Lake's embattled Assistant Fire Management Officer, "The management of [Crater Lake] has spent most of its time [in recent years] covering up blunders. We should demand that all managers have the proper qualifications to do the jobs required of them. Deviation from that standard leads to decisions based on inexperience, fear, and avoidance. We impact resources by hiring the wrong people to manage them."

On the question of competence, Deputy Director Walters said, "I think of it this way: There are one-quart, two-quart, three-quart jobs out there, and one-quart, two-quart and three-quart managers....You can [occasionally end up with] a two-quart person in a three-quart job. We hope that wouldn't happen, but let's face it, sometimes it does."

As key positions open, one hopes Superintendent Lundy will pay careful attention to the "capacity" of his managers, hiring highly qualified people who will engage the park beyond its political terrain. An intimate relationship with the landscape undermines both agency and individual hubris and leads to better management. It also reduces both "drive-by management" and the effects of the Peter Principle. Consistent, well-articulated goals reduce turnover among good managers and make it harder for weak managers to cover their tracks. "Management by personality" will cease if managers are hired to implement an ongoing management plan and are promoted accordingly.

The alternatives to such changes are not pleasant. Crater

Lake's failure to put a fire program in place leaves it culpable for any future loss of life and/or ecosystem damage from fuels left unmitigated by science-based management. The foot-dragging at Crater Lake and elsewhere loads the gun for fires that could devastate sensitive landscapes and the species that depend on them. Nichols noted that in the aftermath of the South Canyon Fire, where 14 firefighters died in 1994, Secretary Babbitt did "a tremendous service by linking hazard fuels reduction to firefighter safety." Even Congress, Nichols said, seems to understand at last that reducing fuel levels is the key to mitigating wildfire impacts. It follows that an active fire program will reduce legal culpability for destructive fires in the future.

At present, federal fire-management successes remain as random as lightning strikes in a wilderness of rules and divergent personalities. Failing reforms that replace petty power struggles with a consistent, cooperative approach to fire management, the only certainties are that fuels will continue to accrue and that fire will have its say in a world neither natural nor subject to our control.

THERE HAS BEEN SIGNIFICANT PROGRESS IN THE BATTLE to reform federal fire policy since I began work on these essays in 1994, but without constant attention to individual programs and national goals, such progress could prove ephemeral. Wildlands advocates should avoid the misleading view that some agencies are better than others (e.g., the Park Service as compared to the Forest Service). Conservation activists and advocacy groups working to improve public lands management—and to restore ecological processes such as wildfire across the landscape—should instead concentrate on finding managers within all agencies who are working for reform and ally themselves with them. There are a lot of brave souls out there fighting in obscurity. To the extent that we give articulate voice to their struggles, we offer them both hope and equal measures of protection and legitimacy. ☾

Robert Hunter Jones (106306.3711@compuserve.com) spent five seasons on Crater Lake's fire crew, active in both research and suppression, and three more seasons on the Arrowhead Hotshots, a National Park Service type-one fire crew based at Sequoia/Kings Canyon National Park. He now teaches and writes in Vienna, Austria.

Addendum Crater Lake's fire management plan was approved in early September; a 415-acre prescribed burn is planned for this fall.

WHAT IS A WFU (and why should a conservationist care)?

by Ron Steffens

I'VE JUST WALKED OUT FROM THE LITTLE Granite WFU in Wyoming's Gros Ventre Wilderness. I monitor fires in the summer, and a WFU—short for "wildland fire use for resource benefits" (and pronounced "woo-foo" by those who use the phrase often)—is the sort of fire that this Wilderness needs. For those who used to support PNFs (lightning-ignited prescribed natural fires), a WFU is the bureaucratic replacement for a PNF. Unlike some government label-switching, this is a good change for your local federal forest, if only because a WFU offers some tricks that make wildfire more palatable to local fire managers.

Let's assume that you already know about fire ecology, the past 90 years of active fire exclusion on public lands, and the formidable bureaucratic pressures to suppress natural ignitions. You should also know about WFUs. The Little Granite will, like many WFUs, remain small. (A week after my visit, it was rained out at half an acre). But a WFU might smolder for weeks until a wind kicks it to 20, 300, maybe 3000 acres. It's my job to predict such fire behavior; often I succeed, and often the fire disproves my hubris. But last week, on the Little Granite, which was smoldering after a thunderstorm, I forgot about predictions. As I monitored the weather and fire behavior, I was hoarded by long-horned beetles and wood-boring wasps, which swarm to charred trees, and soon I was monitoring all manner of avian visitors: Gray Jays whistling in imitation of the passing Red-tailed Hawk. Clark's Nutcrackers, nuthatches, chickadees, Western Tanagers, a flitting Pine Siskin, a hammering Hairy Woodpecker. A Sharp-shinned Hawk in the trees below; above the ridge, three Swainson's Hawks marshaled a Golden Eagle off to another drainage.

Such activity is not unusual on WFUs, whether they are small mosaic-producing fires like the Little Granite or landscape-scale crown fires. Always, as the

CONTINUES

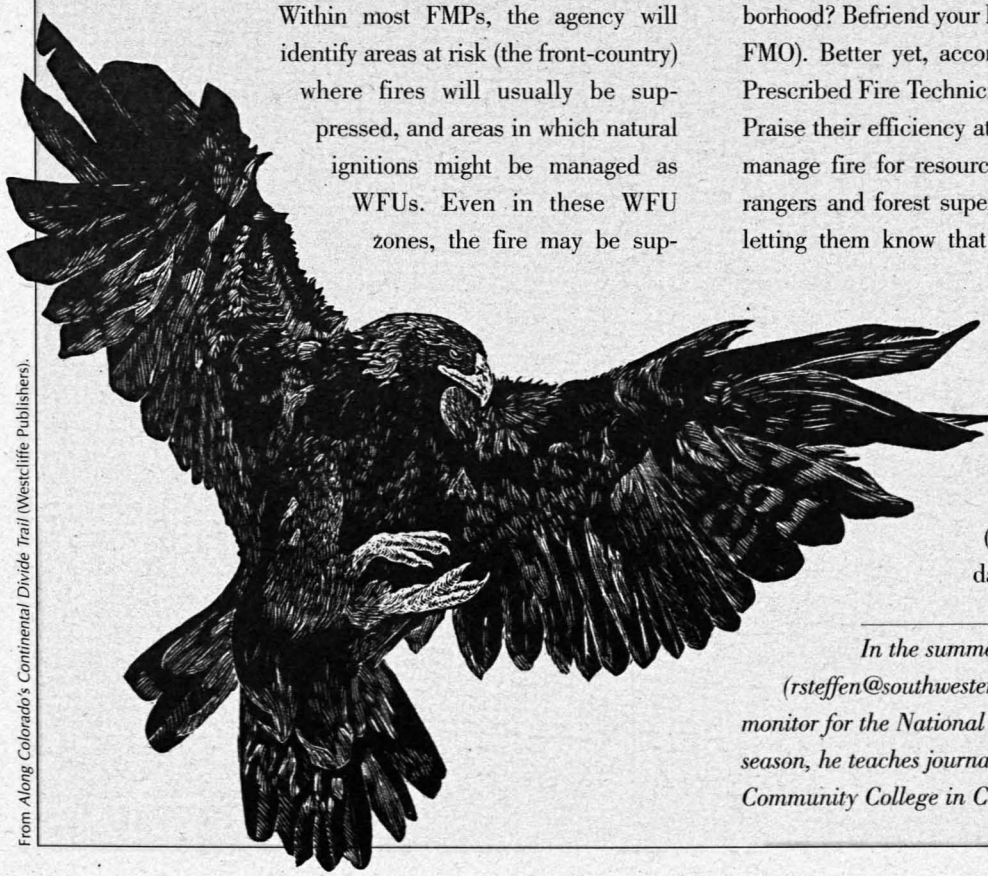
fire cools, as the seasons pass and the vegetation returns, the habitat seems to be more utilized by wildlife, more ecologically vivid for the change that fire brings. A fellow fire monitor refers to our job as "managing the aesthetics of entropy." Energy in the fuels is released to ash, the ash enriches the soil, seeding new growth which becomes the fuel of future burns—and with each change in the cycle, the local critters take a bit of energy as their commission.

If you understand fire ecology, you probably support fire's reintroduction into your ecosystem. For that to happen on most of our federal lands, the initial requirement is bureaucratic: your local landscape must have an approved Fire Management Plan (FMP). This is the legal (and ecological) bedrock for managing fire; without a FMP, a federal jurisdiction cannot apply any management response other than suppression. A large number of National Forests have not felt it necessary to encumber their operations with such a demanding document. Even the National Park Service, considered a leader in natural fire (and also, I might add, my summer employer), has many units that must suppress all natural ignitions because they don't have FMPs.

Within most FMPs, the agency will identify areas at risk (the front-country) where fires will usually be suppressed, and areas in which natural ignitions might be managed as WFUs. Even in these WFU zones, the fire may be suppressed if drought or winds are too severe, or if the region is swamped with fires, or if the fire promises to escape the boundaries of its MMA (maximum manageable area).

Here is the key, and the significance, of the new WFU designation: let's say you have a 10,000-acre MMA and your WFU has edged up to the east ridge. In the old days of PNFs, you had to declare the fire a "wildfire" and suppress the whole thing. Under the new WFU guidelines, a fire manager may suppress one side of the fire, to keep it within its MMA, while allowing the rest of the fire to burn. The old PNFs were pure, with no actions allowed but those of Nature. This may have been more ecologically and aesthetically correct, but in practice, it meant less flexibility for the fire manager, and thus many fewer PNFs were declared and allowed to burn. With a WFU, wilderness fire can be more acceptable to a manager because he or she may suppress one side of the fire while allowing the other side to burn. Equally important, since all fire is now to be managed with the most appropriate and resource-beneficial management techniques, a WFU can be managed from the same pot of money that pays for suppression actions.

How can you help support these fires in your neighborhood? Befriend your local Fire Management Officer (the FMO). Better yet, accompany the Assistant FMO or the Prescribed Fire Technician on a tour of fuels and old fires. Praise their efficiency at suppression while urging them to manage fire for resource benefits. Chat with the district rangers and forest supervisors and park superintendents, letting them know that you will link up with local elk hunters to support the habitat benefits of fire, and that you'll defend the fire managers when folks start to complain about smoke. And after a good lightning storm, look for a small tower of smoke and watch (from a safe distance) as it grows, day after day. ☾



From *Along Colorado's Continental Divide Trail* (Westcliffe Publishers).

In the summer, Ron Steffens (rsteffen@southwestern.cc.or.us) is a wildland fire monitor for the National Park Service. In the off-season, he teaches journalism at Southwestern Oregon Community College in Coos Bay, Oregon.

Golden Eagle by Evan Cantor

State of the SOUTHERN ROCKIES ECOREGION

by Doug Shinneman

The Southern Rockies are world-renowned for their natural beauty and abundant wildlife. The region's rugged and diverse topography is matched only by its diversity of ecosystems, including alpine tundra, coniferous and deciduous forests, shrublands, grasslands, wetlands, lakes, and streams, which offer habitat for wildlife species such as bighorn sheep, mountain lion, elk, mule deer, black bear, cutthroat trout, boreal toad, Bald Eagle, and Peregrine Falcon. The Southern Rockies maintain such an abundance of life, in part, because they still contain significant stretches of relatively wild, remote, and undeveloped lands. Yet the Southern Rockies have not escaped the effects of heavy human use, and an assessment of their ecological condition is long overdue.

