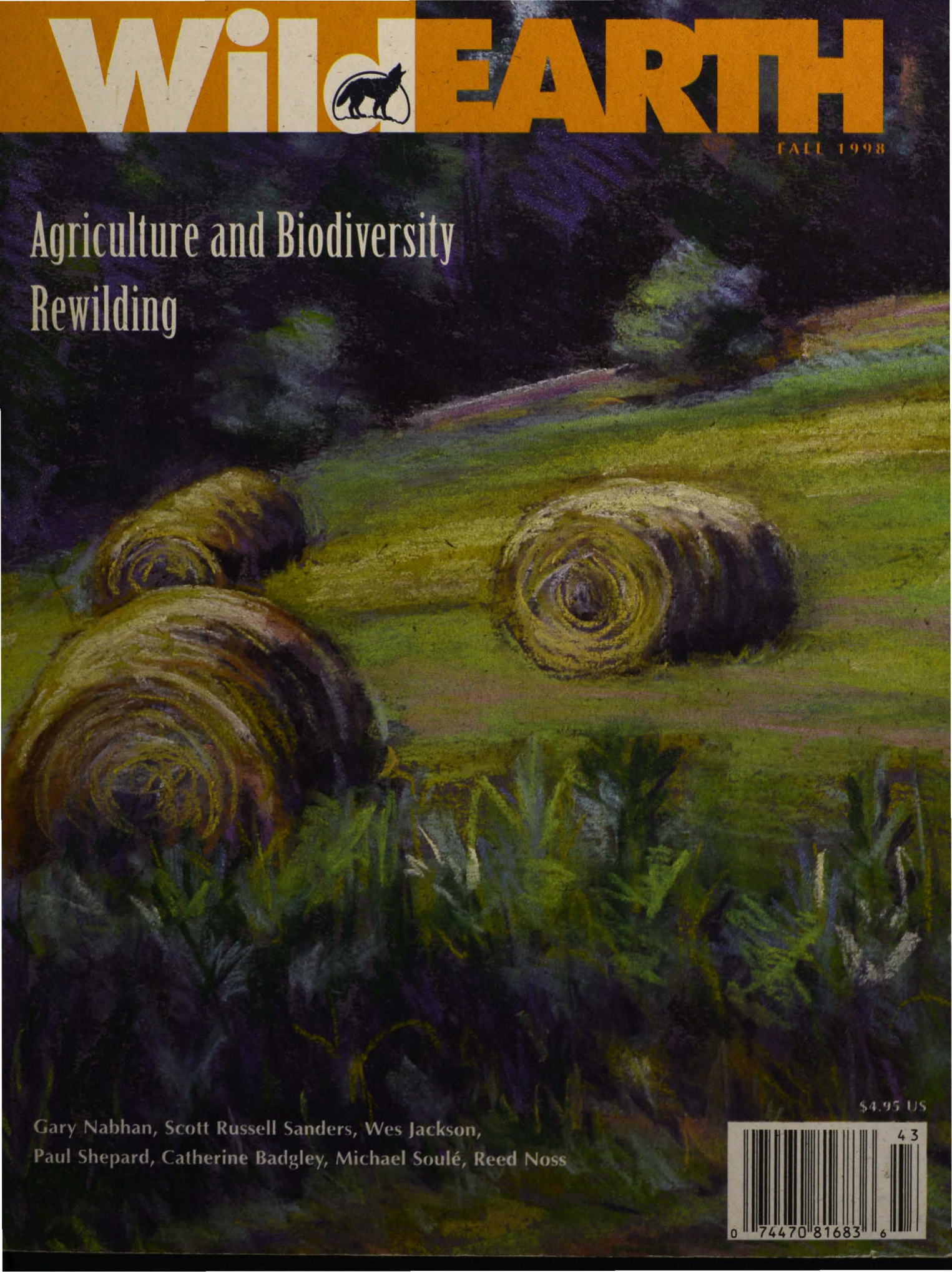
# Wild EARTH

FALL 1998



## Agriculture and Biodiversity
## Rewilding

Gary Nabhan, Scott Russell Sanders, Wes Jackson,
Paul Shepard, Catherine Badgley, Michael Soulé, Reed Noss

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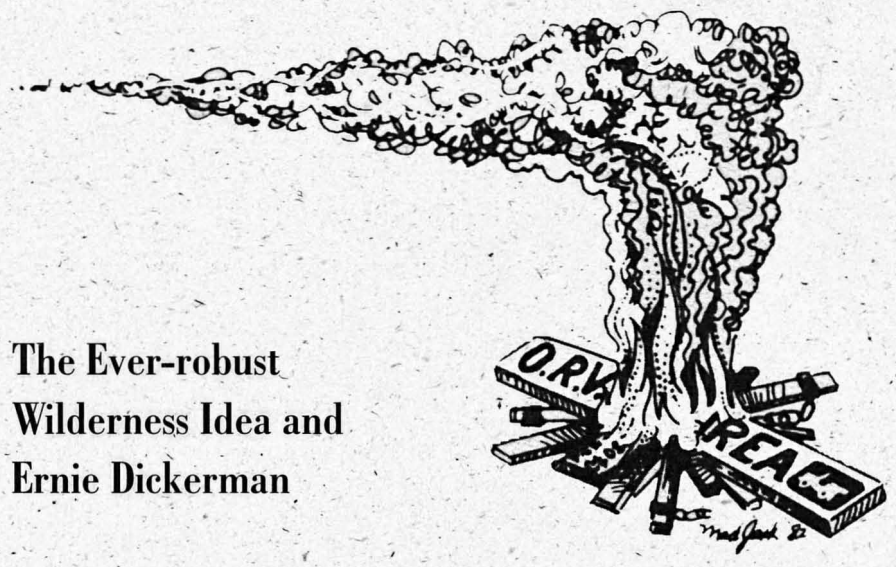
# Around the Campfire

*by Dave Foreman*




## The Ever-robust Wilderness Idea and Ernie Dickerman

When it comes to postmodern deconstructionist critics of the wilderness idea and of Wilderness Areas, J. Baird Callicott stands head and shoulders above his academic colleagues. In scholarship, sincerity, and openness he rises well above William Cronon, for example. Cronon's anthology, *Uncommon Ground: Rethinking the Human Place in Nature,* came out of a trendy academic conference in the artificiality of Irvine, California (whether intended or not, holding that symposium near Disneyland was appropriate). *The Great New Wilderness Debate,* edited by Callicott and Michael Nelson, is a more useful work which pulls together all sides of the discussion and includes papers by Reed Noss, David Johns, and me.

But my friend Baird still doesn't get it.

I got a BA in history from the University of New Mexico in 1968, but I've never been to grad school. This makes me—if I may be so bold—a lay scholar, never having gone through the formal, priestly rituals of becoming an academic. Looking in from the outside, it seems to me that one of the illnesses rife in academia is the casting out of old theories to thoroughly replace them with new theories. (I'm reminded of the story in the New Testament of Jesus casting devils out of a crazy person and sending them into a nearby herd of pigs.) Today's "New West" historians toss Frederick Jackson Turner's frontier thesis of American history to the pigs and chuckle smugly whenever a lay boob like me refers to him (maybe I'm seen as one of the possessed pigs).

There is a wide chasm between constant revolution by throwing out the old to replace it with the new, and an evolutionary process of adding new ideas to old ideas. Instead of saying, "Yes, Turner explains part of the picture; here's another way of looking at history that also explains part of the picture," social scientists say, "Turner is wrong and out-of-date. The new, *correct* view is this." Callicott and Nelson's introduction to their anthology is a sterling case of this search for constant revolution—in this case that the wilderness idea is wrong, has failed, and must be utterly replaced with something new.

Two essays of mine are included: 1) "Wilderness Areas for Real," a combination of my chapter "Where Man Is a Visitor" in David Burks's anthology *Place of the Wild* and "Wilderness Areas Are Vital," my defense of Wilderness Areas against Callicott's

**continued on page 2**

### *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 non-profit 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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**The Wildlands Project** 1955 W. Grant Rd., Suite 148A, Tucson, AZ 85745; 520-884-0875; wildland@earthlink.net; www.twp.org

WILD EARTH

VOLUME 8, NUMBER 3 • FALL 1998



*cover art (detail) by Gertrude Ten Broeck, Middlebury, Vermont*

WILD EARTH (ISSN 1055-1166) is published quarterly by the Cenozoic Society, Inc., POB 455, Richmond, VT 05477. The Cenozoic Society is a non-profit 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. The basic rate for individual membership subscriptions is $25; low income membership is $15. Subscriptions to Canada and Mexico are $30 per year, overseas subscriptions are $45 (air mail). ■ Periodicals postage paid at Richmond, VT. ■ POSTMASTER: Send address changes to *Wild Earth*, POB 455, Richmond, VT 05477. ■ All editorial and membership correspondence should be sent to Wild Earth, POB 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 a limited amount of 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, POB 1808, Ann Arbor, MI 48106. ■ Articles appearing in *Wild Earth* are indexed in ENVIRONMENT ABSTRACTS, ENVIRONMENTAL PERIODICALS BIBLIOGRAPHY and THE ALTERNATIVE PRESS INDEX. *Wild Earth* is printed on 100% PCW paper (cover and insert) and unbleached 50–100% PCW paper (inside).

## *Around the Campfire,* continued from inside front cover

criticism (*Wild Earth* Winter 94/95); and 2) "Wilderness: From Scenery to Nature," also from *Wild Earth* (Winter 95/96). But listen to how Callicott and Nelson describe these two essays in their "Introduction":

> *We (the editors) believe that the received wilderness idea has been mortally wounded by the withering critique to which it has been lately subjected. Even its most indignant and impassioned apologist, Dave Foreman, seems now to have capitulated, as a side-by-side comparison of his two contributions to this anthology will bear witness. The first, "Wilderness Areas for Real"...categorically defends the received wilderness idea and the classic nineteenth- and twentieth-century wilderness preservation movement associated with it. The second, "Wilderness: From Scenery to Nature"...concedes that the historic wilderness preservation movement, though well intentioned, was, from the point of view of biological conservation, misguided.*[1]

Pardon me? Capitulated?

In a pig's eye.[2]

Michael Soulé and Reed Noss, in their landmark paper "Rewilding and Biodiversity: Complementary Goals for Continental Conservation" in this issue of *Wild Earth*, identify three currents in the stream of American Nature protection:

**1)** The traditional wilderness movement with emphasis on beauty, inspiration, and recreatsity conservation with emphasis on ecosystem representation and protection of biological hot spots; and
**2)** Biodiversity conservation with emphasis on ecosystem representation and protection of biological hot spots; and
**3)** Island biogeography with emphasis on connectivity in the landscape.

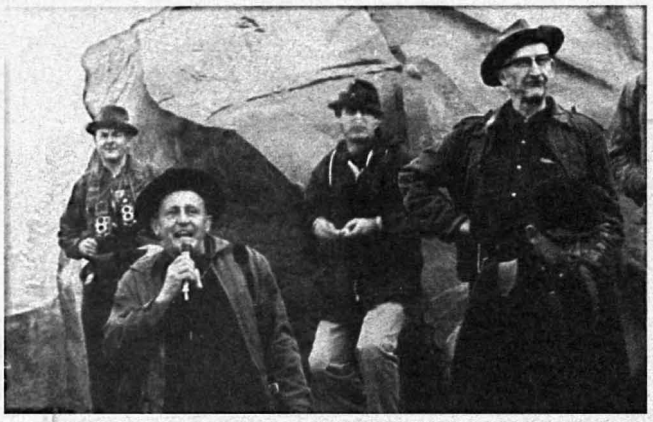
They see rewilding as a fourth current with emphasis on the "three Cs": Cores (Wilderness); Connectivity; and Carnivores. All four currents are blending, I think, into today's wilderness idea.