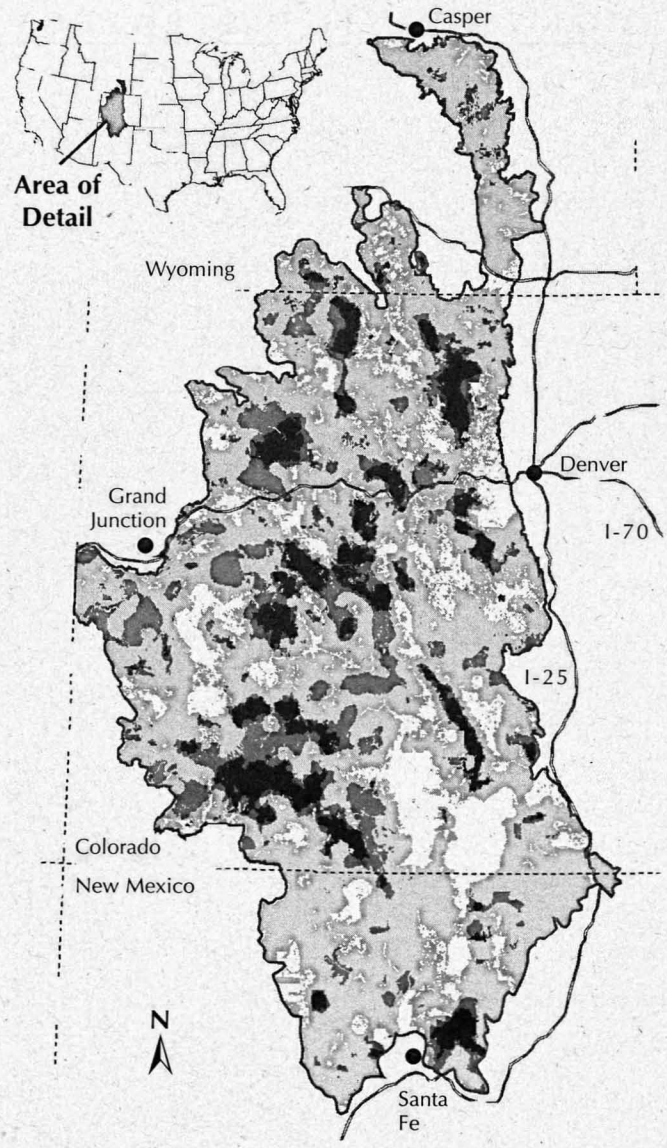
The State of the Ecosystem Report for the Southern Rockies Ecoregion (to be released fall 1999) provides a first-ever ecological assessment of the Southern Rockies Ecoregion (SRE), a large expanse of land (63,654 square miles) stretching from southern Wyoming through Colorado to northern New Mexico. The report examines land-use history, social and economic settings, species diversity, terrestrial and aquatic ecosystem conditions, and the status of protected lands and wilderness areas. It also encourages a landscape-scale framework within which to promote further conservation planning and ecosystem protection efforts.

Land-Use History and Social and Economic Settings

Since nomadic hunters and gatherers first arrived on foot to the Southern Rockies from Siberia around 10,000 years ago, humans have altered its ecosystems. However, while Native Americans may have locally affected the SRE's ecosystems (e.g., setting fires to drive game), recent settlement by Euroamericans has led to far more extensive and damaging ecological changes via widespread and often intense levels of trapping, mining, grazing, logging, and agriculture. Moreover, the region's human population has grown rapidly, from less than 500,000 in 1900 to over 2.8 million people today, with another one million expected by 2020.

Editor's note *The following executive summaries of State of the Ecosystem Reports (SERs) continue a series of articles begun last issue with "State of the Ecosystem Reports: A Tool for Wildlands Advocacy," which described how several conservation groups have used such documents to further their campaigns for ecological reserves. The SERs already produced have differed significantly in methodology, format, cost to produce, and distribution—but are alike in that they aim to advance regional conservation planning.*

illustration by Amy Grogan



Status of the Southern Rockies Ecoregion based on human impacts and ecosystem protection levels. Lighter areas represent landscapes that are more heavily developed (roads, urbanization, agriculture) and are more likely threatened by development due to lower protection levels. Darker areas are less heavily developed and have higher levels of protection (e.g., National Parks and Wilderness Areas).

Today, the vast majority of the region's inhabitants do not depend on agriculture, logging, or mining for their livelihoods. Combined, these job sectors constitute only two percent of employees and total payroll for the region. Spurred on in part by tourism and population growth, today's economy is dominated by the retail and service industries. This new economy also has negative consequences, particularly rampant development. Fortunately, numerous polls show that the people of the SRE favor strengthening environmental laws and protecting natural landscapes. For instance, a recent poll indicates that nearly two-thirds of Colorado residents are willing to raise taxes to buy and protect open space and natural habitat.

Species Diversity

The Southern Rockies Ecoregion holds a great diversity of life: 335 extant vertebrate species and subspecies are tightly associated with the SRE's foothill, mountain, and valley habitats, including 203 birds, 90 mammals, 19 fish, ten reptiles, and six amphibian species. When "peripheral" species are added to this list, the total grows to over 500. The region also has a rich diversity of plants, plant communities, and invertebrates. For instance, with over 270 species of butterflies and an estimated 5200 species of moths, the SRE is the second leading hotspot in North America for the insect order Lepidoptera. This diversity is not evenly distributed among the major ecosystems, however, as species diversity is much higher in wetland/riparian habitats and lower-elevation ecosystems (e.g., piñon-juniper woodlands, shrublands) than in higher-elevation ecosystems (e.g., spruce-fir forests, alpine tundra).

Two vertebrate animal subspecies native to the SRE are known to be extinct (yellowfin cutthroat trout, New Mexico Sharp-tailed Grouse), at least five species are considered extirpated (bison, grizzly bear, gray wolf, black-footed ferret, and wolverine), and other extirpated species have been reintroduced (e.g., the lynx and river otter). Eleven vertebrate animal and three plant species are listed as federally Threatened or Endangered under the US Endangered Species Act, including the Preble's meadow jumping mouse. Other species not listed but at risk include the boreal toad and Gunnison Sage Grouse. In addition, there are hundreds of species of invertebrates, plants, and natural communities in the SRE that are listed as rare and imperiled by state Natural Heritage Programs.

Ecological Assessments

Impacts. Past and present land uses have taken their toll on native ecosystems and, if left unchecked, will continue to degrade the Southern Rockies Ecoregion's natural areas and native species. Some key findings include:

- Urban development in the SRE is among the fastest in the nation. By the year 2020, nearly one-fourth of the region's native ecosystems will be replaced by urban/suburban landscapes, modified by "rural" housing development, or within one mile of development (and thus prone to urban "edge effects" such as songbird predation by household pets).

- Roughly 80–90% of the SRE's public lands (and significant private land areas) are grazed by livestock, thus reducing native species diversity, degrading water quality, and destroying riparian habitat.
- Low-elevation, old-growth ponderosa pine forests in the SRE have been nearly eliminated in most areas by historic and current logging practices. For example, only one percent of ponderosa pine in the Arapaho-Roosevelt National Forest in Colorado is considered old growth.
- Millions of acres of ponderosa pine forests are at risk of catastrophic fires due in part to the collective impacts of fire suppression, logging, and grazing.
- Higher-elevation lodgepole pine and spruce-fir forests have often been highly fragmented by clearcut logging and extensive road-building.
- Tens of millions of visitors on SRE federal lands, including motorized recreationists, are causing significant impacts to native ecosystems, such as erosion and wildlife disturbance. All-terrain vehicle (ATV) use in Colorado alone has increased over 300% in the last seven years and is expected to continue to grow rapidly.
- Exotic plant and animal species (e.g., cheatgrass, introduced trout) are widespread in the SRE, often displacing or harming native species, even within protected habitats. The increase in development, roads, and human recreation into remote areas will continue to spread exotic species.
- Intense water use, principally for agriculture in nearby semi-arid regions, has resulted in the construction of thousands of dams and water diversions that negatively affect river hydrology, water quality, aquatic habitat, and native fish including cutthroat trout.
- At least one-third of all SRE streams are within 500 feet of a road; 600,000 acres of development and agriculture occur within 500 feet of SRE streams and rivers. Thus, thousands of miles of streams and thousands of acres of species-rich, riparian habitats are subjected to road pollution run-off, increased sedimentation, channel straightening, and complete conversion to human-dominated landscapes.
- With over 10,000 active and abandoned mines (many leaking dangerous pollutants such as acids and heavy metals into nearby waterways), numerous SRE aquatic ecosystems have been significantly damaged or destroyed.
- Point source pollution (e.g., industrial and municipal wastewater discharges) and non-point source pollution (e.g., agricultural run-off) have resulted in the classification of nearly 4000 miles of SRE streams as "impaired" (under the Clean Water Act) by state governments.

Status of Protected Lands and Wilderness. Despite the ecological problems outlined above, the Southern Rockies have tremendous conservation opportunities. Currently, 11% of the ecoregion is within protected lands (e.g., National Parks and Wilderness Areas). These protected areas are disproportionately steep, cold, high-elevation landscapes (70% above 10,000 feet), with short growing seasons and poor soils, and support less biodiversity than lower-elevation ecosystems. Therefore, while over 50% of alpine tundra is represented in protected areas, most lower-elevation ecosystems, such as ponderosa pine forests, have under five percent of their total area protected.

However, there is still a tremendous opportunity to adequately protect all of the SRE's major ecosystem types. The ecoregion contains 5.5 million acres of unprotected roadless public lands, and many of these encompass lower-elevation ecosystems. In fact, almost all of the major ecosystem types could be protected above a ten percent level if these roadless lands were designated as Wilderness. Moreover, when combined with the roughly four million acres of existing protected lands, nearly one-quarter of the ecoregion could have Wilderness status, including several relatively large areas (e.g., the roughly 700,000-acre Weminuche Wilderness/roadless complex). These areas potentially could provide habitat for the reintroduction of top-level, wide-ranging predators such as grizzly bears and wolves. Additionally, the closure of a few roads in key areas could greatly expand total wilderness acreage.

Next Steps

In the coming months, the Southern Rockies Ecosystem Project (SREP) will release a draft reserve network proposal for the SRE that will be designed to protect all of the region's native ecosystems and species. SREP will also continue to work with conservation groups, land managers, and other interested stakeholders to promote this conservation vision and encourage the use of sound ecosystem management principles. Because much of the region's biodiversity falls onto private lands, SREP will also support cooperative measures with private landowners, especially land purchases and conservation easements. The Southern Rockies offer one of the best opportunities to protect and restore an ecoregion's entire natural diversity. We encourage all to join us in this crucial conservation effort. ☾

For more information, contact Doug Shinneman, interim executive director of the Southern Rockies Ecosystem Project (PO Box 1182, Nederland, CO 80466; 303-258-0433; dougshin@indra.com).

State of the GRAND CANYON ECOREGION

by Lawrence E. Stevens, Kelly Burke, and Kim Crumbo

The Grand Canyon Wildlands Council, now in its third year, consists of scientists and conservationists interested in preserving and restoring an ecoregion that encompasses 50,000 square miles of the southern Colorado Plateau in northern Arizona, southern Utah, and northwestern New Mexico. This topographically and ecologically diverse landscape extends from the headwaters of the Little Colorado River across Grand Canyon and west to the Grand Wash Cliffs at the edge of the Basin and Range geologic province, and from the Mogollon highlands on the south to the High Plateaus of southern Utah. The hydrologically-based reserve design area is bounded by the drainage basins of the Colorado River's major tributaries in the vicinity of lower Glen Canyon and Grand Canyon. The Grand Canyon Ecoregion wildlands assessment, scheduled for publication in 2000, provides a conservation science-based evaluation of the distribution and condition of the area's many ecosystems.

Our wildlands assessment is based on the core area-corridor-transition zone model developed by conservation biologists and applied by The Wildlands Project. This conservation model is grounded on the premise that large habitat areas are required for the long-term survival of wildlife species, particularly top predators, which often regulate ecosystem processes. The core areas in the Grand Canyon Ecoregion include Wilderness Areas and some of the world's best-known National Parks. The buffer or transition zones surrounding those core areas are primarily managed by the National Forest Service, the Bureau of Land Management, and the National Park Service as multiple-use or recreation areas, and presently retain largely natural ecological conditions. The region includes tremendous erosional escarpments and monoclinal folds, which direct migratory raptor migration and terrestrial wildlife movement. Other natural corridors include streams and associated riparian habitats along more than 1000 tributaries of this 400-mile stretch of the Colorado River.

Although the core and buffer areas are primarily federal lands, they have been managed as isolated units, with little to no coordination of common conservation goals. As a consequence, patterns of regional biodiversity and species loss have received little attention. For example, at least 12 vertebrate species have declined precipitously or disappeared from the ecoregion this century, with nine vertebrates lost from the Colorado River corridor in the past 25 years. At least 25 state or federal Threatened, Endangered, proposed candidate, or sensitive species of plants and animals occur in or near Grand Canyon National Park alone. These data foreshadow a substantial reduction in biodiversity in this World Heritage Site over the next century. The Grand Canyon Wildlands Council aims to improve coordination of ecoregional conservation by providing land-managing agencies with credible scientific information on the status of their biological resources.

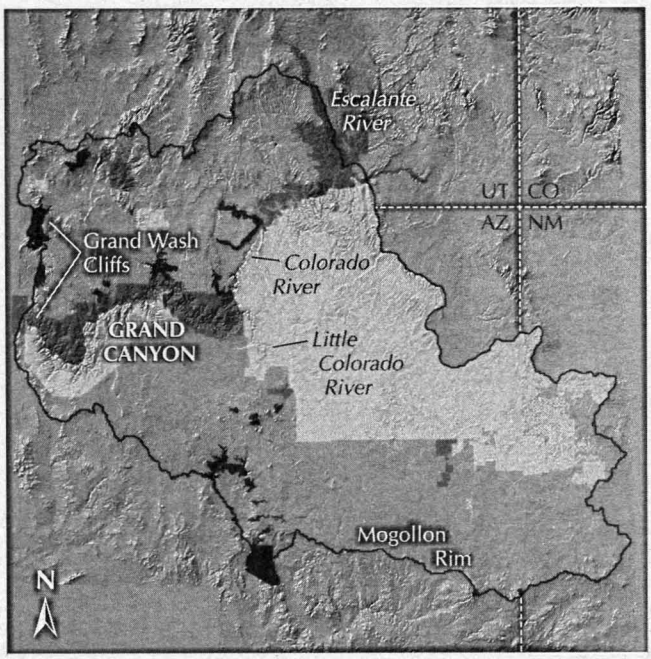
The Grand Canyon Ecoregion contains extraordinarily diverse terrain (>11,000 feet of topographic relief), resulting in powerful elevational effects on temperature and precipitation in this arid landscape, and has a complex biogeographic history resulting from interactions of biota from

illustration by Lezle Williams

four North American biomes. These factors generate a remarkable array of ecosystems, ranging from desert springs to vast montane forests to alpine tundra. These ecosystems are occupied by a diverse biota that includes wide-ranging western ungulates (e.g., desert bighorn sheep, desert mule deer, pronghorn antelope, and introduced Rocky Mountain elk) and predators (e.g., Peregrine Falcon, Northern Goshawk, mountain lion, black bear, and coyote). Many predatory species have been extirpated from the ecoregion. The Colorado pikeminnow, extirpated in 1976, migrated from the lower to the upper Colorado River basin to spawn and grew to nearly two meters in length and 30 kilograms in mass. It and the Colorado River otter (also extirpated or extinct; sign of this native mustelid was last found in 1984) were the top piscivores in the Colorado River. At higher elevations, grizzly bear, Great Basin timberwolf, and jaguar roamed the forested plateaus prior to 1920. The loss of top terrestrial predators strongly affects trophic structure in many of the region's large, widespread ecosystems. Protection, enhancement, and restoration of large species' habitats and populations are primary goals of the Grand Canyon Wildlands Council because protection of "umbrella" species, which have large home and migratory ranges, may serve to protect many other species.

The Grand Canyon Ecoregion also supports large concentrations of unique species in isolated, relict Pleistocene habitats, a factor that complicates conservation planning. For example, less than 0.03% of this arid landscape comprises springs and their associated wetlands, but these habitats support more than 11% of the ecoregion's plant species. Riparian habitat along the Colorado River and its numerous tributaries makes up <0.5% of the landscape, but supports more than 35% of plant and bird species. Arctic tundra exists as small mountaintop islands, but supports a unique array of species, including a poorly known invertebrate fauna and endemic plants such as the San Francisco Peaks groundsel. Development and implementation of strategies to protect local and regional ground and surface waters are a top priority. Global climate change may greatly reduce springs and tundra species diversity, a threat that makes long-term monitoring and site-specific conservation activities critically necessary.

With more than 9800 years of identified human history in Arizona, the Grand Canyon Ecoregion has probably been altered by humans since the late Pleistocene and throughout the Holocene epoch. Thus, interpretation of the "pristine condition" of this landscape must distinguish the human component. For example, the extinction of the Pleistocene megafauna has been primarily attributed to human hunting pressure. Also, Native Americans may have greatly contributed to the high frequency of forest fires detected in the dendrochronological record, as many



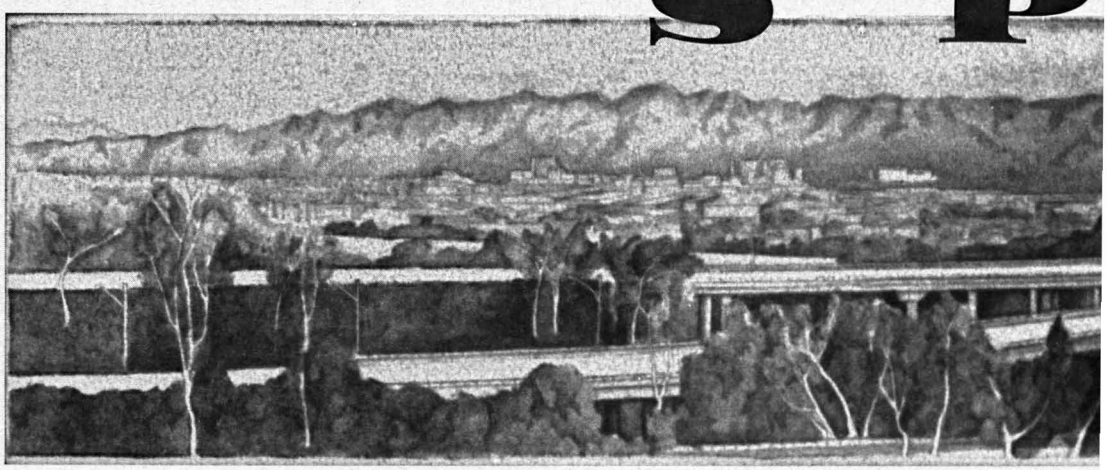
Grand Canyon Ecoregion A mosaic of shaded-relief digital elevation models (US Geological Survey data) shows existing protected areas in the ecoregion. Lightest gray areas are American Indian lands; medium gray are National Park Service administered lands; dark gray are designated Wilderness (land ownership/status from AZ, NM, UT GAP data). Scale is approximately 1:7,000,000 (1 inch = approx. 100 miles).

human cultures ignite fires to drive game animals or enhance the biological productivity of grasslands. Generally, the legacy of human occupation here is one of continuing habitat fragmentation and faunal extirpation and extinction. Although pre-historic anthropogenic influences might be considered "natural" consequences of human activities in this region over thousands of years, modern humans and their technology operate at rates and scales of change that imperil many species. Recognizing that human impacts have been persistent throughout the Holocene epoch, one of the Grand Canyon Wildlands Council's primary goals is to halt human-induced extinction in the ecoregion.

Although the landscape remains largely intact and biological diversity of this region is remarkably high, its ecological future is precarious, particularly in relation to changing land use and development. It is our hope that with this wildlands assessment and the help of scientists, conservationists, tribes, agencies, and communities, we will contribute to the establishment of a scientifically credible reserve network that stems the tide of species loss in the Grand Canyon Ecoregion. ☾

For more information, contact Kelly Burke at the Grand Canyon Wildlands Council (PO Box 1594, Flagstaff, AZ 86002; 520-556-9306; wildland@infomagic.com).

Sizing Up S P



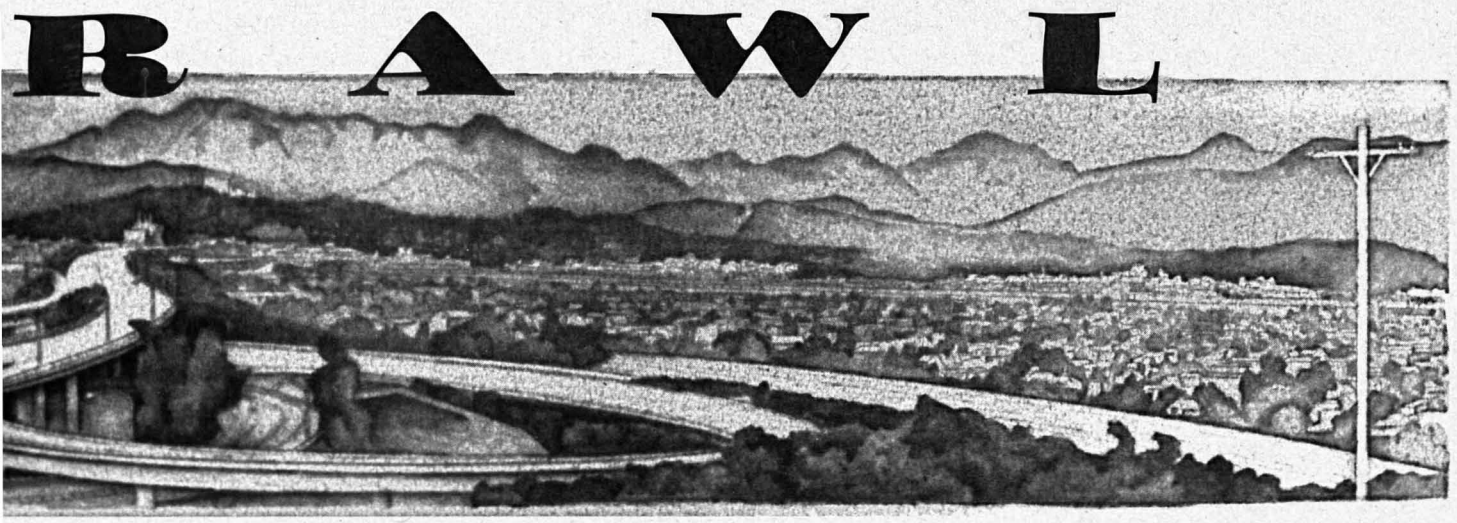
by Mark Lorenzo

The threats to ecological integrity resulting from the production of material goods, from resource extraction through factory processing and packaging, are well recognized. Less well recognized is the destructive potential of consumption in the form of expansive lifestyles. Development for new housing, recreation, and retailing, fed by growing populations with rising aspirations, increasingly converts farm fields, forests, and wetlands at the interface of suburbia and wildlands into sprawling, auto-dependent development. This phenomenon, commonly known as "sprawl," is subjecting species and ecosystems to death by a thousand cuts.

The destructive effects of sprawl include biological impacts such as habitat fragmentation and associated biodiversity losses; environmental impacts such as degraded air and water; and spiritual impacts such as loss of a unique sense of place, diminished cultural connections to the land, and reduced opportunities for experiences in wild Nature. To counter sprawl, we must articulate the immense—and in many ways irreplaceable—value of natural habitats and the ecosystem services they provide. The burgeoning field of ecological economics can help.

Ecological economists estimate the dollar value of ecological processes and entities, a task some conservationists consider impossible or even immoral, but others regard as increasingly necessary. Quantifying the economic value of wildlands, for example, is certainly a methodological challenge that requires an interdisciplinary understanding and synthesis of ecology and economics.

Some objections to this approach seem based either on ignorance of common statistical methods of valuation, or on a moral distaste for assigning a dollar value to something as "priceless" as an old-growth forest. A discussion of the philosophical ramifications of such quantification is beyond the scope of this paper, but in practice, "priceless" resources are routinely destroyed in favor of resource extraction or development for which substantial economic value is claimed. Ecological economists believe it may often prove more useful to attempt to fully "price" the ecological goods and services at risk, than to be surprised and outraged when "priceless" translates effectively to "$0" in the political calculus of land-use policy.



The values and benefits of the ecological systems that are the necessary foundation for all life on this planet can be roughly categorized and partly quantified in biological and economic terms. We must be careful, though, to remember that the whole is far greater than the sum of all the parts. The art of assessing particular damages to well-defined parts of ecosystems has made substantial progress, especially where threats to human health and well-being are concerned. However, the art of biological assessment and economic valuation at landscape scales and for complex interactive systems is only in a formative stage.

In particular, assessing and valuing the categories of greatest public importance—biological diversity and ecosystem services—remain the premier challenges for the emerging field of ecological economics. There are synergistic, threshold, and future effects that are especially difficult to assess rigorously, but which are increasingly apparent across North America's fragmented landscape and prominent in public discussions of the sprawl phenomenon.

Using the best available methods, early estimates suggest that the total public value of ecosystems and biological diversity *in situ* far exceeds the more typically measured values of consumption or "development" of the resource(s) in question. This finding justifies much more caution about further incursions into remaining natural areas or wildlands. As Aldo Leopold put it some fifty years ago:

> *The outstanding discovery of the twentieth century is not television or radio, but rather the complexity of the land organism. If the biota, in the course of aeons, has built something we like but do not understand, then who but a fool would discard seemingly useless parts? To keep every cog and wheel is the first precaution of intelligent tinkering.*

The Value of Ecosystems

The ecological values at risk from ecosystem degradation are largely in addition to the more thoroughly studied costs of pollution. Two pioneering recent studies are instructive. The first was published in 1997 by a National Science Foundation (NSF) research team organized by Robert Costanza of the University of Maryland.

Costanza and colleagues examined 17 categories of ecological value, including generally recognized factors such as food production, raw materials ("natural capital"), recreation, and water supply, but also less obvious ecological services, including regulation of climate and atmospheric gases, water cycling, erosion control, soil formation, nutrient cycling, and the purification of wastes. The multi-disciplinary team estimated the value of the world's ecosystems at $16–$54 trillion per year—roughly equivalent to the entire global GNP! The researchers noted that the majority of value from ecosystem services is not currently recognized by the traditional market system—of critical importance in considering the costs of sprawl.

illustration by Barrie Mottishaw

Although some services, such as food production, water supply, and raw materials, are traded in economic markets, most ecosystem services are not. "This means that current market signals are not adequately incorporating the value of these services," says Costanza. This finding of immense but largely "non-market" value, even just for the ecosystem services deemed valuable to humans, holds true at all scales. Therefore, while we can assess some regional biological impacts and even attribute some dollar costs to degraded waters, air pollution, or clear-cut forests, the greater proportion of ecological value lost to sprawl-type development is not now rigorously measured or incorporated into land-use decision making.