Here is where I disagree with Callicott and Nelson's interpretation of my two essays. In no way do I see ecological values elbowing aside aesthetic, spiritual, and recreational values in the wilderness movement. The rise of conservation biology has helped us understand ecological integrity much better, but ecological values have always been part of the wilderness movement. In our new understanding, The Wildlands Project and the biocentric wing of the conservation movement are emphasizing ecological values, yes; but we are not replacing aesthetic, spiritual, and recreational values with ecological ones. All these values fit together; they are not mutually exclusive, but mutually supportive.

Mortally wounded? Withering critique?

Hardly.

1. Callicott, J. Baird and Nelson, Michael P. "Introduction" in Callicott and Nelson, eds. *The Great New Wilderness Debate* (University of Georgia Press, Athens, 1998) p. 12-13.
2. I had a second essay in the issue of *Wild Earth* that included my "Wilderness: From Scenery to Nature" essay: "Wilderness Areas and National Parks," in which I argued that traditional protected areas had indeed protected much biodiversity in the United States and were the foundation on which The Wildlands Project would design Nature reserve networks. The two need to be read together to get my full view. In fact, I am revising and combining them for an article this winter in the *Denver University Law Review*'s issue on Wilderness Areas.



*Ernie (holding microphone) with Harvey Broome and others at the start of a "Save-Our-Smokies Wilderness Hike" in October 1966 at the Clingman's Dome parking area.*

*On July 31, 1998, Ernest M. "Ernie" Dickerman, a lifelong bachelor, died at age 87 by his own hand as he had long planned, on the little old farm in the Alleghany Mountains where he had lived since retiring in 1976. "Quit while you are ahead" is sound philosophy, both in poker and in life. For over sixty years, as an amateur or as a professional, he was an active conservationist, especially in wilderness preservation.*

**—from his "suggested announcement of my death" prepared by Ernie Dickerman**

Though our ecological understanding of how Wilderness Areas can protect Nature grows, the genius of the wilderness movement remains undiminished. In fact, the wilderness designation movement is undergoing a revival (as the next issue of *Wild Earth* will ably show). Conservation biology has only added to the moral imperative for protecting Wilderness Areas.

Let me add here that, as brilliant and visionary as Soulé, Noss, and I may be, we are not coming up with something new under the sun. Listen:

> *...each biotic province needs its own wilderness....*
>
> *Even the National Parks, which run up to a million acres each in size, have not been large enough to retain their natural predators....*
>
> *Recreation is not their [Wilderness Areas] only, or even their principal, utility.*
>
> *The parks are certainly too small for such a far-ranging species as the wolf. Many animal species, for reasons unknown, do not seem to thrive as detached islands of population.*
>
> *Only those able to see the pageant of evolution can be expected to value its theater, the wilderness, or its outstanding achievement, the grizzly.*[3]

These words are fifty years old, they are part of the canon of the "revealed wilderness idea," and they are exactly what The Wildlands Project is about today: Ecosystem representation. Cores. Corridors. Carnivores.

Aldo Leopold wrote them.

As a noted Leopold scholar, Callicott should know that his obituary of wilderness is premature.[4]

ONE WHO UNDERSTOOD WELL THAT THE MODERN ECOLOGical arguments for Nature protection did nothing to undermine the wilderness idea, but rather strengthened it, was Ernie Dickerman. He was deeply loved for his passion for wilderness and for his unflagging encouragement of his fellow wilderness defenders. Before he left us, *Wild Earth* profiled him (last issue), and he was, according to Jack Humphrey, the uncontested star at this May's wilderness mentoring retreat, where he inspired a whole new generation of wilderness advocates. Though I am saddened by his leave-taking, he picked a good time—his own time.

Ernie was a dear friend and mentor of mine since 1973, when he took me—then a young Wilderness Society staffer new to the big city—around Capitol Hill and taught me how to work Congress. He was more than a master congressional lobbyist and inspiration to younger conservationists, though. As "father" of the 1975 Eastern Wilderness Act, Ernie forced the Forest Service to accept Wilderness Areas east of the Rockies and thereby added to the character of the National Wilderness Preservation System. Note that I said, "added to," not "changed," not "replaced."

Indeed, I believe that Ernie Dickerman is one of the half-dozen or so giants who molded the character of our Wilderness Areas system—and of the "revealed" wilderness idea, so sneered at by the postmodern deconstructionists. In 1973, the Senate Subcommittee on Public Lands held hearings on The Wilderness Society's proposed Eastern Wilderness Act. The Forest Service argued up and down, frontwards and backwards, that no areas in the National Forest System east of the Rockies qualified for Wilderness Area designation because they were not "pure" or pristine enough.

3. Leopold, Aldo "Wilderness," *A Sand County Almanac* (Oxford University Press, New York, 1949), p. 196-199.
4. Two chapters in my book-in-progress, *The War on Nature*, will respond to the whole range of postmodern deconstructionist/noble savage critics of wilderness.

Ernie Dickerman responded in his testimony:

*It is part of the genius of the Wilderness Act that it embodies two quite separate sets of standards. First there are the standards for suitability of an area to be designated as wilderness. These may be referred to as the entry criteria for an area to come into the wilderness system. These standards are found solely in section 2(c) of the act, the definition of "wilderness."*

*Second, there are the standards for the management of wilderness areas once designated. This is a wholly separate set of standards, and is found in section 4(c) of the act, as supplemented by section 4(a) and (b), and in special cases, by section 4(d).*

*A great deal of confusion results from failure to carefully distinguish these two sets of criteria. The point is simply this: Under the practical, less-than-pure standards for designation of wilderness, certain evidence of past disturbance and existing nonconforming uses may be included within a new wilderness area. But once that area is designated and comes under the Wilderness Act, it is to be managed under the standards of Section 4(c), which proscribe new adverse uses or disturbances within wilderness areas....*

*What it boils down to is this: Certain past disturbances may be accepted under the entry criteria of the act, but similar disturbing actions may not be newly initiated within a designated wilderness under the management criteria.*[5]

As Ernie eloquently demonstrated, the Wilderness Act has absolutely no requirement that candidate Wilderness Areas be completely free of roads or timber cutting; but, under the management directions in Section 4, after an area is in the Wilderness System, roads and timber cutting are then prohibited.

Ernie added the less-than-pure recovering wildlands of the eastern National Forests to the Wilderness System. He did not replace previous standards of wilderness, he built on them and refined them—and, in doing so, strengthened our protection of Nature. Thanks to Ernie and to all the citizens who have since labored to protect wilderness in the East, the National Wilderness Preservation System is more diverse, more ecologically representative, and more glorious.

This is the legacy and genius of Ernie Dickerman; this is the true story of the wilderness movement and of the wilderness idea, whether the postmodern deconstructionists understand it or not.

Happy Trails.

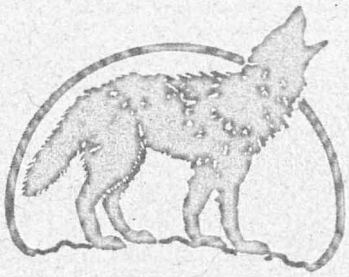
**— DAVE FOREMAN**
*Wolf Hollow Canyon, proposed addition to the Gila Wilderness Area*

5. Dickerman, Ernest *Hearing Before the Subcommittee on Public Lands of the Committee on Interior and Insular Affairs United States Senate on S. 316, February 21, 1973* (US Government Printing Office, Washington, 1973), p. 49-50.



Bristol Cliffs Wilderness Area, Vermont by Suzanne DeJohn

# Wild Earth Update



Vermont's oft-celebrated leaves have already begun to slowly turn color. As early fall breezes blow through our windows, thoughts of some office-bound folk turn to...end-of-year fundraising appeals. Given that subscriptions pay only 25% of *Wild Earth*'s annual expenses, we hope that the added enticement of *Wild Earth* calendars and free gift subscriptions will encourage even more of you to respond. Readers are also encouraged to respond to the survey included with this year's fundraising letter; your feedback is essential to our success. One of the survey questions of particular interest is how subscribers feel about receiving *occasional* mailings from other conservation organizations with news of national or regional significance. Our policy of never selling our mailing list or allowing it to be used for commercial purposes, however, remains firm.

Thanks to subscriber and recent high school graduate Bill Wetzel for his fundraising bike tour for *Wild Earth*'s Buy Back the Dacks (BBtD) fund. Bill's pedaling adventure from New Jersey through New York and New England is raising money for and awareness of BBtD in true grassroots style. Bill has temporarily deferred his admission to Cornell in pursuit of other forms of education—the Adirondack trip was a great first start, Bill!

Our spring issue mentioned a fundraiser to benefit The Wildlands Project that brought *Mission: Wolf* to Falmouth, Massachusetts; we would like to thank Diane Boretos of Call of the Wild, Inc. for sponsoring this event. Call 508-548-0521 for further information about her nature store and natural history tours.

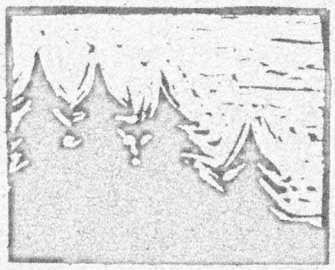
Finally, we issue a few goodbyes and welcomes to staff. Thanks to Sharon McGreevy of Blue House Graphics for designing the last four issues; her hard work and obvious design skills have been much appreciated this past year. We extend warm greetings to our new in-house designer, Kevin Cross. Business Manager Andrea Beenhouwer and part-time employee Jordan Silverman have left *Wild Earth* in pursuit of other pleasures; we welcome the promotion of Lina Miller as Andrea's replacement. We wish you well, Sharon, Andrea, and Jordan, and welcome, Kevin!

—MONIQUE MILLER


*Volume 1, No. 1, published in Spring 1991.*

## A Bevy of Back Issues

In the interest of circulating a surplus of back issues of *Wild Earth*, **we are offering one back issue free for every five names of potential subscribers you send us.** Available issues include Vol. 1, No. 1 through and including Vol. 4, No. 4 (except sold out issue Vol. 1, No. 3). Please review pages 107–108 of this issue for a description of the contents of each available journal, then drop us a note with your name and address specifying which issues you would like us to send to you. The people you recommend to us will receive a brochure and a letter offering them a free sample issue of *Wild Earth* (if you would prefer that we not mention your name, please let us know). We promise that the names you send us will be contacted only once. We hope to hear from you!