The second study, led by Cornell University ecologist David Pimentel, also examined ecosystem services and included estimates of their value to the United States alone. Many of the 20 categories used by Pimentel et al. are more specific than those used by the Costanza team, such as "nitrogen fixation" (which is a sub-set of the NSF category of "nutrient cycling") or "crop breeding" (a part of the NSF "genetic resources" category). However, each category either corresponds to, or is a part of, ten of the 17 areas identified by Costanza et al.

The NSF categories not estimated by Pimentel's team include: climate regulation, disturbance regulation, water regulation, water supply, erosion control and sediment retention, fish and wildlife refugia, and cultural value. Even without these seven major categories of ecosystem services, Pimentel and his colleagues found, for the United States alone, the total annual economic and environmental benefits of biodiversity to be approximately $319 billion.

"We hope assessments such as this can serve as a foundation to develop strategies and policies to preserve biological diversity and maintain ecosystem integrity," says Pimentel. "All these services to humanity are possible only because our planet is such a diverse place. Every species that's lost diminishes that vast resource and makes us all poorer for the loss." Costanza and Pimentel present substantial and provocative estimates—although highly conservative in that each assesses only certain subsets of values—of some of the ecological value at risk from sprawl-type development.

Synergistic effects such as that between soil erosion and degraded waters, threshold effects such as fish or wildlife population crashes, and future effects such as global climate change are not assessed in these snapshot analyses. Neither are most of the traditional human health concerns regarding environmental pollution. Nonetheless, these studies offer useful measures of biological and environmental values.

Such global and national scale assessments are not simply academic exercises. Individual, community, and state-level decisions regarding resource consumption and land use are made daily based on highly deficient economic accounting systems. These primarily incorporate short-term financial gains, while ignoring most ecological losses that cumulatively drive the global extinction crisis. Sprawl is a major factor in local extirpations of wildlife and plant species. Vermont, where I live and work, is generally considered environmentally conscious and relatively pristine. Nonetheless, in 1998, eight more species, including the sedge wren and wild lupine, were proposed for addition to the state's already extensive list of 187 Threatened and Endangered species. Steve Parren, the Coordinator for Vermont's Nongame and Natural Heritage Program, notes that "when you look at all the species, we are continuing to use up their habitat, with more roads, more road traffic, and development." Globally and locally we are daily losing "cogs and wheels" in most basic ecological processes, yet we are only beginning to grasp the immense human and intrinsic value of biodiversity.

Environmental Effects of Sprawl

Sprawl-type development may destroy wildlife habitat and fragment natural ecosystems directly and indirectly from extensive construction activity, water diversion, and creation of road and other infrastructure networks. Thus, many ecosystem services become less productive, ecological integrity is diminished, and biodiversity is lost. Conservation biology can help describe causal mechanisms linking development, disturbances, and resulting biological impacts; ecological economics can provide methods for quantifying the actual or probable losses in economic terms.

A comprehensive framework to assess the environmental effects of sprawl should include potential negative effects on: 1) human health; 2) ecosystem health and biodiversity; and, 3) recreational, aesthetic, spiritual, and future values:

Category 1: Human Health Impacts

- Ground-level drinking water pollution.
- Aquifer water pollution.
- Water resource pollution affecting swimmers, shellfish, and fish consumers.
- Air pollution.
- Soil contamination, including bio-accumulative toxins.
- Noise-related stress factors, such as from traffic, construction, or industrial sources.

DRIVING SPRAWL—POPULATION GROWTH & CONSUMPTION

According to United Nations estimates, October 12, 1999, marks the day the global human population passes the six billion mark. What does "Y6B" mean for the future of human and nonhuman life on Earth?

With the quadrupling of human population since 1900, the Earth is experiencing the sixth mass extinction event in history. The primary cause of extinction is human-induced habitat alteration, fragmentation, and destruction; other important causes are exotic species invasions, pollution, and overhunting.

While global biodiversity declines, human well-being is also threatened. Per capita cropland, irrigation water, and grain harvests are declining—and 17% of the planet's soils have been severely degraded. More than a billion people have no access to clean water. The richest 20% of humanity consumes 86% of all goods and services, while the poorest fifth consumes just 1.3%. Burning of fossil fuels has quintupled since 1950, accelerating climate change.

Population growth has slowed worldwide, but additional growth is ensured because of demographic momentum; that is, past rapid growth means roughly one billion young people are now entering their reproductive years. World population continues to increase by 78 million per year, and the UN projects that another four to five billion may be added before the population stabilizes late next century. This assumes that wealthy nations meet their commitments to funding population programs, which for the past five years they have failed to do; the United States is the leading deadbeat in this regard.

Even if population programs were fully funded starting today, a substantial increase in the human population for the remainder of our lifetimes is unavoidable. The challenge, then, is to provide a meaningful, equitable, and healthy life for six, eight, or ten billion people while simultaneously protecting and restoring the natural systems and biodiversity upon which all life depends.

Whether we can minimize additional ecological damage on our way to population stabilization depends in part on our commitment to creating sustainable human economies. Human impact depends as much on per capita resource consumption and waste generation as on population size. If everyone alive today were to live like the average North American, and even if all land and ocean areas were devoted to human uses, we would still need at least two additional uninhabited Earths to provide the necessary resources and waste sinks. Wasteful consumption and consumption disparities are a significant part of the 21st century ecological footprint dilemma.

As we reflect on the condition of the Earth on the eve of the millennium, we should renew our commitment to population stabilization worldwide, to reducing wasteful consumption, and to "saving the pieces" through wildlands protection and restoration. In the coming decades, funding for comprehensive population programs may be the best and the cheapest insurance policy we have for the flourishing of future generations of humans and nonhumans alike.

—by Annie Faulkner, *coordinator of the New England Coalition for Sustainable Population (PO Box 194, Sullivan, NH 03445; 603-847-9798; d9cat@cheshire.net)*

Category 2: Impacts on Ecosystem Goods, Services, and Biodiversity

- Diminished, fragmented, or simplified habitat for resident and transient nongame wildlife populations, including nurseries, stopovers for migratory species, or overwintering grounds.
- Diminished production of consumable wild fish, game, crops, nuts, or fruits accessible by hunting, gathering, or fishing.
- Increased wildlife roadkill.
- Diminished availability of raw materials including sawtimber, fuel, or fodder.
- Impaired disturbance regulation including storm protection, flood control, and other ecological responses to environmental variability, as mainly controlled by vegetation structure.
- Impaired gas regulation, especially reduced CO_2 sequestration and oxygen production, and climate regulation, especially of micro-climes including temperature and moisture.
- Impaired regulation of hydrological flows and waters for agriculture, industry, or transportation.
- Decreased storage and retention of water by watersheds, reservoirs, and aquifers.
- Decreased erosion control and sediment retention within an ecosystem. Increased losses of soil by wind, runoff, or other removal processes; storage of silt in lakes and wetlands.
- Decreased nutrient cycling including storage, internal cycling, processing, and acquisition of nutrients, especially nitrogen, potassium, and other elemental nutrient cycles.
- Reduced waste treatment, pollution control, and detoxification by recovery of mobile nutrients and removal or breakdown of excess or mutagenic nutrients and compounds.

- Reduced pollination and movement of floral gametes necessary for plant reproduction.
- Reduced biological control and trophic-dynamic regulation of populations. Loss of keystone predator control of prey species, resulting in mesopredator and herbivore (e.g., deer) overabundance.
- Depletion of genetic diversity that has evolved over millennia.
- Loss of unique biological materials and products, medicines, products for materials science, and horticultural varieties of plants.

Category 3: Aesthetic, Recreational, Spiritual, and Future Impacts

- Loss of agriculture-dominated landscapes.
- Loss of natural or wild landscapes.
- Altered viewsheds.
- Night sky pollution.
- Background noise pollution.
- Obnoxious or irritating smells.
- Reduced opportunities for ecotourism, birdwatching, hiking, bicycling, sport fishing, hunting, and other outdoor recreational activities.
- Lost opportunities or "option" value for future noncommercial uses including aesthetic, artistic, educational, spiritual, and/or scientific values of ecosystems.
- Reduced "legacy" value to future generations, from impaired ecosystems and biodiversity losses.
- Reduced "existence" value due to loss of intrinsic value of biodiversity, wildlands, and wildness.

A Formula to Evaluate the Environmental Impacts of Sprawl

"SPRAWL" = A Function of (I–M) x E
(Impacts–Mitigation)(Ecological Value)

"IMPACTS" = A Function of (C1) + (C2) + (C3)
(Category 1: Human Health Impacts of Sprawl) + (Category 2: Impacts on Ecosystem Goods, Services, and Biodiversity from Sprawl) + (Category 3: Aesthetic, Recreational, Spiritual, and Future Impacts from Sprawl)

"MITIGATION" = A Function of (M1) + (M2) + (M3)
(Mitigation of Category 1 impacts, for example through pollution prevention and control, vehicle miles traveled reduced by fees or access to alternative transport, etc.) + (Mitigation of Category 2 impacts, i.e., through habitat protection measures, runoff management, etc.) + (Mitigation of Category 3 impacts, i.e., through greenways, buried power lines, etc.)

"ECOLOGICAL VALUE" = A Function of (B) + (EGS) + (NA)
(Biodiversity)(Ecosystem Goods and Services)(Natural Aesthetics)

When this formula is applied to potential land use, it suggests sprawl's effects will be most severe where both the environmental impacts and ecological values are relatively high; for example, large developments in rural areas. In a continuum of land development that ranges from relatively low environmental impacts on less ecologically valuable sites, to relatively higher impacts on more ecologically valuable sites, sprawl's consequences escalate with size and habitat quality. Even with mitigation efforts, sprawling development chews up land, resulting in diminished biodiversity. For conservationists working to restore ecological integrity across landscapes, sprawl poses a grave threat—especially as it fragments semi-wild areas and de facto wilderness near protected lands.

Of course no technical analysis can put a definitive dollar value on the environmental impacts of sprawl, for either a single site or a landscape; such assessments are inherently subjective. One person's invaluable forested landscape appears to another as a timber supply, or to another as a prime second home site.

However, for purposes of decisions about land use, it is essential to understand that public, nonconsumptive value is an *additive* function, whereas private consumptive value is *subtractive* relative to the fundamental value of natural systems, including biodiversity. Development of sites in agricultural and forested landscapes may provide profits to a few but unquestionably diminishes great value for many. Increased application of ecological economics can help show the full costs of sprawl and reinforce the case for wildlands protection and restoration. ☾

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Book Reviews

Reviewed in this issue

Fire on the Plateau: Conflict and Endurance in the American Southwest

by Charles Wilkinson; A Shearwater Book published by Island Press (1718 Connecticut Ave. NW, Suite 300, Washington, DC 20009); 1999; $24.95; 416 pp.

Imagine a region in the American West whose heart-stopping beauty was reasonably protected from human overexploitation by poor roads, inclement weather, and poverty. A region settled in such low densities that it still fit Frederick Jackson Turner's definition of frontier. A region nearly 80 million acres in size that was inhabited largely by Indians and Mormons, whose economies were marginal and therefore relatively sustainable. A landscape whose administrative boundaries were divided mostly into public and tribal ownership, with a modest amount in private lands. A region with vast quantities of minerals beneath its soils and more water than it used. This was the Colorado Plateau after World War II.

Now, imagine this expansive region rimmed by cities whose populations were small but whose civic elders carried the credo of manifest destiny emblazoned on their chests. Where Chambers of Commerce meetings opened with the collective chants "There is no god but progress; there is no success like growth." These were the cities of Tucson, Phoenix, El Paso, Denver, Salt Lake City, Albuquerque, and Las Vegas, before a wave of population growth and development would transform them.

Thus the stage was set for another American tragedy. Would the human and natural communities of another lonely region be prepared for the juggernaut of boomers and boosters? Look what happened: Dams were built, coal-fired steam plants mushroomed, uranium and coal were mined, and once-modest cities erupted into America's most rapidly growing metropolitan areas. This growth, what Charles Wilkinson has termed the "Big Build-up," occurred because cities on the perimeter of the plateau needed water and electricity to grow, and the potential resources to produce those engines of growth were largely unguarded.

In *Fire on the Plateau*, Charles Wilkinson presents a remarkably balanced account that is sympathetic to the region's peoples and landscape while probing how communities are unprepared to resist the sophisticated efforts of cities and industries that believe in the goodness of growth. As important, in *Fire on the Plateau* Charles Wilkinson gives us his singular voice. Certainly his past books, such as *American Indians, Time and Law*, *Crossing the Next Meridian*, and *The Eagle Bird*, were exemplary scholarship—but they were written in the inevitable style

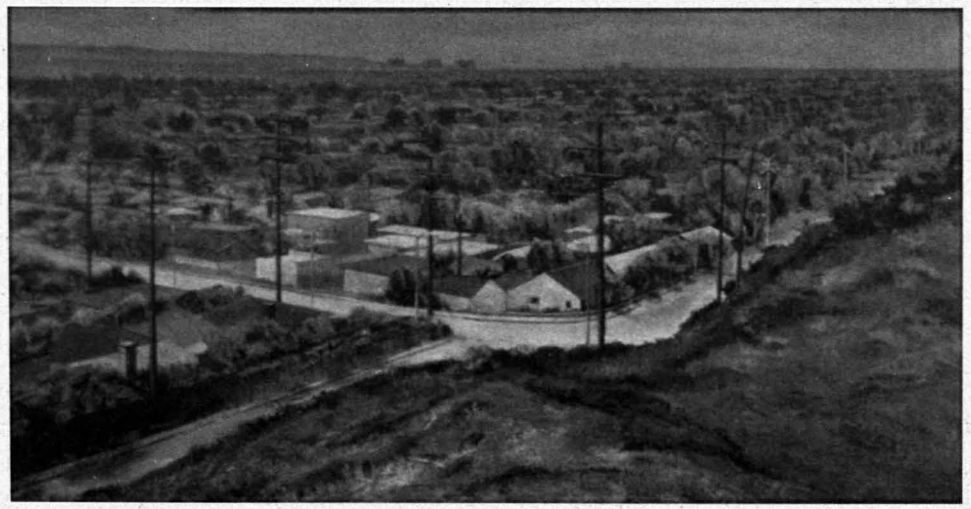


illustration by Barrie Mottishaw

of academic publications. Here, Wilkinson, perhaps the region's most distinguished scholar, combines his heart and head and writes in a style that captures the passion he has always felt for this lovely region and its people.

Fire on the Plateau is not only wonderful reading, it is richly informative. No matter how well readers know the region, I suspect they will be delighted at how much they learn while enjoying this monumental book. Whether explaining the injustices of Indian schools, the double-dealing of big city attorneys, the threat of industrial-strength tourism, or the inequities between rural and urban cultures, Wilkinson presents a grand synthesis of the Colorado Plateau that will leave one both better informed and more committed to become involved in ongoing discussions over its future.

But above all of this, readers will be impressed by Charles Wilkinson. Considering what he knows about the region, how he has been involved in its conflicts, how passionately he cares about its human and natural communities, it is a wonder that he writes so thoughtfully. Wilkinson does not moralize; instead he allows one to learn about this grand geography and its inhabitants, and along the way to think deeply about the struggles that swirl over its escarpments, that eddy along its rivers, that storm over its mountains. In the end, Wilkinson leaves us better than we were before. In telling the Colorado Plateau's story, Wilkinson offers a testimony to the value of endurance, that the land and its people have a resilience that growth can erode but, perhaps, not destroy.

Reviewed by **RICHARD L. KNIGHT**, *professor of wildlife conservation at Colorado State University*

Primitives in the Wilderness:
Deep Ecology and the Missing Human Subject

by Peter C. van Wyck; State University of New York Press (State University Plaza, Albany, NY 12246); 1997; $17.95; 186 pp.

When Basho wrote about Nature 500 years ago, he wrote like this: "Go to the pine if you want to learn about the pine, or to the bamboo if you want to learn about the bamboo." When John Muir wrote about Nature 100 years ago, he wrote like this: "If a war of the races should occur between the wild beasts and Lord Man, I would be tempted to sympathize with the bears." When the author of the book *Primitives in the Wilderness*, Peter van Wyck, writes about Nature, he writes like this:

A weak ecology is a hedge against the retro-futuristic moves of an ecology of depth. It is savvy to the tricks of a reactionary ecology, an ecological algebra of reversal, an ecology blind to its own remainder....

And this:

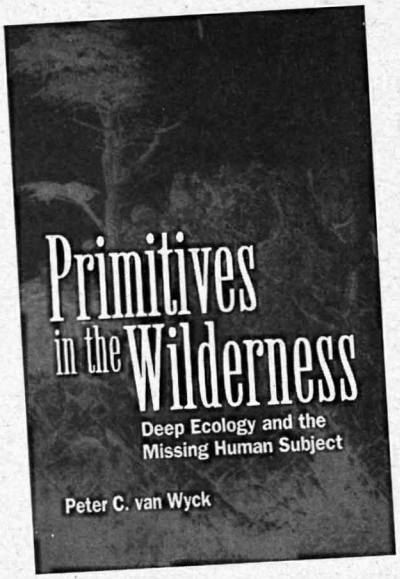
Rather, a weak strategy proceeds from the understanding that even with the decline of Truth's certitude, and the decentering of the knowing Cartesian subject, these traditions persist as illnesses, traces, ghosts. The cyborg, we could say, is a performance artist of weak thought.

One would be hard pressed after reading these passages to say that "progress" is the operative word here. The sort of lucidity that was expected of public intellectuals several decades ago (one thinks of Rachel Carson or Lewis Mumford) has now been buried under a deluge of cookie cutter flimflam and blundering drivel. All the stock buzz-words and phrases are trundled out by van Wyck, and the reader is left floating in the familiar detritus of "contingencies and artifice," "zones of traces," and "semiotic negotiations," dismantling this and that signified signifier. Likewise, the usual bunch of suspects is rounded up to represent this new "reality" (always refer to reality in quotation marks, it's exquisitely trendy): Derrida, Foucault, Baudrillard, Lyotard, Haraway, and all the rest.

McGill doctoral candidate van Wyck's stated purpose in writing this book is to deconstruct deep ecology, and replace it with his own "weak ecology" (weak being superlative in this case), coupled with a relentless, almost worshipful deference to the "cyborg" theories of Donna Haraway, along with their respective opaque terminology.

To van Wyck, deep ecology has become "a kind of monster that squats upon thought," replete with its "reactionary consciousness" and "authoritarian restraints," not unlike the conditions that preceded "the rise of National Socialism," etc. There is absolutely nothing new here; this is nearly a word-for-word reiteration of the groundless charges made by Murray Bookchin and Alexander Cockburn in the late 1980s.

Curiously enough, even though Arne Naess, the exceptionally gentle founder of deep ecology, resisted Nazi violence as a young man and has written several books about Gandhian nonviolence, know-nothings like van Wyck confidently repeat these tired assertions without a shred of evidence to back them up. Even if we did take seriously this paranoid fantasy that the rise of deep ecology parallels the rise



of National Socialism, it has been 25 years since deep ecology was first proposed by Naess, and nothing even vaguely similar to what happened in the 1930s and 40s has taken place. Further, van Wyck doesn't even attempt to engage books by Andrew McLaughlin or Robyn Eckersley that deal at length with the interplay between deep ecology and political theory.

From this inauspicious beginning, van Wyck attempts to build the case for his own "weak ecology," probably the most appropriately named and inadvertent free-fall into self-parody in decades. He makes fun of the "sites of resistance" of deep ecology advocates, contrasting them with "Haraway's political analysis," which "tends to engage the problem from the point of view of the subjugated or marginalized."

Let me get this straight. So conservationists around the world who espouse a deep ecological worldview, who are risking life and limb fighting roads and clearcutting and all manner of Earth-destroying activities, are not really "oppositional to structures of power"; however, when van Wyck or Haraway come out from the safety of their graduate lounges and start gabbling away about "a planetary Foucauldian administrative panapticon," or "sites for political and semiotic negotiation," they are true "transgressive" revolutionaries? Does van Wyck really think that just because he can spell Trinh Minh-ha (though he misspells Theodore Roszak's name as "Rozak" throughout), this makes him some sort of spokesman for the Third World?

Then he gets to the heart of his theory: Adherents of deep ecology are so dumb, they haven't even caught on to the fact that "technology and the body have converged." (And boy, just in time!) Van Wyck cites another one of his exemplars, Jean Baudrillard: "Am I a man, am I a machine?...the quality of being human, as opposed to being a machine, is undecidable." Readers might remember that Baudrillard is the author of the now infamous *The Gulf War Did Not Take Place*, an exquisitely condescending work that seriously attempts to argue that the Gulf War was "unreal," fought by decoys with "simulated losses and victims."

Van Wyck explains that, by the saving grace of Mistress Haraway, individuals are interpreted "through the grid of technologies which they inhabit, and which inhabit them." Her preference for the machine is made clear in this quote: "Our machines are disturbingly lively, and we ourselves are frighteningly inert." "The cyborg is our ontology," says Haraway, "it gives us our politics."

Now this last quotation is grimly amusing in that it is the very sort of thing van Wyck harshly criticizes deep ecology advocates for. If it is inappropriate to imply that enlightened politics will simply emerge from a commitment to Nature (and I tend to agree, this being one of the few strong points in this incredibly bad book), then how is it any better to imply they will spontaneously arise from a cyborg identity? Are the millions of young women engaged in making computer chips in Malaysia and other countries for starvation wages under dictatorial conditions a good example of how "merging" with technology spells progressive politics? Would Haraway and her ilk have us believe that massive corporations like Dupont or Monsanto—which are now reengineering the very fabric of life to sell back to us at a profit—are friends and partners in "transgressive boundary crossing"? One doesn't know whether to laugh or cry.

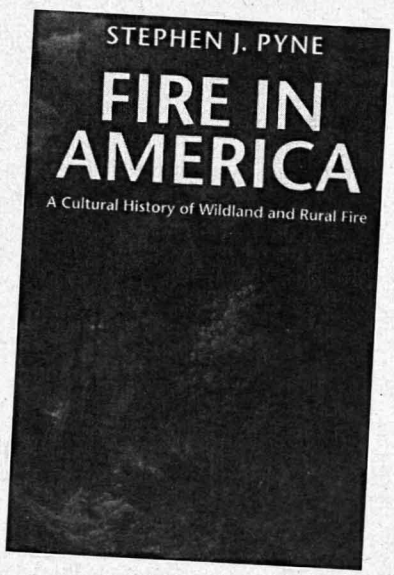
This book is filled with such howlers that it is a marvel it ever got to press. The author soars on the rhetorical wings of an ostrich, again positing his "weak" (read "cyborg") ecology against "reactionary" (read "deep") ecology. He fumbles to a stop, ending with a plea for us not to be swayed by the "dystopic futures" glimpsed by a recent Star Trek movie devoted to fighting "the Borg," a high-tech cyborg race that either assimilates or exterminates whatever lays in its path.

It shouldn't be any surprise that I disagree and think that in portraying "the Borg," the writers at Star Trek got it exactly right. Speaking of that, in an unnerving interview published in *Wired* (February 1997), entitled "You Are Borg," Haraway argues that "we are already assimilated." The title page features a picture of a hideous plastic mannequin stuffed with wires and other junk. Now that's really something to look forward to, isn't it?

Reviewed by **BILL McCORMICK**, *a writer who lives in Charlottesville, Virginia*

Fire in America: A Cultural History of Wildland and Rural Fire

by Stephen J. Pyne, foreword by William Cronon; University of Washington Press (PO Box 50096, Seattle, WA 98145); 1997; $24.95 paper; 680 pp.



North America, from sea to shining sea, is a fire continent, and no one is better able to convey the subtleties of American fire than Stephen Pyne. The long-time crew leader of Grand Canyon's North Rim Longshots, Pyne fought fire for 15 seasons before becoming a professor of history and the author of eight books (with two more in the works) on the culture, history, and management of wildland fire.

Pick a region and Pyne offers information on the political and environmental history of its fire regime—*Fire in America* describes the forest-clearing fires lit by Native Americans in the Northeast; the South's history of under-burning that inspired today's prescribed burning; the Northwest and upper Midwest's post-logging and drought-fueled conflagrations; the doghair thickets of ponderosa regeneration in the Southwest, the product of decades of fire exclusion; the burning brush of California and the burning sagebrush (fed by the invasion of cheatgrass) of the Great Basin; and the landscape-scale fires of the Rockies in the 1870s, 1910, and 1988.

This history begins with lightning, which shaped the evolution of plants and ecosystems as climates dried; it continues with the addition of anthropogenic fires, ignited first by Indians and then by European settlers, who adapted their field-burning agriculture system with lessons learned from Indian burners. In the 1880s, as the frontier edged towards closure, a light-burning (or native-style burning) debate nearly succeeded in launching an ecologically sound fire policy…but the huge burns in 1910, when linked with the military influence on park and forest management, fostered a suppression mentality from which we may never fully recover.