# A Wilderness View

## Thrashing About

*For there is not a just man upon Earth, that doeth good, and sinneth not.*

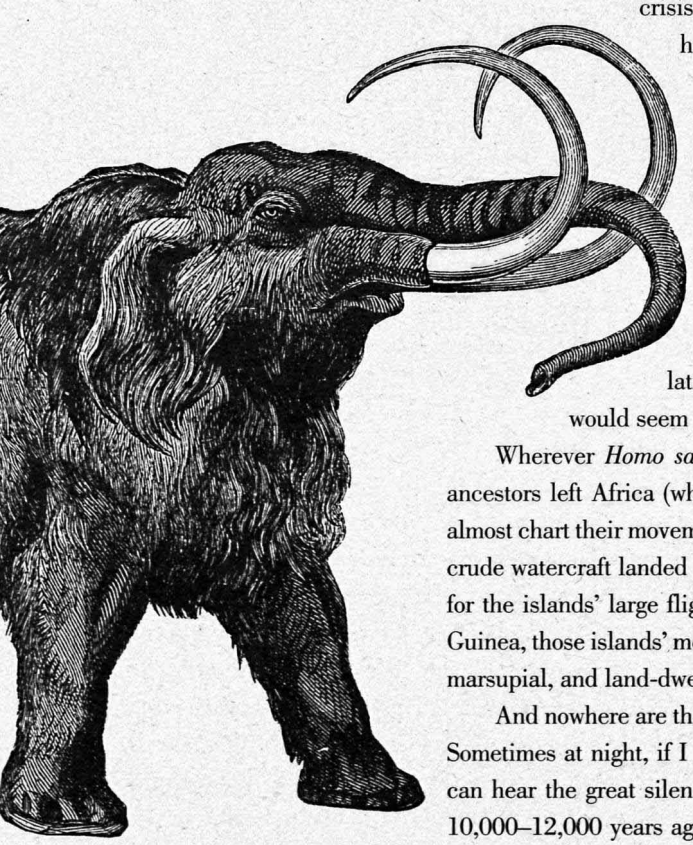
**—Ecclesiastes 7:20**

*Now I am become death, the destroyer of worlds.*

**—J. Robert Oppenheimer, quoting the Bhagavad-Gita after witnessing the first atomic bomb test**

Are humans fallen creatures? Is there something in our spiritual or biological composition that made our exile from Nature—our departure from the Garden of Eden—inevitable? What precipitated the break? Minds more astute than mine have long wrestled with this subject; Cartesian dualism, the Greek language problem, abandonment of hunting and gathering in favor of horticulture, irrigation technologies, and evolution of abstract reasoning have all been proposed as landmarks in our fall from grace.

Some have suggested that our estrangement from Nature, manifest in the present ecological crisis, may have biological underpinnings. Across humans' long evolutionary history certain traits, such as curiosity and fascination with novelty, would have been selected for because an ability to exploit new information (a new hunting technique or tool, or insight about animal behavior) would have conveyed immediate advantage. Thus, the compulsion to build a better mousetrap may well be encoded in the human genome. Genetically based propensities for biophilia and altruism, while perhaps present, would be weakly expressed, and overwashed by a more dominant trait—the desire to control.



Club…spear…atlatl…bow…rifle…nuclear missile. The appellation *Homo sapiens* (from the Latin *sapere* = "wise" or "thinking" man) would seem a misnomer. *Homo innovatus:* Man the Innovator might be more apt.

Wherever *Homo sapiens* has spread, biological impoverishment has followed. After our ancestors left Africa (where large animals co-evolved with bipedal hominid hunters), one can almost chart their movement by the sudden extinctions we see in the fossil record. When the first crude watercraft landed on Polynesian islands and people disembarked, a death knell sounded for the islands' large flightless endemic birds. Soon after humans reached Australia and New Guinea, those islands' megafauna—including giant kangaroos, a 2000-pound lizard, a cow-sized marsupial, and land-dwelling crocodiles—disappeared forever.

And nowhere are the great gashes in the tapestry of life more garish than in North America. Sometimes at night, if I step into the dark woods behind my house and listen very carefully, I can hear the great silence, the reverberation of a wave of extinction that swept over the land 10,000–12,000 years ago, soon after Paleo-Indian hunters arrived from Eurasia. It's a chilling sound—a fearsome silent echo mixing the cry of sabre-tooth tigers, the roar of short-faced bears, the rumbling hooves of native North American horses and camels, the bugling of mammoths and

mastodons. That human hunters—armed only with fire, stone tools, and the pathogens they carried in their bodies and in those of their domestic dogs—could have accomplished so much death in so short a time makes it difficult for me to dismiss entirely the notion of original sin.

What does the foregoing have to do with this issue's theme coverage on agriculture and biodiversity? My point is this: the 10,000-year-old problem of agriculture is formidable, and we must address it as creatively and quickly as possible. It is critical, of course, that we develop alternatives to mechanized, fossil fuel-dependent agribusiness to stanch the bleeding away of species and genetic diversity, soils, aquifers, and streams.

But as we conservationists work to counter today's ecological abuses, we should also be willing to take the long view, and not delude ourselves that solutions will be easily found. The larger dilemmas that wildlands defenders wrestle with daily—how to protect wilderness and biodiversity, how to use land while not diminishing land health—have very deep roots. We would do well to occasionally remind ourselves that the current anthropogenic extinction crisis did not begin with the invention of biotechnology, internal combustion engines, corporate capitalism, nation states, or the moldboard plow—although these social and technological innovations have greatly increased the efficiency with which human societies transform and degrade the natural world. The task we face in mending our broken relations with Nature, to become, as Aldo Leopold said, but "a plain member and citizen" of the biotic community is so profoundly challenging because the roots of the estrangement are so ancient. They may be as old as human nature itself.

AFTER DELIVERING THE KEYNOTE ADDRESS AT A CONference in Kentucky some years ago, farmer and writer Wendell Berry was asked how a landowner sympathetic to the needs of Nature might further her conservation agenda in the face of neighbors hostile to such an aim. Wendell responded to the questioner that he had no definitive answer, but that perhaps the best one could do was to simply *get in there and thrash about.*

It seems to me that Wendell's advice was eminently sound, and I think of it often as we put together this periodical. Certainly no good work—physical or intellectual—will be accomplished by persons afraid to jump into the fray. And so in this issue of *Wild Earth* we wander into the maze (or should it be maize) of problems associated with agriculture.

Scott Russell Sanders, surely as fine an essayist as any today writing, begins our theme coverage by noting the pleasures of an unspectacular landscape and anticipating the ecological recovery of his Indiana homeground. Historian Frieda Knobloch reminds us that agriculture is as much about ideas as it is about specific cultivation practices or ecological relationships. The late great Paul Shepard, in a pre-publication excerpt from his final book, *Coming Home to the Pleistocene,* tackles the entire agrarian worldview. Leading eco-agriculture proponents Wes Jackson, Catherine Badgley, and Mark Ritchie discuss reforms necessary to build a more ecologically sound agriculture. Entomologist Amy Seidl cautions that biological control techniques—often touted by sustainable farming advocates as a benign alternative to chemical pesticides—may also present grave ecological threats. The economic and ecological costs associated with invasive exotic plants are briefly described by Ana Ruesink. Andrew Kroll and Dwight Barry lead us into Wichita Mountains National Wildlife Refuge, a public natural area in the heart of farm country. Andy Kerr and George Wuerthner debate the merits of public lands grazing reform. Steve Trombulak speculates on the language of despoilment and offers suggestions for resisting metaphorical language that hurts the cause of biodiversity conservation, and for employing such language that furthers it.

Outside the theme section, Gary Nabhan and Reed Noss bemoan the loss of natural history training for ecologists, Chris Bolgiano looks back at pioneering forest ecologist E. Lucy Braun, David Johns continues his Y2Y political strategy series, Jerry DeMarco suggests anti-mining activists stake a claim for conservation, Harold Glasser profiles the venerable conservationist Dan Luten, and we reprint a paper [Engines in the Wilderness] Luten first published decades ago that remains instructive for conservationists today.

ULTIMATELY, ANY SOLUTION TO THE PROBLEM OF AGRIculture that fully addresses ecosystem health will entail a conscious stepping back—a reduction in both the intensity and amount of manipulated acreage. Natural communities would be allowed to recover: *to rewild.* In this issue we are also pleased to publish "Rewilding and Biodiversity: Complementary Goals for Continental Conservation" by eminent biologists Michael Soulé and Reed Noss. We anticipate that this paper will reach a large audience and will provoke much spirited discussion within the conservation community. Toward that end, we will make article reprints available; contact The Wildlands Project for copies.

**—TOM BUTLER**

# Terminals of *Seduction*

*by Gary Nabhan*

THE NATIONAL PARK SERVICE RESOURCE MANAGEMENT COORDINATOR SAT IN FRONT OF *his computer terminal and never looked up from the screen to make eye-contact with us when Humberto and I went to visit him.*

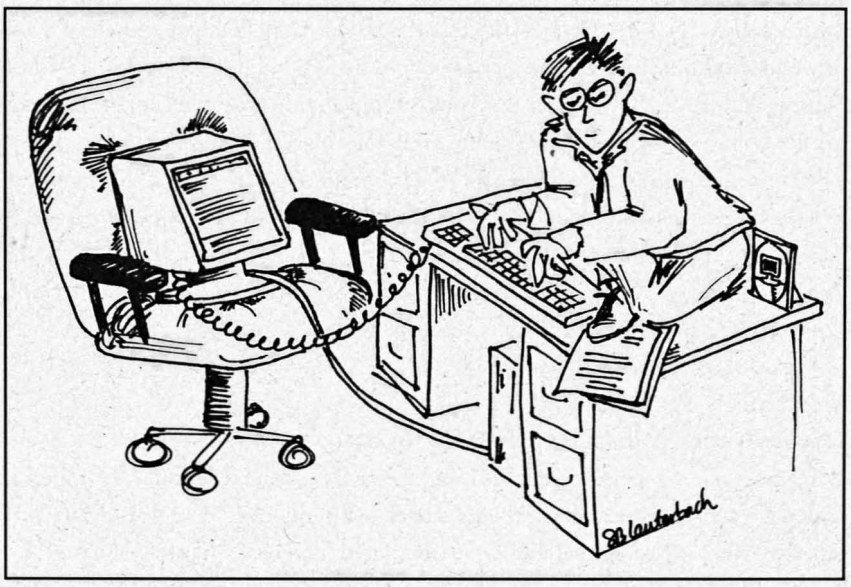
*"Ironwood? Let me see if we have a distribution map for it here in the park.... We're still a ways away from having full coverage—let me see what comes up. Oh, it's a little slow; there, let's see...well, we only have five percent coverage for tree species in the park. Where did you say you have a concern about ironwood?"*

*"Right along the border. About half the trees within a half kilometer of the border have already been cut down—within the park."*

*"Oh, well, we haven't sampled over that way yet. We'll be working on extending distribution maps over to the park boundary within three years."*

*"What do you sample* for*?"*

*"Presence or absence. Percent cover. You know."*



*"Do you map or monitor what's happening just outside the park?"*

*"Well, no, we're restricted to...we have to stay inside our boundaries."*

*"But what if the threats emanate from just over the other side of your fence?" I asked.*

*"Well, we don't note where they come from. Actually, our database on threats to plants is species-specific."*

*"But woodcutting is affecting not just ironwood, but all the rare species that require its protective canopy. Like night-blooming cactus," Humberto noted. "The woodcutting affects its microclimate, even though the woodcutters don't chainsaw the cactus itself."*

*Eyes still glued to the screen, the coordinator punched a few buttons. "Well, wait a minute...let's see what the database says are the threats to night-blooming cactus....Hmmm...it says cactus-poaching and erosion. No, the experts didn't mention woodcutting...."*

*"What experts?"*

*"The consulting firm that did the literature review...."*

*"Have you been* down there*?" Humberto moaned. "Have you seen the trees cut down and the sun-burnt cacti drying up because of this sudden exposure?"*

*"Look, it's taken most of my time just to manage the consultants who are getting the GIS program up and running. I haven't had a chance to get down to the border for months."*

illustrations by Sarah Lauterbach

**We have become increasingly remote from the very lives we presume to care about.**

Most of the federal agencies with which I'm familiar pride themselves on how many resource management and conservation biology positions they have added to their staffs. Unfortunately, few of these positions are dedicated predominantly to fieldwork. To the contrary, I would argue that a greater percentage of park and wildlife refuge staff time now goes to paperwork and computer gazing than to making natural history observations in the field. While Reed Noss, David Ehrenfeld, and others have already warned us that we are losing natural historians as a side effect of how biology is taught today, the situation is even worse in resource management fields such as forestry, fisheries, and range management. Few of the new professionals in these fields are learning trees, fish, or grasses; they are learning raster and vector analysis of aerial photos of vegetation, without much on-the-ground knowledge of the very habitats that they are mapping.

At best, field ecologists have been reduced to "ground-truth field surveyors" for technocrats safely ensconced in their remote sensing laboratories. A Mexican institution that received large grants for geographic information systems (GIS) analysis dissolved its field natural history program and demoted its field biologists to technician-level positions serving its land use planners. Any ecological dynamic that cannot be interpreted by satellite imagery is literally "left out of the picture."

Wes Jackson, the Fire and Brimstone Prophet of the Prairies, has complained that farmers on oversized tractors no longer have either their eyes or their feet on the land; thus, they hardly notice changes in the land's fertility and health from year to year. The same can now be said for resource managers in parks, forests, wildlife refuges, and biosphere reserves. Worse yet, many now maintain, without any hint of humility, that they have the area "covered." A computer screen full of coded patterns is sufficient to give such people a (false) sense that they truly know what is going on within their areas of concern.

It amazes me that natural scientists who keep a healthy skepticism about the influence of other technologies have been so fully seduced by GIS, GPS, and other remote sensing accoutrements. The most blatant consequence is the least discussed: we have become increasingly remote from the very lives we presume to care about. Surely, conservation done remotely will prove to be as unfulfilling as cyber-intimacy. Like fast food or quick sex, remote sensing may thrill us for the moment, but ultimately will make most of us feel empty or guilty. You may indeed be able to recite your coordinates as given on your gps unit by a set of satellites, but when you are lost, you are lost. You have no sensible means of moving from where you are to where you should be. ❙

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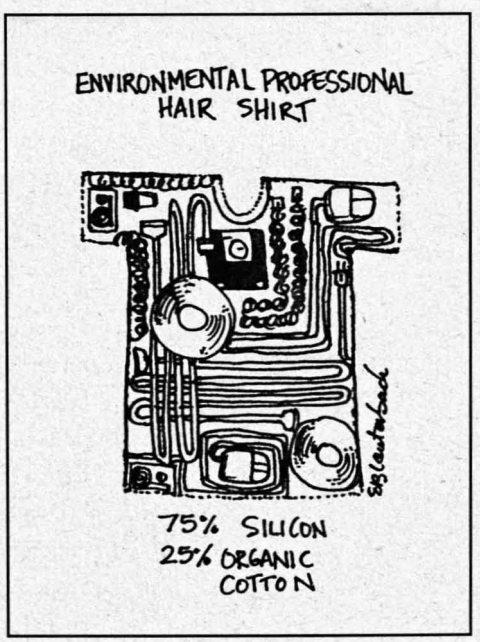
*Ethnobotanist Gary Nabhan (Arizona Sonora Desert Museum, 2021 N. Kinney, Tuscon, AZ 85743), a sporadic contributor to* Wild Earth, *is author of* Gathering the Desert, The Geography of Childhood, The Forgotten Pollinators, *and many other books. His latest work, co-authored with John Tuxill, is* Plants and Protected Areas *(Kluwer Publishing). This essay is dedicated to his buddy Stephanie Mills.*



# Does Conservation Biology Need Natural History?

*by Reed F. Noss*

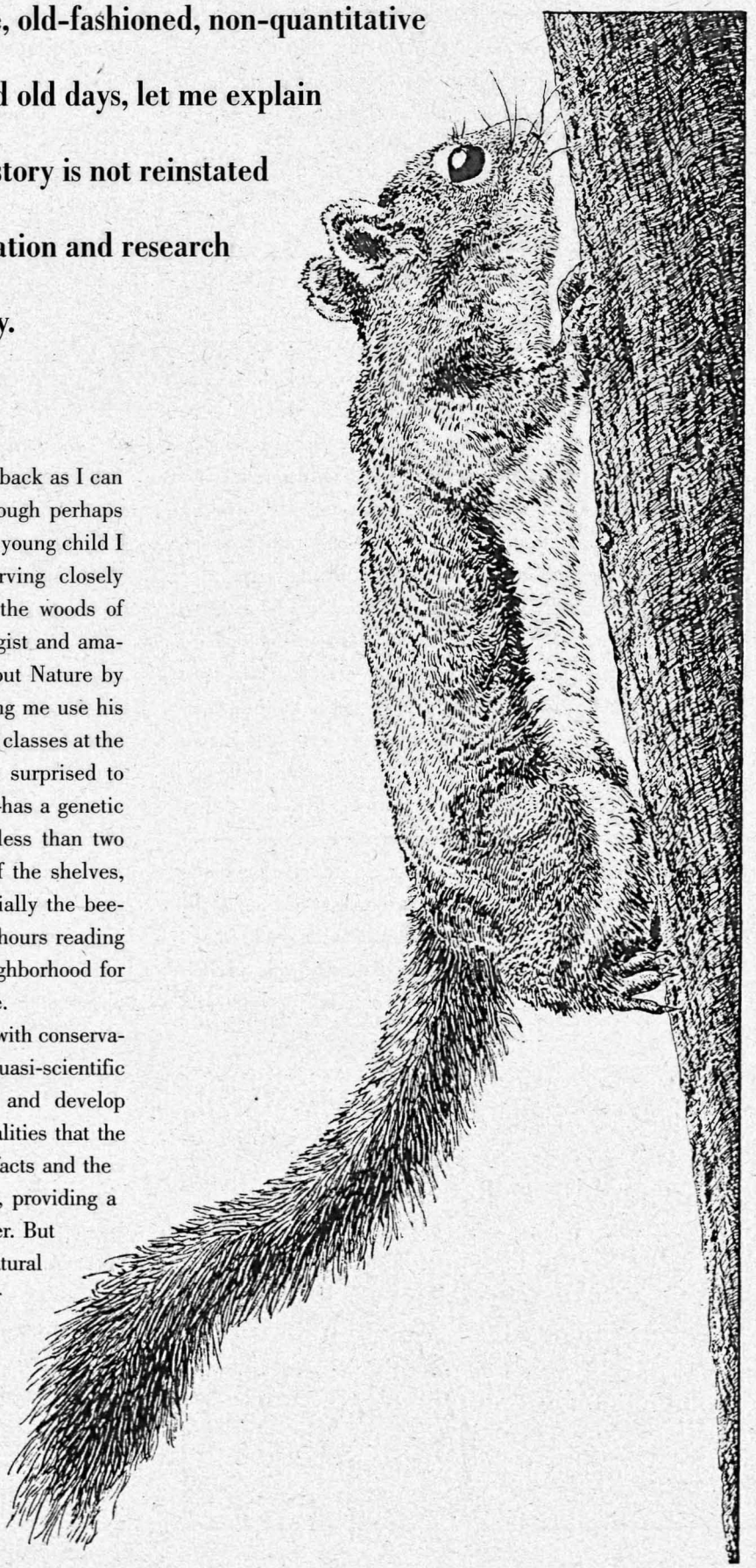
*[The naturalist] looks upon every species of animal and plant now living as the individual letters which go to make up one of the volumes of our earth's history; and, as a few lost letters may make a sentence unintelligible, so the extinction of the numerous forms of life which the progress of cultivation invariably entails will necessarily render obscure this invaluable record of the past. It is, therefore, an important object [to preserve them]. . . . If this is not done, future ages will certainly look back upon us as a people so immersed in the pursuit of wealth as to be blind to higher considerations.*

**—Alfred Russell Wallace (1863)**

Since well before the time of Aristotle, students of natural history have defined, organized, and interpreted the natural world for the rest of humanity. It can be argued that the selective pressure for being a competent naturalist was strong for primitive peoples, who depended on an intimate knowledge of the local plants and animals to determine what was safe to eat, what might eat or poison them, and which natural objects contained important pharmaceuticals, dyes, fibers, and other products. Later, naturalists in the Western world developed the background for virtually all of modern biology, geology, and the other natural sciences. The selective pressure in favor of natural history has declined markedly in recent decades, however, to the extent that naturalists today are disparaged as old-fashioned and are in danger of dying out. In this essay I argue that the consequences of this loss are troubling in many ways, but will be especially devastating to our attempts to maintain biological diversity in the decades and centuries to come.

I CALL MYSELF A CONSERVATION BIOLOGIST. I SUPPOSE THAT MEANS I'M A SCIENTIST. To counter the baseless "Wise Use" movement charges that conservation biology is a religion rather than a science, I argue that conservation biology is both theoretical and empirical: when practiced well it tests hypotheses and applies its theories and findings to the solution of real problems. These things are generally not true of religion. Conservation biology does, however, have a legitimate emotional and even spiritual component. Personally I have never been entirely comfortable with the self-image of scientist. I have not worn a white lab smock since I was an undergraduate, computers make me nervous, and math gives me a headache. These facts bespeak my personal history—before I was a conservation biologist or a vertebrate ecologist (my area of research in graduate school), I was a naturalist.

**Lest you think I'm just a miserable, old-fashioned, non-quantitative posey-sniffer yearning for the good old days, let me explain what we stand to lose if natural history is not reinstated as a fundamental element of education and research in ecology and conservation biology.**



Natural history was my greatest love as far back as I can remember, at least until I discovered girls (though perhaps that's just another facet of natural history). As a young child I delighted in catching, identifying, and observing closely every snake and salamander I could find in the woods of southwestern Ohio. My grandfather, a metallurgist and amateur dendrologist, encouraged my curiosity about Nature by taking me on long walks to identify trees, letting me use his microscope, and sponsoring my summer science classes at the local natural history museum. I would not be surprised to learn that my love for Nature—this biophilia—has a genetic component. My own son, for example, when less than two years old, delighted in pulling field guides off the shelves, exclaiming excitedly over the pictures—especially the beetles. Today, at eight years old, he spends long hours reading those same field guides and searching the neighborhood for reptiles and amphibians, just as I did at his age.

What do childhood experiences have to do with conservation biology? I submit that the exploratory, quasi-scientific investigations of young naturalists stimulate and develop curiosity, observational skills, and intellect, qualities that the adult scientist finds essential. Natural historic facts and the patterns they fall into accumulate in the brain, providing a rich database for the scientist to draw from later. But these benefits of childhood explorations in natural history would accrue to any natural scientist. For conservation biologists there are additional, more profound benefits of early years in the out-of-doors.

Conservation biology, all observers concede, is a mission-oriented discipline. I define it as science in the service of conservation. Just as medical science seeks to heal sick people,

red squirrel by David Hunsberger

conservation biology seeks to heal sick ecosystems and save their components (e.g., species). This mission requires, fundamentally, an ecological ethic. It is difficult to behave ethically toward abstractions—species, communities, ecological processes one knows only from books or mathematical models on a computer screen. Ethics require contact with tangible things. As Aldo Leopold noted, we behave ethically only toward "something which we can see, feel, love, or otherwise have faith in."