To participate more knowledgeably in the hazardous fuel loading debate; or learn why managers elect suppression on one fire but "wildland fire use for resource benefits" on another; or understand why prescribed fire in the cooler off-seasons can often make political and ecological sense; or simply know why our parks and forests look the way they do…start with the comprehensive history of *Fire in America*. Fire casts a shadow (as Plato noted in his allegory of the cave) with which we might see ourselves and our landscape. As Pyne notes, "If man alone can create fire, he alone can extinguish it deliberately. He can alter a landscape as much by excluding fire as by introducing it."

Reviewed by **RON STEFFENS** *(rsteffen@southwestern.cc.or.us), a seasonal wildland fire monitor for the National Park Service*

Blood Rites: The Origins and History of the Passions of War

by Barbara Ehrenreich; Henry Holt & Co. (115 W. 18th St., New York, NY 10011); 1997; $14.95; 256 pp.

A study of American children in 1965 found surprising little concern about practical threats such as nuclear war, traffic, and germs. The astonishing fact, concluded the author of that study, was that children in our urbanized civilization most fear an exceedingly unlikely source of danger: wild animals. Eighty percent mentioned snakes, lions, tigers, and bears. *Blood Rites*, despite its attention to the origins and history of war, is of interest to conservationists as we push for public discussion and support for large predator recovery.

Why do we fear predators? Various authors reflecting on the subject suspect that it is probably not the thought of being killed that most concerns us, but rather the thought of being eaten as prey. This is the focus of much of Ehrenreich's book; she looks at our evolutionary history before our "toothless, clawless, shivering species" turned into the dominant predator. The first weapons (and artificial fire) came into use relatively recently, around 15,000 years ago. With the invention of weapons came man-the-hunter. Before this, and for most of our evolutionary history, the evidence is overwhelming that we were man-the-hunted; in those times, when *Homo sapiens* ate meat it was most likely gained by scavenging.

Thus the age before hunting was a long dark era of fear. According to Ehrenreich, this caused an "original trauma" which was not a single event but a long-standing condition of being hunted and eaten. Human sacrifice

was perhaps a way of dealing with the guilt of hunting and killing animals. Or, perhaps, if during the hunt a comrade fell prey to hungry carnivores, the rest of the band would be safe. The burial of the dead, estimated to have begun around 150,000 years ago, was conceivably to "cheat the beast," to refuse to accept the status of prey.

Grief, depression, helplessness: these are the experiences of being sentient prey. And the obvious way out, according to the author, is to assume the stance of predator—turn grief to rage, go from listless mourning to bustling preparation for offensive attack.

Ehrenreich's research leads her to see the transformation from prey to predator as the central story of the human narrative. Over eons, it has been recounted as myth, reenacted as ritual, and may be at the heart of religion.

In our culture today "blood rites" often mime predation. Commercial entertainment is filled with stories of men and women being "stalked by killers." Contemporary war is no longer about warriors but rather is filled with preparations for battle (training, organizing supplies, marching) and is hardly the scene of ferocious aggressiveness, whether hot-tempered macho or otherwise. But it does offer the thrill of defensive solidarity, giving us an enemy and a team with which to face that enemy, during which "all anxiety dissolves"—temporarily.

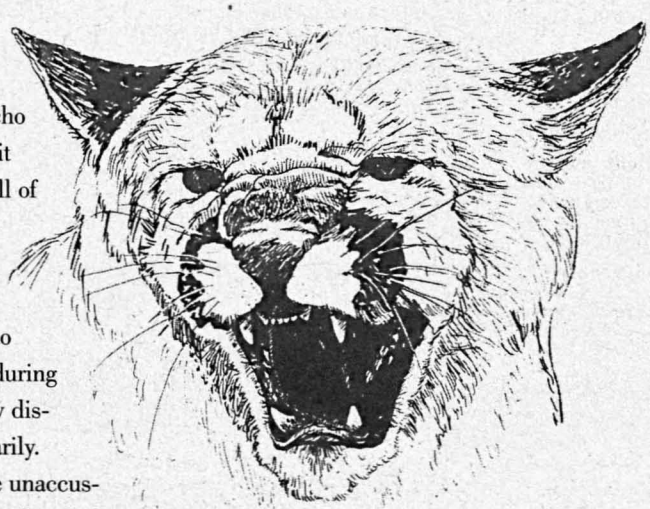


illustration by Margaret Pettis

Today we are unaccustomed to thinking of animals as anything other than instruments of human ambition or as pets. They are, according to Ehrenreich, buried in history with adjectives modifying forms of human culture, as in, "herding peoples, hunting peoples, horse peoples," with the adjectival status of the animal emphasizing its total subordination to human needs. Urban people today think of animals as useful servants or as merely cute. Bears have been trivialized as teddy bears, etc. It is now almost beyond our power as a species to think of animals as actors in their own rights, following their own agendas, much less as actors that have shaped the course of human destiny.

The author of *Blood Rites* illuminates well our archaic phobias that result from an evolutionary history as prey. This insight may provide the basis for a new relationship with the other beings at the top of the trophic ladder, a place a growing number of us wish to share again with big wild animals, restored to their native ranges across the landscape.

Reviewed by **LINDA DRISKILL**, *a seasonal fire lookout for the US Forest Service and forest activist in eastern Oregon*

Maybe One:
A Personal and Environmental Argument for Single-Child Families

by Bill McKibben; Simon and Schuster (1230 Avenue of the Americas, New York, NY 10020); 1998; $12.95 paper; 254pp.

Maybe One addresses the population issue at the level where the real decisions about childbearing are made: in the intimacy of home and bedroom; within the knot of relationships among lovers, spouses, parents, children, and extended family; and within the human heart. McKibben and his wife agonized for years over the question of whether or not to bring a child into an already overburdened world. They eventually became parents to a baby girl. Impelled by his deep love for his daughter, McKibben's anxieties shifted to fears that as an only child, his daughter would become the proverbial "spoiled brat," or grow up lonely and socially maladjusted. After much soul-searching, and extensive research into the child development and sociological literature, McKibben was reassured—at least intellectually—that an only child has an even, if not a better, chance of being a normal, happy, successful, and caring human being. This deconstruction of the myths surrounding only children makes *Maybe One* a valuable contribution to the population literature.

Population activists would do well to heed McKibben's moderate and nonjudgemental approach. He presents a familiar litany of grim statistics on the status of the biosphere and the impacts of population growth, but never champions dracon-

ian solutions. Rather than douse his readers in guilt, he makes a reasoned case for having one—and only one—child, thereby making a significant contribution to population reduction. He acknowledges that for many people, having just one child will entail substantial sacrifice. Indeed, I personally believe that even stronger than the anxieties that can drive parents to have subsequent children is the love most feel for their firstborn, which they long to experience at least one more time with another baby. McKibben does not dismiss this loss, but calls on current generations to find other ways of nurturing "without being parents of large families," suggesting that it is the Earth itself that needs our love and our restraint.

Reviewed by biologist, writer, and mother **MOLLIE Y. MATTESON**

The Story of Vermont: A Natural and Cultural History

by Christopher McGrory Klyza and Stephen C. Trombulak; Middlebury College Press, published by University Press of New England (23 So. Main St., Hanover, NH 03755-2055); 1999; $19.95; 240 pp.

Not since the glaciers retreated from the region 11,000 years ago has Vermont experienced such enormous landscape-level changes as those wrought by colonial settlers and their descendants during the past 200 years. *The Story of Vermont: A Natural and Cultural History* by Christopher McGrory Klyza and Stephen C. Trombulak examines the history of Vermont from the Precambrian to the present, focusing special attention on the period since European arrival in the Champlain Valley. This excellent history of a peopled landscape transcends a purely Nature-based approach, melds good scholarship with an engaging, accessible style, and would be a great new addition to any conservationist's library.

The first release in the Middlebury College Bicentennial Series in Environmental Studies, *The Story of Vermont* lays the groundwork for forthcoming books on such topics as eastern wolf restoration and rewilding the Northeast. By illuminating where Vermont is in the continuum of her past—not at the bust stage of the late 1800s when forests and wildlife were desperately depleted, but at a boom state of ecological recovery tempered by new threats—the authors establish a cautious vision of hope for Vermont's natural and cultural future.

Reviewed by **ALICIA DANIEL,** *Associate Director of the University of Vermont's Field Naturalist Program*

ANNOUNCEMENTS

Grizzly Report A new study, "Wilderness-based Ecosystem Protection in the US Northern Rockies" by Mike Bader, concludes that delisting grizzly bears (from Endangered Species Act protections) and resumption of hunting could destabilize the Yellowstone and Northern Continental Divide Ecosystem populations, further threatening the bears. The study found that the density of bear mortalities has shifted from wilderness to non-wilderness areas since legal hunting ended. Delisting grizzlies would allow the resumption of legal hunting, potentially shifting the density of mortalities back to the core habitat. Bear mortality is also linked to the presence of roads, trails, and major developments. Contact the Alliance for the Wild Rockies at 406-721-5420 or email awr@wildrockies.org for a copy.

Roadless Areas Threatened "Loopholes and Exemptions: Losing our Heritage Forests," a new report released by the Heritage Forest Campaign, documents how our nation's remaining roadless wildlands continue to be destroyed by logging, roadbuilding, mining, and off-road vehicle use. In addition to exempting entire regions from its announced moratorium on developing roadless lands, the US Forest Service is treating long-abandoned logging roads and snowmobile trails as existing roads to permit continued timber extraction. For a copy of the report, contact the Heritage Forest Campaign at 202-861-2242 or visit the campaign website: www.ourforests.org.

Religious Campaign for Forest Conservation A national strategic planning conference will be held on November 19–21, 1999, for church and synagogue leaders, clergy, forest activists, denominational representatives, and others who wish to better integrate the religious community into forest protection efforts. The gathering will take place at Blackwater Lodge in Blackwater Falls State Park near Davis, West Virginia. For registration information, contact RCFC at 409 Mendocino Ave., Suite A, Santa Rosa, CA 95401; 707-573-3162.

Wolf Conference The International Wolf Center and University of Minnesota Duluth University College will host "Wolves: A Global Symposium" on February 23–26, 2000 in Duluth, MN. The gathering of wolf advocates, agency personnel, biologists, and NGOs will feature presentations by scientists from around the world on wolf recovery and management. For information, contact International Wolf Symposium, UMD–University College, 251 Darland, 10 University Dr., Duluth, MN 55812; 218-726-6819; merickso@d.umn.edu.

Carnivore Conference Call for Papers Defenders of Wildlife invites session proposals and paper and poster abstract submissions for its November 12–15, 2000, conference on Predator Biology and Conservation in the 21st Century, to be held in Denver, Colorado. Appropriate topics include biology, behavior, taxonomy, general ecology, recovery, policy, management, and economic impacts of carnivores. Session proposals are due by February 29, 2000; paper and poster abstract deadline is March 30, 2000. For submission guidelines or to receive registration information, contact Carnivores 2000, Defenders of Wildlife, 1101 14th St. NW, Suite 1400, Washington, DC 20005; 202-789-2844 ext. 315; nfascione@defenders.org.

Call for Submissions The 1999/00 issue of *Whole Terrain*, "Legacy and Posterity," is now available. Ann Zwinger, Everett Gendler, and Simon Ortiz join others to reflect on the importance of environmental legacy in our lives. For a copy, send $7 to address below. "PLAY: the role of humor, wonder & freedom at work" is the theme for 2000/01. Do you have an essay, poem, story, or artwork on how 'play' has shaped or could shape our work in the environmental field? What role do imagination, humor, and color play in the environmental movement? Submit manuscripts (2000 words max.) by February 15, 2000. For guidelines, contact Whole Terrain, Antioch New England Graduate School, 40 Avon Street, Keene, NH 03431-3516; 603-357-3122 ext. 272; fax 603-357-0718; whole_terrain@antiochne.edu.

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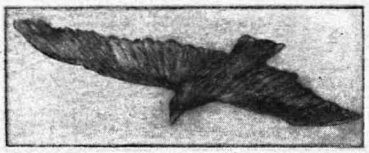

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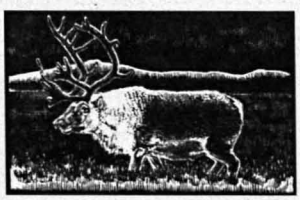

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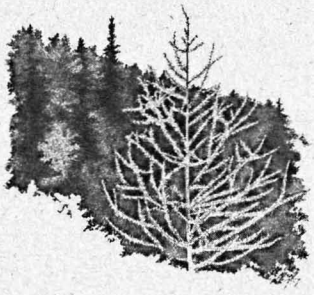

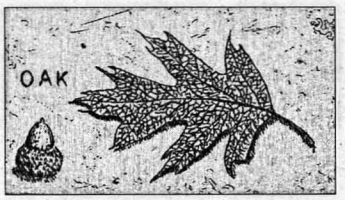

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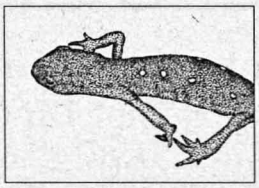

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We list here only the major articles of each issue, by partial title or subject. For a more complete listing, request a comprehensive Back Issues List (see form on last page).