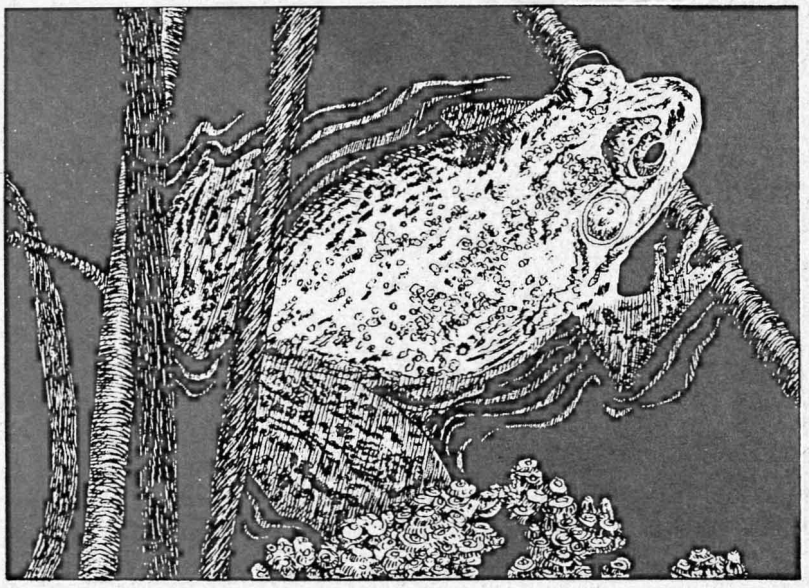
Naturalists, through their intimate connection with Nature, are often moved to try to protect what they love. In that process they become conservationists. Edward O. Wilson, a consummate naturalist, has written that "every scrap of biological diversity is priceless, to be learned and cherished, and never to be surrendered without a struggle." How one chooses to engage such a struggle is a matter of personal choice, determined by one's age, abilities, and inclinations. Many young people take a very direct approach to defending Nature. One well-respected biologist described to me how, as a child, he learned to start the engines of bulldozers and other construction equipment and sent them careening over precipices. Some may disagree, but I consider these fine and noble deeds. Such actions may at least slow the destruction of Nature and allow a few more young naturalists to experience the untamed areas near their homes before those areas disappear forever.

Other naturalists, or perhaps the same individuals as they grow older, express their love for Nature and their outrage over its destruction in other ways. Some become conservation biologists, environmental lawyers, educators, or activists. From many conversations with people in all kinds of conservation-related work, a common trait is apparent: most of these people, in their youth, spent a lot of time outdoors exploring wild or semi-wild areas; they were captivated by natural history; and they saw much of what they studied and loved destroyed by developers. With this destruction, and with the increasing urbanization of our population, opportunities for people of all ages to study natural history and form a personal bond with Nature are diminishing. Some semblance of Nature remains, of course, in even our biggest cities, but it is certainly not as enthralling—or as instructive—as in wilder areas. Even Henry David Thoreau had difficulty finding pristine nature, and remarked sadly:

> *I seek acquaintance with nature—to know her moods and manners. Primitive nature is most interesting to me. I take infinite pains to know all the phenomena of the spring, for instance, thinking that I have here the entire poem, and then, to my chagrin, I hear that it is but an imperfect copy that I possess and have read, that my ancestors have torn out many passages, and mutilated it in many places. I should not like to think that some demigod had come before me and picked out some of the best stars. I wish to know an entire heaven and an entire earth.*

There are other reasons, besides habitat destruction and urbanization, for the decline of natural history. Among professional scientists, natural history has drifted out of style. Indeed, naturalists themselves are threatened with extinction. In a 1996 editorial in *Conservation Biology*, I lamented the passing of the age of natural history and wondered whether the middle-aged biologists of today may be the last generation to have been exposed to truly wild places and taught serious natural history as part of their training. The evidence for the decline of natural history is abundant—just look at the change in virtually any university's biology curriculum and list of faculty interests over the last few decades. With the influx of molecular geneticists and their giant budgets, out have gone the botanists, entomologists, malacologists, ichthyologists, herpetologists, ornithologists, mammalogists, and other scientists working on whole organisms, live or dead. Ecology and conservation biology are becoming dominated by keyboard jocks—mathematical modelers and statisticians often with scant experience in the field. Of course these professionals make meaningful contributions to biology, but what they have to give us is not enough. Even the core experience of any good organismic biology or ecology course—the field trip—has become a rare event because of concerns about travel costs, liability, and relevance to the "cutting edge" high-tech pursuits of the day. Those biologists who still tromp around in the woods or regularly don hip-waders are con-

**The perspective of a naturalist...is one of wonder, awe, endless curiosity, deep respect, and humility before Nature. These are among the most admirable of human qualities, bred in the out-of-doors, that also make for good scientists.**



sidered anachronisms, amusing vestiges of biology's past, to be grudgingly tolerated until they retire or die.

Am I exaggerating? I don't think so, or not much, anyway. But lest you think I'm just a miserable, old-fashioned, non-quantitative posey-sniffer yearning for the good old days, let me explain what we stand to lose if natural history is not reinstated as a fundamental element of education and research in ecology and conservation biology. First, we stand to lose the real data upon which all progress in testing hypotheses, making accurate predictions of the effects of human activities, and constructing successful conservation plans depends. Computers continually get faster and more powerful, and mathematical models capable of predicting such things as habitat suitability and population viability for rare species, effects of perturbations, and outcomes of implementing alternative conservation actions get increasingly more sophisticated. Already, the limiting factor in many cases is unavailability of basic data on the life histories of species, interactions among species, and ecological processes. How can we possibly construct, for example, a successful recovery plan for an endangered bird when we lack basic information on such things as what it eats, where it nests, how sensitive it is to edge effects, how far the juveniles disperse, and so on? Collecting these kinds of data is not easy. It requires competent field work by careful, well-trained observers who can get by, often by themselves, for long periods in uncomfortable and sometimes treacherous field conditions.

We are not training many of these kinds of biologists today. And if and when field data do come in, how can we expect them to be analyzed and interpreted with insight and wisdom by people who have never seen the species in question and scarcely ever take their eyes off the computer screen? There *is* such a thing as "the naturalist's intuition." Perhaps it is partly innate, but I suspect it is mostly a sensibility that is developed only through many long hours in the field, with sweat dripping down your neck and mosquitoes dancing around your face as you silently watch, listen, and ponder. When the profession of biology loses these kinds of experiences, its capacity for insight is diminished. A second unfortunate consequence of the demise of natural history in academia will be loss of employment eligibility and flexibility, especially for young professionals. At the same time that universities are training narrow, computerized specialists with little experience outside the campus, academic jobs for many kinds of biologists are declining. This trend reflects, in part, the shift within universities from whole-organism biology and ecology to other kinds of biology (e.g., molecular) that don't involve field work. The new jobs for conservation biologists, in particular, are in conservation groups, private research institutes, consulting firms, government agencies, and occasionally industry. By and large, these employers require broadly trained individuals capable of working on a variety of problems, in many different geographic areas, and involving a diversity of taxonomic groups. In short, ironically, employers still need naturalists! Most true naturalists are also generalists and hence are much better equipped than specialists for today's job opportunities.

A third problem stemming from the decline of natural history is a matter of perspective and perception. The perspective of a naturalist, evident in such books as Aldo Leopold's *A Sand County Almanac*, Rachel Carson's *A Sense of Wonder*, and Ed Wilson's *Naturalist*, is one of wonder, awe, endless curiosity, deep respect, and humility before Nature. These are among the most admirable of human qualities, bred in the out-of-doors, that also make for good scientists. With the naturalist's intuition comes the ability to see things in a broader context, to perceive relationships and patterns that are obscure to the specialist working indoors. A competent computer modeler may also see patterns and relationships, but has little way to know if they are real or imaginary. Experience in the field provides that reality check. I can't fathom anything that might substitute for this experience. Yet, today's universities implicitly assume that we can trust the interpretations and reasoning of scientists who have had very little contact with the real world of wind, sun, rain, mud up to your waist, and a Northern Cardinal's beak crushing your fingers in a mist net.

Fourth, perhaps my major trepidation about the replacement of natural history by indoor science is one I alluded to near the beginning of this essay. With loss of direct contact with wild

bullfrog by David Hunsberger

creatures and their homes, it is all too easy to dismiss them as "nonessential" (which is the US government's designation for reintroduced populations of Endangered species) or superfluous. We cease to care about them as wonderful, living beings. Yes, I am talking about emotion, not reason. A conservation biologist who lacks an emotional attachment to her study organisms and field sites might be seen as a model of scientific detachment and objectivity. But I would not trust—or hire—such a robot. I look for love—indeed, passion—in the eyes of the researcher, in addition to curiosity, intellectual acuity, and honesty. Without love for the richness and beauty of life on Earth—the kind of emotion that brought John Muir to his knees in tears when he found a calypso orchid in an Ontario bog—no biologist, no matter what her credentials, is anything more than a technician. When hard decisions must be made, the conservation biologist must always be willing to risk erring on the side of protecting too much, rather than too little. Because it is politically and financially advantageous, even for a biologist, to protect too little, only someone whose love for Nature overrides such temptations can be trusted to do the right thing.

IT IS STUDENTS, FROM KINDERGARTNERS TO PHD CANDIdates, who stand to suffer most from the absence of natural history in their curricula. My advice to them is: buck the system. Reject the purely academic, theoretical, and technical training that's being forced upon you. If your indoor classes are boring you to death, skip class and take a walk in your nearby natural area. (That's what I did, and I ended up gainfully employed, more or less.) Familiarize yourself with your local flora and fauna. If you are open-minded and not jaded and dulled by too many years of scientific reductionism, you will soon find yourself falling in love with these creatures. Don't let your conditioned reflex of scientific objectivity suppress these feelings. Let them flower and grow. Find in them the strength you need to persevere in the face of adversity, to never give up trying to protect and restore the places and things you love, despite all the odds and industry money against you.