BACK ISSUES

1/Spring 1991 • Ecological Foundations for Big Wilderness, Howie Wolke on The Impoverished Landscape, Reed Noss on Florida Ecosystem Restoration, Biodiversity & Corridors in Klamath Mtns., Earth First! Wilderness Preserve System, GYE Marshall Plan, Dolores LaChapelle on Wild Humans, and Bill McCormick's Is Population Control Genocide?

2/Summer 1991 • Dave Foreman on the New Conservation Movement, Ancient Forests: The Perpetual Crisis, Wolke on The Wild Rockies, Grizzly Hunting in Montana, Noss on What Wilderness Can Do for Biodiversity, Mendocino NF Reserve Proposal, Christopher Manes on the Cenozoic Era, and Part 2 of McCormick's Is Population Control Genocide?

3/Fall 1991 • SOLD OUT (but photocopies of articles available). The New Conservation Movement continued. Farley Mowat on James Bay, George Washington National Forest, the Red Wolf, George Wuerthner on the Yellowstone Elk Controversy, The Problems of Post Modern Wilderness by Michael P. Cohen and Part 3 of McCormick's Is Population Control Genocide?

4/Winter 1991/92 • Devastation in the North, Rod Nash on Island Civilization, North American Wilderness Recovery Strategy, Wilderness in Canada, Canadian National Parks, Hidden Costs of Natural Gas Development, A View of James Bay from Quebec, Noss on Biologists and Biophiles, BLM Wilderness in AZ, Wilderness Around the Finger Lakes: A Vision, National ORV Task Force

5/Spring 1992 • Foreman on ranching, Ecological Costs of Livestock, Wuerthner on Gunning Down Bison, Mollie Matteson on Devotion to Trout and Habitat, Walden, The Northeast Kingdom, Southern Rockies Ecosystem Protection, Conservation is Good Work by Wendell Berry, Representing the Lives of Plants and Animals by Gary Paul Nabhan, and The Reinvention of the American Frontier by Frank and Deborah Popper

6/Summer 1992 • The Need for Politically Active Biologists, US Endangered Species Crisis Primer, Wuerthner on Forest Health, Ancient Forest Legislation Dialogue, Toward Realistic Appeals and Lawsuits, Naomi Rachel on Civil Disobedience, Victor Rozek on The Cost of Compromise, The Practical Relevance of Deep Ecology, and An Ecofeminist's Quandary

7/Fall 1992 • How to Save the Nationals, The Backlash Against the ESA, Saving Grandfather Mountain, Conserving Diversity in the 20th Century, Southern California Biodiversity, Old Growth in the Adirondacks, Practicing Bioregionalism, Biodiversity Conservation Areas in AZ and NM, Big Bend Ecosystem Proposal, George Sessions on Radical Environmentalism in the 90s, Max Oelschlaeger on Mountains that Walk, and Mollie Matteson on The Dignity of Wild Things

8/Winter 1992/93 • Critique of Patriarchal Management, Mary O'Brien's Risk Assessment in the Northern Rockies, Is it Un-Biocentric to Manage?, Reef Ecosystems and Resources, Grassroots Resistance in Developing Nations, Wuerthner's Greater Desert Wildlands Proposal, Wolke on Bad Science, Homo Carcinomicus, Natural Law and Human Population Growth, Excerpts from *Tracking & the Art of Seeing* and *Ghost Bears*

Wildlands Project Special Issue #1 • TWP (North American Wilderness Recovery Strategy) Mission Statement, Noss's Wildlands Conservation Strategy, Foreman on Developing a Regional Wilderness Recovery Plan, Primeval Adirondacks, Southern Appalachians Proposal, National Roadless Area Map, NREPA, Gary Snyder's Coming into the Watershed, Regenerating Scotland's Caledonian Forest, Geographic Information Systems

9/Spring 1993 • The Unpredictable as a Source of Hope, Why Glenn Parton is a Primitivist, Hydro-Quebec Construction Continues, RESTORE: The North Woods, Temperate Forest Networks, The Mitigation Scam, Bill McKibben's Proposal for a Park Without Fences, Arne Naess on the Breadth and Limits of the Deep Ecology Movement, Mary de La Valette says Malthus Was Right, Noss's Preliminary Biodiversity Plan for the Oregon Coast, Eco-Porn and the Manipulation of Desire

10/Summer 1993 • Greg McNamee questions Arizona's Floating Desert, Foreman on Eastern Forest Recovery, Is Ozone Affecting our Forests?, Wolke on the Greater Salmon/Selway Project, Deep Ecology in the Former Soviet Union, Topophilia, Ray Vaughan and Nedd Mudd advocate Alabama Wildlands, Incorporating Bear, The Presence of the Absence of Nature, Facing the Immigration Issue

11/Fall 1993 • Crawling by Gary Snyder, Dave Willis challenges handicapped access developments, Biodiversity in the Selkirk Mtns., Monocultures Worth Preserving, Partial Solutions to Road Impacts, Kittatinny Raptor Corridor, Changing State Forestry Laws, Wild & Scenic Rivers Act, Wuerthner Envisions Wildland Restoration, Toward [Population] Policy That Does Least Harm, Dolores LaChappelle's Rhizome Connection

12/Winter 1993/94 • A Plea for Biological Honesty, A Plea for Political Honesty, Endangered Invertebrates and How to Worry About Them, Faith Thompson Campbell on Exotic Pests of American Forests, Mitch Lansky on The Northern Forest, Human Fear Diminishes Diversity in Rocky Mtn. Forests, Gonzo Law #2: The Freedom of Information Act, Foreman on NREPA and the Evolving Wilderness Area Model, Rocky Mtn. Nat. Park Reserve Proposal, Harvey Locke on Yellowstone to Yukon campaign

13/Spring 1994 • Ed Abbey posthumously decries The Enemy, David Clarke Burks's Place of the Wild, Ecosystem Mismanagement in Southern Appalachia, Mohawk Park Proposal, RESTORE vs. Whole-Tree Logging, Noss & Cooperrider on Saving Aquatic Biodiversity, Atlantic Canada Regional Report, Paul Watson on Neptune's Navy, The Restoration Alternative, Intercontinental Forest Defense, Chris McGrory-Klyza outlines Lessons from Vermont Wilderness

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15/Fall 1994 • BC Raincoast Wilderness, Algoma Highlands, Helping Protect Canada's Forests, Central Appalachian Forests Activist Guide, Reconsidering Fish Stocking of High Wilderness Lakes, Using General Land Office Survey Notes in Ecosystem Mapping, Gonzo Law #4: Finding Your Own Lawyer, The Role of Radio in Spreading the Biodiversity Message, Jamie Sayen and Rudy Engholm's Thoreau Wilderness Proposal

16/Winter 1994/95 • Ecosystem Management Cannot Work, Great Lakes Biodiversity, Peregrine Falcons in Urban Environments, State Complicity in Wildlife Losses, How to Burn Your Favorite Forest, ROAD-RIPort #2, Recovery of the Common Lands, A Critique and Defenses of the Wilderness Idea by J. Baird Callicott, Dave Foreman, and Reed Noss

17/Spring 1995 • Christopher Manes pits Free Marketeers vs. Traditional Environmentalists, Last Chance for the Prairie Dog, interview with tracker Susan Morse, Befriending a Central Hardwood Forest part 1, Economics for the Community of Life: Part 1, Minnesota Biosphere Recovery, Michael Frome insists Wilderness Does Work, Wilderness or Biosphere Reserve: Is That a Question?, Deep Grammar by J. Baird Callicott

18/Summer 1995 • Wolke on Loss of Place, Dick Carter on Utah Wilderness: The First Decade, *WE* Reader Survey Results, Ecological Differences Between Logging and Wildfire, Bernd Heinrich on Bumblebee Ecology, Michael Soulé on the Health Implications of Global Warming, Peter Brussard on Nevada Biodiversity Initiative, Preliminary Columbia Mtns. Conservation Plan, Environmental Consequences of Having a Baby in the US

19/Fall 1995 • SOLD OUT (but photocopies of articles available). Wendell Berry on Private Property and the Common Wealth, Eastside Forest Restoration, Global Warming and The Wildlands Project, Paul J. Kalisz on Sustainable Silviculture in Eastern Hardwood Forests, Old Growth in the Catskills and Adirondacks, Threatened Eastern Old Growth, Andy Kerr on Cow Cops, Fending of SLAPPS, Using Conservation Easements to save wildlands, David Orton on Wilderness and First Nations

20/Winter 1995/96 • ***TWP Special Issue #2.*** Testimony from Terry Tempest Williams, Foreman's Wilderness: From Scenery to Strategy, Noss on Science Grounding Strategy and The Role of Endangered Ecosystems in TWP, Roz McClellan explains how Mapping Reserves Wins Commitments, Second Chance for the Northern Forest: Headwaters Proposal, Klamath/Siskiyou Biodiversity Conservation Plan, Wilderness Areas and National Parks in Wildland Proposal, ROAD-RIP and TWP, Steve Trombulak, Jim Strittholt, and Reed Noss confront Obstacles to Implementing TWP Vision

21/Spring 1996 • Bill McKibben on Finding Common Ground with Conservatives, Public Naturalization Projects, Curt Steger on Ecological Condition of Adirondack Lakes, Acid Rain in the Adiron-

dacks, Bob Mueller on Central Appalachian Plant Distribution, Brian Tokar on Biotechnology vs. Biodiversity, Stephanie Mills on Leopold's Shack, Soulé asks Are Ecosystem Processes Enough?, Poems for the Wild Earth, Limitations of Conservation Easements, Kerr on Environmental Groups and Political Organization

22/Summer 1996 • McKibben on Text, Civility, Conservation and Community, Eastside Forest Restoration Forum, Grazing and Forest Health, debut of Landscape Stories department, Friends of the Boundary Waters Wilderness, Private Lands in Ecological Reserves, Public Institutions Twisting the Ear of Congress, Laura Westra's Ecosystem Integrity and the Fish Wars, Caribou Commons Wilderness Proposal for Manitoba

24/Winter 1996/97 • SOLD OUT (but photocopies of articles available). Opposing Wilderness Deconstruction: Gary Snyder, Dave Foreman, George Sessions, Don Waller, Michael McCloskey respond to attacks on wilderness. The Aldo Leopold Foundation, Grand Fir Mosaic, eastern old-growth report, environmental leadership. Andy Robinson on grassroots fundraising, Edward Grumbine on Using Biodiversity as a Justification for Nature Protection, Rick Bass on the Yaak Valley, Bill McCormick on Reproductive Sanity, and portrait of a Blunt-nosed Leopard Lizard

25/Spring 1997 • Perceiving the Diversity of Life: David Abram's Returning to Our Animal Senses, Stephanie Kaza on Shedding Stereotypes, Jerry Mander on Technologies of Globalization, Christopher Manes's Contact and the Solid Earth, Connie Barlow Re-Stories Biodiversity by Way of Science, Imperiled Freshwater Clams, WildWaters Project, eastern old-growth report, American Sycamore, Kathleen Dean Moore's Traveling the Logging Road, Mollie Matteson's Wolf Re-story-ation, Maxine McCloskey on Protected Areas on the High Seas

26/Summer 1997 • Doug Peacock on the Yellowstone Bison Slaughter, Reed Noss on Endangered Major Ecosystems of the United States, Dave Foreman challenges biologists, Hugh Iltis challenges abiologists, Virginia Abernethy explains How Population Growth Discourages Environmentally Sound Behavior. Gaian Ecology and Environmentalism, The Bottom Line on Option Nine, Eastern Old Growth Report, How Government Tax Subsidies Destroy Habitat, Geology in Reserve Design, part 2 of NPS Prescribed Fires in the Post-Yellowstone Era

27/Fall 1997 • SOLD OUT (but photocopies of articles available). Bill McKibben discusses Job and Wilderness, Anne LaBastille values Silence, Allen Cooperrider and David Johnston discuss Changes in the Desert, Donald Worster on The Wilderness of History, Nancy Smith on Forever Wild Easements in New England, George Wuerthner on Subdivisions and Extractive Industries, More Threatened Eastern Old Growth, part 2, the Precautionary Principle, North and South Carolina's Jocasse Gorges, Effects of Climate Change on Butterflies, the Northern Right Whale, Integrating Conservation and Community in the San Juan Mtns., Las Vegas Leopard Frog