A skeptic might ask, do I have any data to support the speculations, assertions, and accusations I've made in this essay? Yes, I do, but alas those data are of a qualitative kind. I've come to these conclusions over many years of observing the state of education and of hearing countless colleagues speak of the loss of naturalists and the decline of field courses at their own institutions. After publishing my naturalists editorial in *Conservation Biology* in 1996, I received more responses from readers than for anything else published in the journal in my four-plus years as editor. Of the more than 75 responses (by last count) all but one have been in agreement with my thesis that naturalists are in decline and that this phenomenon bodes ill for biology. Many people have shared personal experiences similar to my own. My parting editorial (December 1997) on the failure of universities to produce broadly trained conservation biologists has been met by similar responses. This affirmation of my position does not cheer me, but it does suggest that the trends I've described are real. Those people with time and grant money to spare could easily test my hypotheses more rigorously by examining trends in the research interests of biology faculty and in course curricula over the last few decades. In the meantime, let's get outdoors and insist that our students do the same, before there is no more natural history left to study and to inspire us. Yes, conservation biology needs natural history—and natural history needs conservation. ❙

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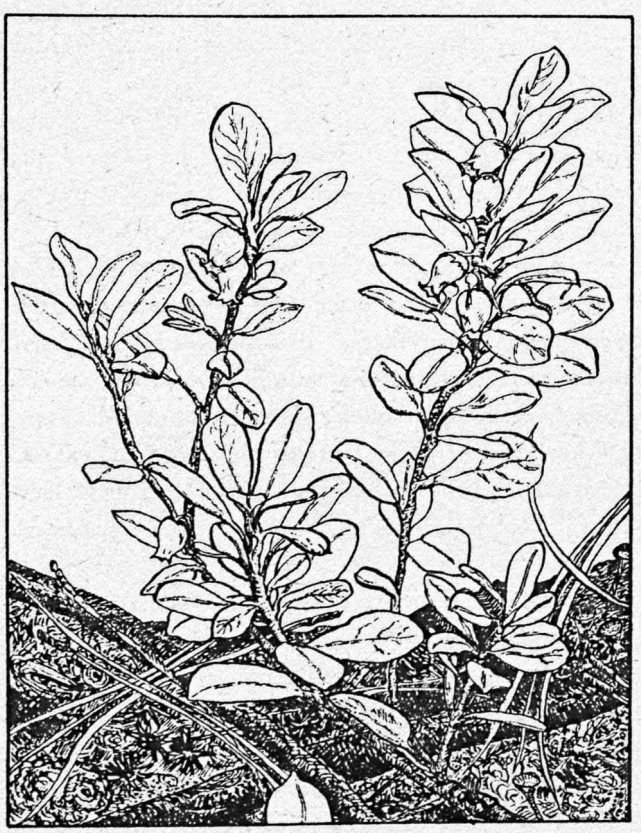
*Reed Noss is science editor for* Wild Earth, *former editor-in-chief of* Conservation Biology, *president-elect of the Society for Conservation Biology, and co-director of the Conservation Biology Institute (800 NW Starker Ave., Suite 31C, Corvallis, OR 97330; nossr@ucs.orst.edu).* *This essay was originally presented in a symposium on "the naturalists' tradition" at Oregon State University, March 1998.*



blueberry by David Hunsberger

# A Clamor for Quiet

I, too, read with great interest Anne LaBastille's "The Gift of Silence" (fall 1997) and was struck by her remark that "There is no Citizens Group to Save Silence." In "Silence and Quiet Use" (spring 1998), Jean Smith said, in effect, "Yes, there is": the Quiet Use Coalition of Colorado's Upper Arkansas Valley.

Perhaps, then, there are many of us. The Alaska Quiet Rights Coalition (AQRC) is a year and a half old and is vigorously fighting noise pollution from private and commercial motorized recreational vehicles in a state that most people probably assume is the last bastion of vast silences and solitudes—of Robert Service's "stillness that fills me with peace."

It ain't so. Ironically, much of Alaska's backcountry is probably noisier than that of many other states. Even in designated Wilderness, the use of snowmachines, powerboats, and airplanes is often allowed as a result of a (disputed) provision in the Alaska National Interest Lands Conservation Act. Denali National Park, perhaps the foremost symbol of wild Alaska, is not immune: "A dramatic increase in airplane and snowmachine use is changing the wilderness character of Denali National Park...," the Anchorage *Daily News* reported in early July, 1998. While frontier mentality—"No one can tell me where I can drive my vehicle!"—is alive and well in Alaska, natural quiet is seriously endangered.

The AQRC is a diverse organization that includes far more than "just" greenies and youthful backpackers (although non-motorized recreationists and wildlife enthusiasts are certainly core constituencies). Among our supporters are the owners of both urban homes and remote cabins who are disturbed by snowmachines, jet skis, or constant flightseeing. We also seek to represent the interests of people who enjoy the frontcountry of our public lands, places like campgrounds, picnic areas, and interpretive trails. Ninety percent of the visitors to our National Parks are seeking not just scenic beauty but peace and quiet as well; it's obvious that only a relatively small percentage of those visitors are backcountry recreationists.

Who else is out there? (We'd love to hear from you.) Is there a national coalition advocating the restoration of natural quiet—and the croak of the raven, the hiss of falling snow—to our public lands? If not, shouldn't there be? As a conservation/natural history magazine junkie, I know that this issue is of rapidly increasing importance nationwide. In numbers there is strength, but is anyone adding up the numbers?

**CLIFF EAMES**

*Cliff Eames is a Board Member of the Alaska Quiet Rights Coalition, POB 202592, Anchorage, AK 99520; 907-566-3524; cliffe@pobox.alaska.net*

I especially enjoyed Dave Foreman's revisionist take on "environmentalism" (spring 1998). It reminded me of Joseph W. Meeker's marvelous essay "People and Other Misused Resources" (*Minding the*


*Earth,* Latham Foundation, 1988), as well as Donald Worster's insightful "The Shaky Ground of Sustainability" (*Deep Ecology for the 21st Century,* ed. George Sessions, Shambhala, 1995), both of which should also be required reading for any activist concerned with clear thinking.

Thank Gaia (or whomever, whatever) for plants and animals to remind us how much easier it is to commune-icate with our other brothers and sisters.

**DAVID GRAVES**

*San Francisco, California*

*Wild Earth* arrived in today's mail and I indulged in a comforting ritual. First, I checked to see if any of my illustrations appeared in the issue. Then I sat down immediately to read two of my favorite conservationists, Dave Foreman and George Wuerthner. Since I almost entirely fulfill George's qualifications for those who may "communicate a new vision of the American West" (I am a musician, writer, and artist, three out of his four), I felt appropriate in responding to Dave's "Campfire" and George's article about myth

and Yellowstone (spring 1998).

While George correctly identifies the paradigm of an industrialist utilitarian at odds with the ecocentric, he ignores a very real issue in the management of Yellowstone wildlife. While we may disagree with the conclusions drawn by conservative thinkers such as Alston Chase, we really ought not to dismiss their arguments entirely. Chase, in his much maligned *Playing God in Yellowstone*, accurately relates the natural history of the Yellowstone area. In short, Yellowstone was summer range for small numbers of animals and winter range for only a precious few. The vast hordes of creatures we associate with today's park were driven by agricultural development in lower elevation ranges to Yellowstone as a last refuge. These animals are essentially held captive within the park, risking slaughter should they leave. This is not the so-called natural state and it cannot help but have had a significant impact on ecosystemic function. The decline of aspen due to elk over-browsing is perhaps the most visible of these impacts. In attempting to blow one myth out of the water, George sets another one afloat: all of those who disagree with the park's natural regulation policy are ignorant yahoos and their opinions about everything concerning Nature are viewed through the lens of anthropocentric utilitarianism. I think George would probably agree that the truth of the matter is something less radical, that we are all both right and wrong about a good many things.

Dave takes us on an etymological tour to explain why he dislikes the word "environment." Aldo Leopold's land ethic is certainly a desirable and available alternative paradigm, but the words "land ethic" do not adequately replace "environmental ethic," as Dave argues. While there may be many "environmental ethics," there is only one land ethic. The phrase "environmental ethics" means two things. One meaning denotes a perspective toward Nature. Even James Watt and Ron Reagan possessed an "environmental ethic," however abysmal it may have been. Survivalists, Evangelicals, Wise Users, Multiple Users, and Just-Plain-Users all possess an "environmental ethic." It would be false to say that they do not possess a philosophy about Nature, regardless of how odious it might appear to the biocentric.

The second meaning implies a positive and ecocentric perspective toward Nature. Thus, in developing an "environmental ethic," one presumably grows ever more biocentric in the process. But the land ethic is not the only "environmental ethic" out there. There is Environmental Economics, Christian Ecology, Ecofeminism, Gaia Theory, and Pantheism. There are Luddite radicals and pragmatic utilitarians lurking everywhere. They may not wish to be brow-beaten (Brower-beaten?) into giving up their personal categorization simply because Dave's personal favorite is Leopold's. Leopold's land ethic is my personal favorite as well, but I'm not willing to give up "environmental ethics."

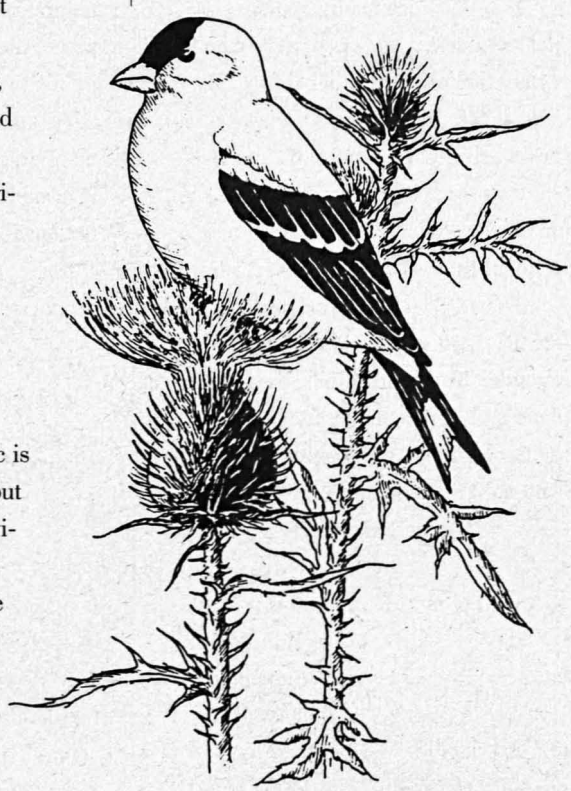
Thanks, as always, for the provocative thinking.

**EVAN CANTOR**
*Boulder, Colorado*

## Yesterday I had the

thrill of seeing *Wild Earth* displayed on the magazine shelves of my community library (Western New Mexico University). Part of the thrill was knowing that it was my gift subscription that made this possible. I urge all *WE* subscribers to do the same for their local libraries.

**CONNIE BARLOW**
*Silver City, New Mexico*

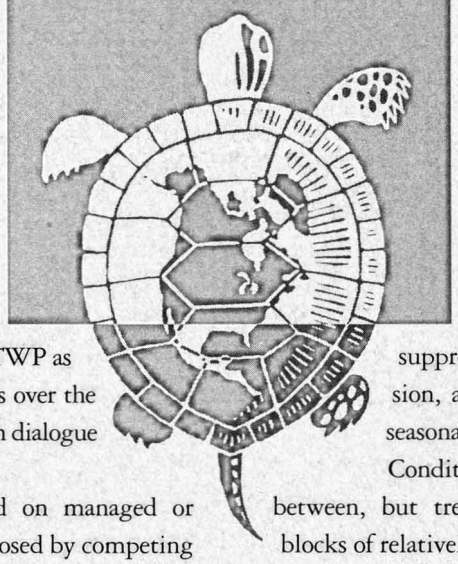


American Goldfinch by Libby Davidson

## The Wildlands Project

# Update

BY STEVE GATEWOOD



This issue of *Wild Earth* features two themes that have been the subject of considerable debate within Wildlands Project circles for some time, and, despite the coverage in these pages, will continue to be important topics for discussion in the future. The first, rewilding—and more specifically, "representation" and "rewilding" as different approaches to ecological reserve design—is explored here by two of the best practitioners of each: Reed Noss and Michael Soulé, respectively. Their paper, "Rewilding and Biodiversity: Complementary Goals for Continental Conservation," will certainly influence how TWP as an organization relates to cooperating groups over the next few years, and will likely stimulate much dialogue in the larger conservation community.

The second theme, broadly centered on managed or "working"* landscapes and the dilemmas posed by competing needs of use and conservation, will likely prove a much more difficult subject on which to reach agreement. Different camps will probably always espouse varying levels of human manipulation of landscapes. For conservationists working to devise effective strategies appropriate to place, context is everything. A quick trip around the continent will illustrate what I mean:

In the Yukon Territory, the need for rewilding does not yet exist. There, the Big Wild is the matrix within which islands of human development are growing. It is, and has been for thousands of years, a "working" landscape for the First Nations that live there, yet is still very wild. So reserve design in the Yukon has been a process of deciding where protected areas should be established to sustain key ecological refugia at the landscape or watershed scale, assessing the extent and intensity of development expanding out of existing settlements, and deciding what types of use are compatible in the "'tweeners," those areas between refugia and developments. The entire territory should continue to be a wild landscape for thousands of years into the future, while sustaining vibrant human communities as well.