28/Winter 1997/98 • ***Overpopulation Issue*** explores the factors of the I=PAT model: Gretchen Daily & Paul Ehrlich on Population Extinction and the Biodiversity Crisis, Stephanie Mills revisits nulliparity, Alexandra Morton on the impacts of salmon farming, Sandy Irvine punctures pro-natalist myths, William Catton Jr. on carrying capacity, Virginia Abernethy considers premodern population planning, Stephanie Kaza on affluence and the costs of consumption, Kirkpatrick Sale criticizes the Technological Imperative, McKibben addresses overpopulation One (Child) Family at a Time, Interview with Stuart Pimm, Resources for Population Publications & Overpopulation Action, Spotlight on Ebola Virus

29/Spring 1998 • Interview with David Brower, Anthony Ricciardi on the Exotic Species Problem and Freshwater Conservation, George Wuerthner explores the Myths We Live By, forum on ballot initiatives, John Clark & Alexis Lathem consider Electric Restructuring, Paul Faulstich on Geophilia, critiques of motorized wreckreation, Mitch Friedman's Earth in the Balance Sheet, Anne Woiwode on Pittman Robinson, Peter Friederici's Tracks, Eastern Old Growth, Connie Barlow's Abstainers

30/Summer 1998 • ***Wildlands Philanthropy*** tradition discussed by Robin Winks, John Davis on Private Wealth Protecting Public Values, Doug Tompkins on Philanthropy, Cultural Decadence, & Wild Nature, Sweet Water Trust saves wildlands in New England, A Time Line of Land Protection in the US, Rupert Cutler on Land Trusts and Wildlands Protection, profiles of conservation heroes Howard Zahniser, Ernie Dickerman, & Mardy Murie, Michael Frome recollects the wilderness wars, David Carle explores early conservation activism and National Parks, and Barry Lopez on The Language of Animals

31/Fall 1998 • ***Agriculture & Biodiversity*** examined by Paul Shepard, Catherine Badgley, Wes Jackson, and Frieda Knobloch, Scott Russell Sanders on Landscape and Imagination, Amy Seidl addresses exotics, Steve Trombulak on the Language of Despoilment, George Wuerthner & Andy Kerr on livestock grazing, **Rewilding** paper by Michael Soulé & Reed Noss, Gary Nabhan critiques the Terminals of Seduction, Noss asks whether conservation biology needs natural history, Y2Y part 2, profile of Dan Luten

32/Winter 1998/99 • ***A Wilderness Revival*** perspectives from Bill Meadows on the American Heart, Juri Peepre on Canada, Jamie Sayen on the Northern Appalachians, and John Elder on the edge of wilderness, Louisa Willcox on grizzlies, politics from Carl Pope, Ken Rait's Heritage Forests, Jim Jontz's Big Wilderness Legislative Strategy, Debbie Sease & Melanie Griffin's stormy political forecast, Mike Matz's Domino Theory, Wilderness campaign updates from Oregon, California, Nevada, Grand Canyon, New Mexico, Colorado, and Utah, NREPA, focal species paper by Brian Miller et al.

33/Spring 1999 • ***Coming Home to the Wild*** Flo Shepard, Paul Rezendes, Glendon Brunk, and Kelpie Wilson imagine rewilding ourselves, Paul Martin and David Burney suggest we Bring Back the Elephants! and Connie Barlow discusses Rewilding for Evolution, Freeman House on restoring salmon, John Davis on Anchoring the Millennial Ark, Chris Genovali exposes risks to Canada's Great Bear Rainforest, Madsen and Peepre on saving Yukon's rivers, Bryan Bird on roads and snags, George Wuerthner on population growth, Brock Evans uses wild language, and John Terborgh and Michael Soulé's "Why We Need Megareserves: Large-scale Networks and How to Design Them"

34/ Summer 1999 • ***Carnivore Ecology and Recovery*** "The Role of Top Carnivores in Regulating Terrestrial Ecosystems" by Terborgh et al., Todd Wilkinson on the Yellowstone Grizzlies Delisting Dilemma, Wolves for Oregon, Carnivores Rewilding Texas, fire ecologist Tim Ingalsbee suggests we Learn from the Burn, David Orr continues the Not-So-Great Wilderness Debate, Tom Fleischner on Revitalizing Natural History, Northup remembers Wildlands Philanthropist Joseph Battell, the Continuing Story of the American Chestnut

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American conservation is, I fear, still concerned for the most part with show pieces. We have not yet learned to think in terms of small cogs and wheels. Look at our own backyard: at the prairies of Iowa and southern Wisconsin. What is the most valuable part of the prairie? The fat black soil, the chernozem. Who built the chernozem? The black prairie was built by the prairie plants, a hundred distinctive species of grasses, herbs and shrubs; by the prairie fungi, insects, and bacteria; by the prairie mammals and birds, all interlocked in one humming community of co-operations and competitions, one biota.

—Aldo Leopold*

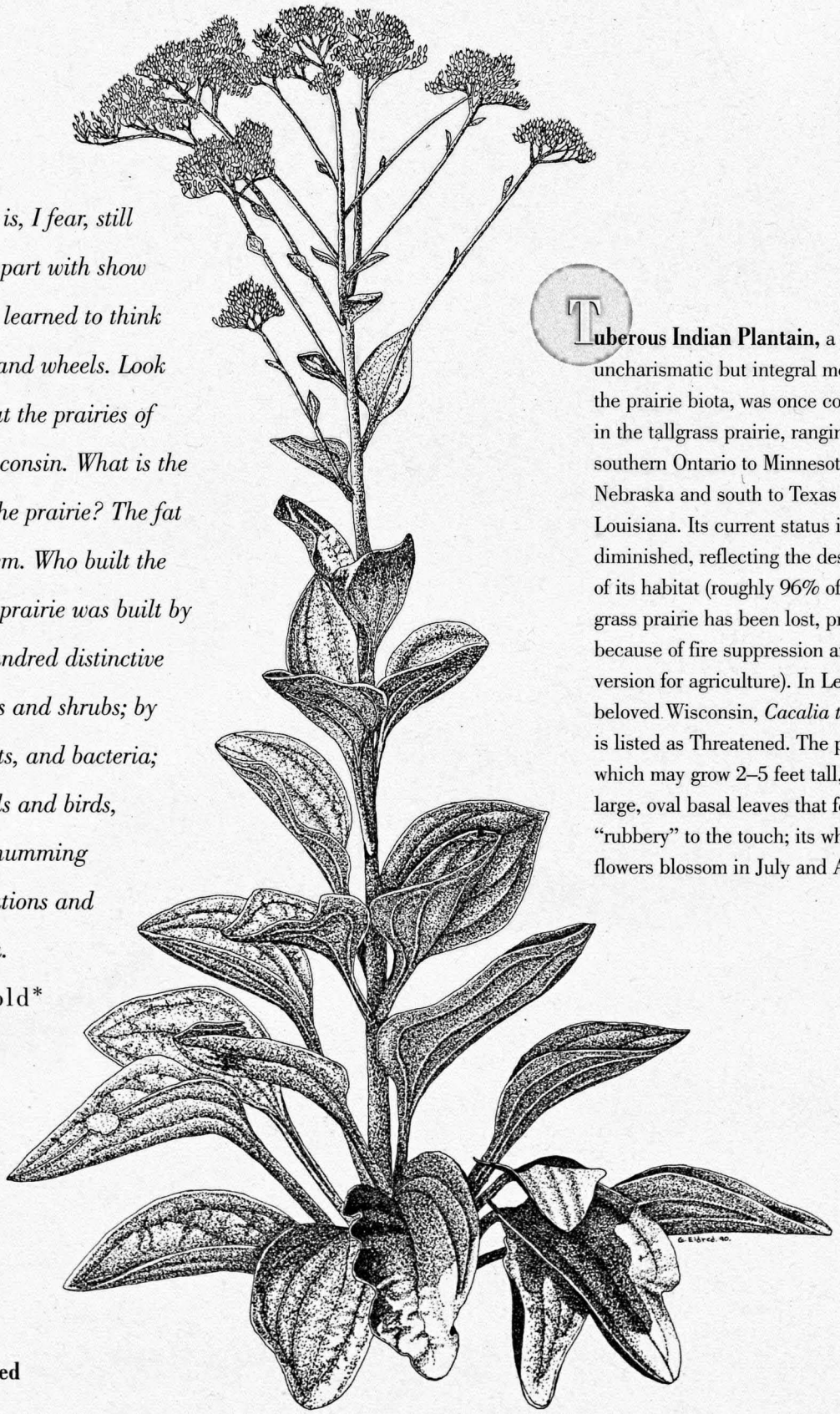
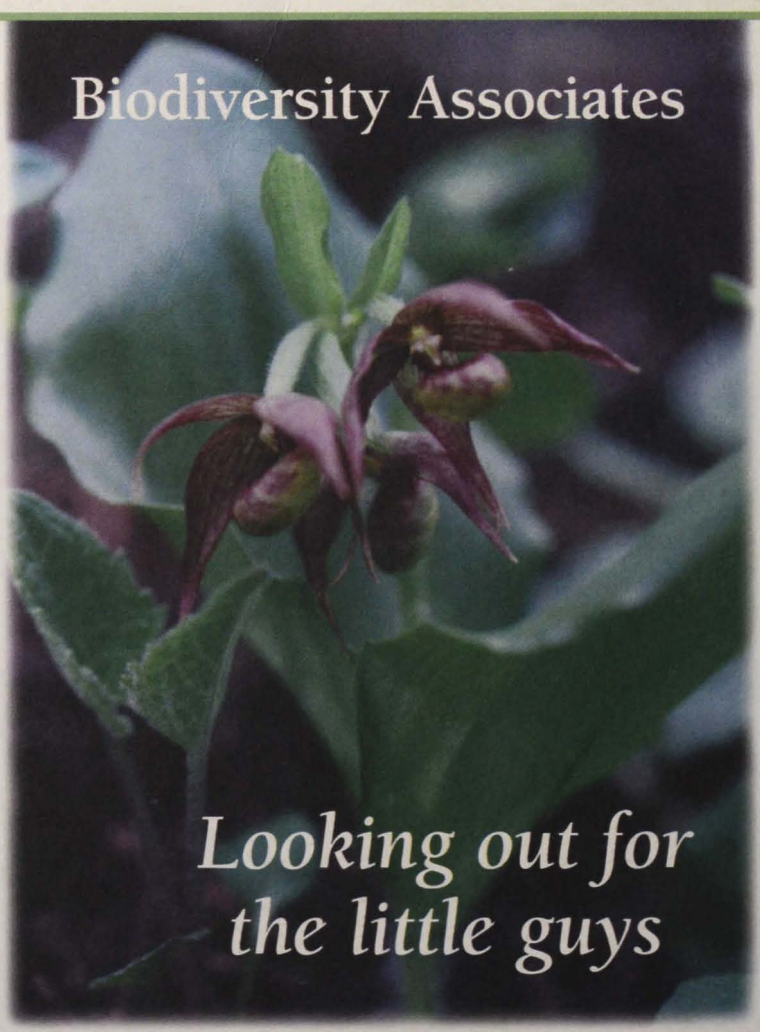


illustration by Gary Eldred

Tuberous Indian Plantain, a perhaps uncharismatic but integral member of the prairie biota, was once common in the tallgrass prairie, ranging from southern Ontario to Minnesota and Nebraska and south to Texas and Louisiana. Its current status is sadly diminished, reflecting the destruction of its habitat (roughly 96% of the tallgrass prairie has been lost, primarily because of fire suppression and conversion for agriculture). In Leopold's beloved Wisconsin, *Cacalia tuberosa* is listed as Threatened. The plant, which may grow 2–5 feet tall, has large, oval basal leaves that feel "rubbery" to the touch; its whitish flowers blossom in July and August. ☾

Gary Eldred, a longtime Wild Earth *contributing artist, is the president of Southwest Wisconsin Prairie Enthusiasts (4192 Sleepy Hollow Rd., Boscobel, WI 53805).*



Because of their public appeal, a few charismatic species such as the grizzly bear and gray wolf receive considerable conservation action. Efforts to protect these species are essential, but hundreds of lesser-known imperiled species also deserve vigorous conservation advocacy.

Few people have heard of—much less sought protection for—the small rock cress plant *(Arabis pusilla)* or Berry's mountainsnail *(Oreohelix strigosa berryi)*. And who looks out for Wyoming's disappearing native fish such as the bluehead sucker (*Catostomus discobolus*)?

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photo of clustered lady's-slipper (*Cypripedium fasciculatum*) by Shelly Ellis

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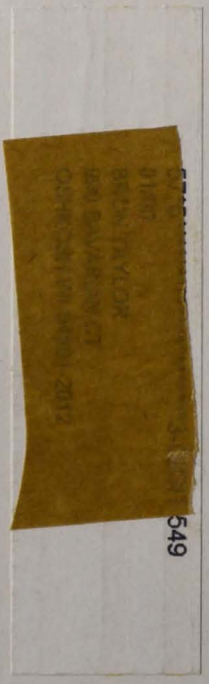

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