In Florida, any landscape, including wilderness, will be a managed one because humans will have to work constantly to sustain its ecological integrity. Natural processes have been so disrupted and ecosystems so severely fragmented that human actions—to introduce fire, control exotic species, and restore and maintain hydrologic conditions—will be absolutely necessary, at least in the near term. Although the current conservation plan targets 47% of the state to ultimately come under some form of protection and identifies several multi-million-acre reserve areas, no wild habitat in Florida now exists in blocks large enough to be self-regulating and to maintain all natural ecological and evolutionary processes. The largest contiguous block of "natural" land in the state, the Everglades-Big Cypress-Ten Thousand Islands complex, is subject to wildfire suppression, heavy exotic plant and animal invasion, and vastly reduced depth and duration of seasonal flooding; humans call all the shots.

Conditions in northern Mexico fall somewhere in between, but trend toward the Florida situation. Large blocks of relatively wild habitat still exist, adequate perhaps even for top carnivores like the jaguar and Mexican wolf. Indigenous cultures continue to occupy the landscape. But "public" land there is managed by *ejidos*, communities of local people that must secure their living from the land, and private ranches are domesticating more and more of the remote areas. Any partitioning of the landscape, even for "protected" areas like the existing federal biosphere reserve system, will create multi-use landscapes where the concerns and needs of local communities will have equal footing with biodiversity protection. Growing human populations will also likely lead over time to an ever greater degree of human use of the landscape.

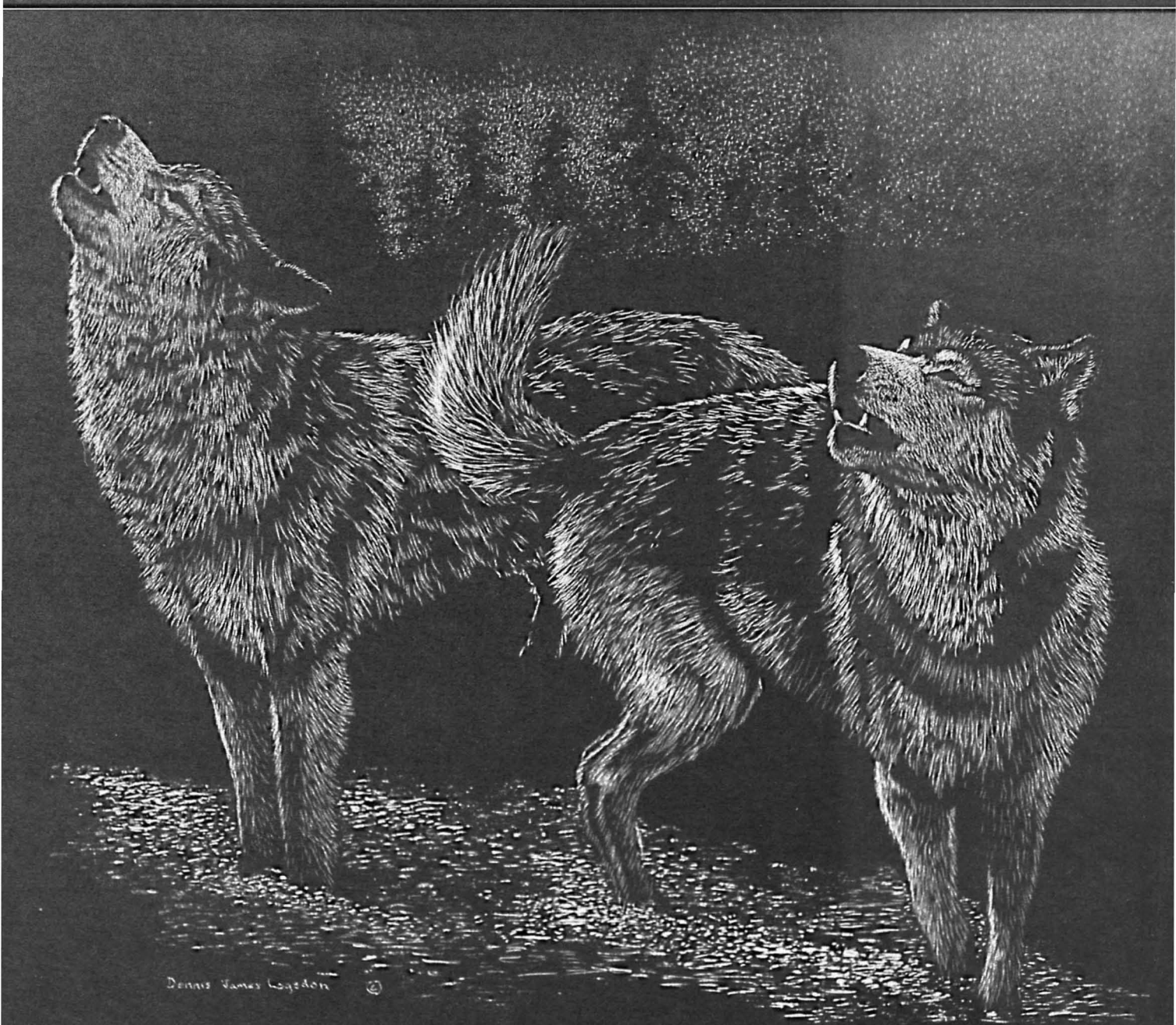
The Wildlands Project is working in each of these areas and will continue to advocate for the design of conservation reserve systems that address the needs of Nature first. Plenty of organizations, including some of our cooperators, are strong advocates for indigenous peoples' rights, environmental justice, and sustainable economies, and those groups will be more heavily involved in wildlands work as the process of reserve system implementation unfolds. Whether based on rewilding or representation, we recognize that reserve networks will be imbedded in—and an integral part of—managed landscapes that provide livelihoods and products for people. We just want to be sure that as people work the land, Nature doesn't get worked over.

*Steve Gatewood is Executive Director of The Wildlands Project.*

* Use of the phrase "working" as synonymous with human-dominated landscapes is of course problematic for many of us who recognize that wild, unmanaged lands work very hard providing a range of indispensable ecological services.

# *Rewilding and Biodiversity:*

**Michael Soulé and Reed Noss**



# Complementary Goals for Continental Conservation

DISPUTES ABOUT GOALS AND METHODOLOGY are nothing new in the nature conservation movement. Gifford Pinchot's insistence on responsible use and John Muir's emphasis on strict preservation have survived as distinct ideologies for nearly a century. Currently, conservationists are discussing and implementing two versions of science-based or science-informed methodologies for conservation. We refer to the older and more conventional of these as *biodiversity conservation*; it stresses the representation of vegetation or physical features diversity and the protection of special biotic elements. The other we refer to as *rewilding*; it emphasizes the restoration and protection of big wilderness and wide-ranging, large animals—particularly carnivores. Differences between these two approaches have led to some tension about goals within wildlands conservation circles, in part because of the human tendency to dichotomize and to perceive different emphases as competitive rather than complementary. In this paper we define rewilding, placing it in the context of older conservation currents in North America.

## Nature Protection in North America

The roots of current conflicts about how best to conserve nature in North America reach back into the Pleistocene when huge mammals dominated the continent's ecosystems. Starting between 11,000 and 12,000 years ago, the megafauna virtually disappeared. The die-off was brief, lasting only about 2,000 years. Human beings are implicated in this catastrophic extirpation—sometimes referred to as the Pleistocene Overkill—of more than 50 species of large mammals in North America including mammoths, mastodons, horses, giant ground sloths, American camels, lions, and the saber-tooth cats. Paleoecologists generally agree that two of the major factors in this short but profound event were, first, the arrival from Asia of efficient big-game hunters—now called the Clovis people—who came armed with a new and effective spear technology (Ward 1997) and, second, the lack of evolutionary experience of the prey species with strategic, cooperative, two-legged hunters.

**scratchboard illustrations by Dennis Logsdon ■ tracks by Heather Lenz**

It is not widely appreciated, however, that North American ecosystems remain profoundly altered by that extinction episode. For example, a dozen large mammalian herbivores once coexisted in the eastern US; now only one or two remain (Terborgh et al. 1999). The truncated nature of contemporary ecosystems is relevant to debates about the design and management of protected areas. The link is the ecological role of large predators; now, only a handful of large carnivore species persist, including the cougar, the black bear, the grizzly bear, and the wolf.

The Clovis technology, and later Stone Age successors, have been replaced by even more efficient tools—steel traps and firearms—facilitating a second wave of carnivore extirpation. Guns helped eliminate nearly all grizzly bears and wolves from the lower 48 states. Cougars and black bears have been extirpated from more than half of their original geographic range in the United States. Predator "control" (killing), even on public lands, is still the default policy in many areas of North America, and the unsustainable hunting of grizzly bears is still permitted in Canada (Hummel and Pettigrew 1991).

Other modern technologies have helped convert highly productive wildlands to farmlands, clearcuts, tree plantations, and overgrazed rangelands. Human population growth also contributes to habitat destruction, not just in Mexico and Central America, but throughout North America. Population pressures are aggravated by corporate-driven consumerism, new technologies such as refrigerated transport, and political innovations such as the North American Free Trade Agreement that encourage habitat conversion in tropical nations. The rapid growth in the importation of perishable produce and seafood from the South is directly linked to loss of tropical forests, mangroves, and estuaries. As we import flowers, fruits, coffee, vegetables, shrimp, and forest products, we export habitat destruction to Latin America, Asia, and Africa (Thrupp 1995).

## Monumentalism

Conservationists in North America have responded to the loss of wild nature by employing several major arguments—or currents—to sway public opinion and private behavior.[1] The first argument, sometimes called *monumentalism* (Runte 1987), was articulated by the founding preservationists almost a century ago. Among these early pioneers, John Muir was the most famous. Muir and allies wished to save places of extraordinary natural beauty—the grand spectacles of nature, places that today are the crown jewels of National Park systems. Muir, Bob Marshall, and the other preservationists appealed to patriotism, deism (respect for God's creation), spiritual inspiration, and aesthetics in their advocacy for wild places.

Over time, monumentalism evolved into the *wilderness movement.* The Wilderness Society was founded in the 1930s; among its founders were two early opponents of predator control, the biologists Olaus Murie and Aldo Leopold. The emphasis of this movement gradually shifted from preserving spectacular natural scenery to providing recreation opportunities in primitive areas, and to a belief in the intrinsic value of self-willed nature (Nash 1989, p. 149). Another branch in this lineage was the creation of National Parks dedicated to protecting particular charismatic species; these parks include Wood Buffalo and Antelope National Parks in Canada.

## Biological Conservation, Including Representation of Ecosystems

The next important current—*biological conservation*—can be traced to the second and third decades of the 20th century, when ecologists and naturalists began to realize that nature didn't always achieve its apex of biological productivity and richness in aesthetically notable places like Yosemite and Banff, and that many kinds of ecosystems were unrepresented in National Parks. They observed that the diversity of species and habitats was often greatest in less grandiose ecosystems, particularly the warmer lowlands, wetlands, streams, humid forests, and in coastal areas.[2] Unfortunately, many of these habitats and attendant resources are also favored by real estate developers, industrial loggers, and agriculturalists.

Two committees of the Ecological Society of America, chaired in the early years by Victor Shelford and involving such well-known scientists as Aldo Leopold, E. T. Seton, and Charles Kendeigh, were instrumental in calling for an end to the persecution of carnivores and for the protection

**1** In addition to the four arguments emphasized here (monumentalism, biological conservation, island biogeography, and rewilding), other rationales and strategies for conservation have been employed, particularly in Europe, Africa, and Latin America; these include creating reserves designed to preserve particular cultural forms, and those that emphasize "sustainable" land uses including harvesting of products such as Brazil nuts, chicle, and rubber.

**2** Everglades National Park, established in 1947, was the first American park founded for an explicitly biological purpose—to preserve aquatic wildlife. (Unfortunately, the ecosystem "preserved" was far too small.)

of large, unmanaged wilderness landscapes to represent all of North America's major ecosystems (Shelford 1926, 1933a, 1933b, and unpublished documents; Kendeigh et al. 1950–51). One of these committees, the Committee on the Preservation of Natural Conditions, left the Ecological Society after arguments over the role of advocacy in the Society, and became the Ecologists' Union. This group was later renamed The Nature Conservancy (which, ironically, now avoids direct advocacy).

By the late 1970s and early 1980s, biological conservationists were beginning to employ sophisticated classifications of landscapes and vegetation, plus lists of vulnerable species, to assist in sequestering representative samples of all ecosystem types and "special elements" in a system of nature reserves. The state natural heritage programs established by Bob Jenkins of The Nature Conservancy led this effort. Later, the Endangered Spaces Campaign of World Wildlife Fund Canada assessed representation of landscape features throughout Canada. Contemporary scientific conservationists call for the protection of representative ecosystems, "hot spots of biodiversity," centers of endemism (locales relatively rich in species with limited geographic distributions), and the habitats of rare or vulnerable species.

A significant elaboration of biological conservation grew out of the recognition that landscapes are dynamic and that natural disturbance regimes must also be maintained. More recently, there has been a focus on the scale and intensity of natural disturbances such as fires, floods, and catastrophic weather events (Pickett and Thompson 1978, White 1979, Pickett and White 1985, Foster 1986). Fire, for example, can have profound effects on ecosystem structure, diversity, and function, and might be referred to as a keystone process (Noss 1991).

By the early 1980s biologists recognized that large carnivores—such as grizzly bears, wolves, and cougars—require extensive, connected, relatively unaltered, heterogeneous habitat to maintain population viability (e.g., Frankel and Soulé 1981). These became the animals used to justify large nature reserves, earning them the title "umbrella species." The assumption in this approach is that large, wide-ranging carnivores offer a wide umbrella of land protection under which many species that are more abundant but smaller and less charismatic find safety and resources. We note, however, that large carnivores also figured prominently in arguments advanced earlier by Shelford, Kendeigh, and others. These ecologists sought to preserve complete, self-regulating ecosystems with all native species. For example, Kendeigh et al. (1950–51) observed that "it is in the absence of the large predators that many sanctuaries are not entirely natural and have unbalanced populations of the various species."

## Island Biogeography

A third major current in conservation advocacy arose with *island biogeography*, which emerged as a field of scientific inquiry in the late 1960s. Arguably, the most salient generalization from island biogeography is the species-area relationship (MacArthur and Wilson 1967), which was actually recognized decades earlier (Arrhenius 1921) but became the basis, much later, for quantitative prediction of extinctions in isolated habitat remnants and nature reserves (e.g., Diamond 1975, Soulé et al. 1979, Newmark 1995). The principles of island biogeography were soon incorporated into the emerging synthesis called conservation biology (Terborgh 1974, Diamond 1975, Wilson and Willis 1975, Simberloff and Abele 1976, Frankel and Soulé 1981, Noss 1983, Harris 1984, Soulé and Simberloff 1986; see review in Noss and Cooperrider 1994).

Conservation biologists had identified weaknesses with the existing conservation approaches, based on their understanding of the scale on which ecological processes operate, and noted the empirical correlation of area with both species diversity (positive) and extinction rates (negative). Small habitat remnants were recognized as being relatively vulnerable to many other dissipative phenomena—edge effects, and invasions of exotic plants, animals, and pathogens (Soulé and Wilcox 1980)—hastening the local extirpation of species and ecosystem disintegration.

A defining moment in the acceptance of island biogeography in conservation circles was the publication of William Newmark's paper (1985) demonstrating the loss of mammal species in all but the largest North American park complexes. Newmark discovered that the rate of local extinction in parks was inversely related to their size. By then it was understood that small, isolated populations of animals were vulnerable to accidents of demography and genetics and to environmental fluctuations and catastrophe, underlining the need for bigness and connectivity (Franklin 1980, Frankel and Soulé 1981). Inter-regional connectivity was seen as necessary for providing genetic and demographic rescue and for viability of wide-ranging species (Soulé 1981, Noss 1983, Harris 1984, Noss and Harris 1986, Soulé 1987); even regions as large as the

Greater Yellowstone Ecosystem could not provide sufficient demographic resilience and genetic-evolutionary fitness for animals such as wolverines and grizzly bears (Shaffer 1981). It became clear that island biogeography needed to be integrated into conservation planning and practice.

## Rewilding

The fourth current in the modern conservation movement is the idea of *rewilding*—the scientific argument for restoring big wilderness based on the regulatory roles of large predators. Until the mid-1980s, the justification for big wilderness was mostly aesthetic and moral (see, e.g., *Earth First! Journal* 1981-1988, Foreman and Wolke 1989, Fox 1981, Nash 1982). The scientific foundation for wilderness protection was yet to be established.

We recognize three independent features that characterize contemporary rewilding:

- Large, strictly protected, core reserves (the wild)
- Connectivity
- Keystone species

In simplified shorthand, these have been referred to as the three C's: Cores, Corridors, and Carnivores (Soulé, in prep.). A large scientific literature supports the need for big, interconnected reserves (Frankel and Soulé 1981, Soulé 1986, Noss and Cooperrider 1994, Noss and Csuti 1997). Keystone species are those whose influence on ecosystem function and diversity are disproportionate to their numerical abundance (Paine 1980, Gilbert 1986, Terborgh 1988, Mills et al. 1993, Power et al. 1996). (By definition, species that are typically abundant or dominant, such as fig trees, salmon, coral, and social insects including termites and ants, though often critical interactors, are not classified as keystone species, even though the effects are similar when they are greatly diminished in abundance.) The critical role of keystone species is gaining acceptance (Terborgh et al. 1999). Conservatively, though, the role of keystones might still be categorized as a hypothesis, its validity depending on the ecological context and the degree to which large carnivores and herbivores persist in the particular ecosystem. In any case, the keystone species hypothesis is central to the rewilding argument.

Keystone species enrich ecosystem function in unique and significant ways. Although all species interact, the interactions of some species are more profound and far-reaching than others, such that their elimination from an ecosystem often triggers cascades of direct and indirect changes on more than a single trophic level, leading eventually to losses of habitats and extirpation of other species in the food web. "Keystone species" is an inelegant but convenient way to refer to these strong interactors (Mills et al. 1993). Top carnivores are often keystones, but so are species that provide critical resources or that transform landscapes or waterscapes, such as sea otters, beavers, prairie dogs, elephants, gopher tortoises, and cavity-excavating birds. In North America it is most often the large carnivores that are missing or severely depleted.

Three major scientific arguments constitute the rewilding argument and justify the emphasis on large predators. First, the structure, resilience, and diversity of ecosystems is often maintained by "top-down" ecological (trophic) interactions that are initiated by top predators (Terborgh 1988, Terborgh et al. 1999). Second, wide-ranging predators usually require large cores of protected landscape for secure foraging, seasonal movement, and other needs; they justify bigness. Third, connectivity is also required because core reserves are typically not large enough in most regions; they must be linked to insure long-term viability of wide-ranging species. (Note, however, that "frontier" regions like Canada, north of the 50th parallel, are exceptions because of very low human population density.) In addition to large predators, migratory species such as caribou and anadromous fishes also justify connectivity in a system of nature reserves. In short, the rewilding argument posits that large predators are often instrumental in maintaining the integrity of ecosystems; in turn, the large predators require extensive space and connectivity.

The ecological argument for rewilding is buttressed by research on the roles of large animals, particularly top carnivores and other keystone species, in many continental and marine systems (Terborgh et al. 1999, Estes et al. 1978). Studies are demonstrating that the disappearance of large carnivores often causes these ecosystems to undergo dramatic changes, many of which lead to biotic simplification and species loss (Mills et al. 1993). On land, these changes are often triggered by exploding ungulate populations. For example, deer, in the absence of wolves and cougars, have become extraordinarily abundant and emboldened in many rural and suburban areas throughout the United States, causing both ecological and economic havoc (McShea et al. 1977, Nelson 1997, McLaren and Peterson 1994).

Following extirpation of the wolves in Yellowstone National Park, large populations of elk over-browsed riparian

vegetation in many areas. Beaver, having nothing to eat, abandoned large valleys, and beaver ponds and riparian habitat greatly diminished, impoverishing the local biodiversity. Where wolves have returned, elk herds don't dally as long near streams, and one might hope for the return of the missing beaver ponds, an ecological irony given that beaver are a prey item of wolves.

Current studies in South America by John Terborgh and his colleagues are showing that the absence of carnivore control on herbivores (tapir, monkeys, rodents, insects) can precipitate a rapid loss of plant species diversity. Construction of a reservoir in Venezuela caused flooding of a vast area, now known as Lago Guri. Many of the islands thus created lack the larger predators (jaguar, puma, Harpy Eagle), and on these islands the reproduction and replacement of many species of canopy trees has come to a halt. On middle-sized islands, even though 60–70 species of trees coexist in the canopy, only a handful of species are represented in young recruits. Terborgh et al. believe that the primary factor in the failure of canopy trees to reproduce is the superabundance of herbivores (leaf-eating monkeys and ants, rodent seed predators). The herbivores have apparently been "released" from the population control imposed, directly or indirectly, by large predators. As a result, the entire island ecosystem is crashing.

Another frequent consequence of the absence of large carnivores is a remarkable increase in abundance of smaller predators (mesopredators), largely because the top carnivores would normally prey upon and inhibit the foraging of their smaller counterparts. Several studies have suggested that this "demographic release" of mesopredators such as house cats, foxes, and opossums causes severe declines in many songbirds and other small prey animals (Soulé et al. 1988, Palomares et al. 1995, Côté and Sutherland 1997, Terborgh et al. 1999). Studies by Crooks (1997 and pers. comm.) in isolated remnants of scrub habitat in southern California are showing that the presence of coyotes, the top carnivore in these fragments, is associated with the restriction of house cats to the edges of the fragments.

Finally, in some situations the absence of top predators can lead to intense competition among former prey species for space or food, eventuating in one species of competitor eliminating many others (Terborgh et al. 1999). Often referred to as the "Paine effect" (after R. Paine, who first demonstrated the keystone effects of predatory starfish; Paine 1966), this is yet another example of the indirect, but profound, consequences of eliminating large predators.

Prior to the megafauna overkill in the Pleistocene, the role of large carnivores as top-down regulators may not have been as important as it is today. At that time in North America, huge herbivores (including mammoths, mastodons, giant camels, and giant ground sloths) dominated many ecosystems, and probably controlled the distribution and abundance of many plant species and habitat types, as megaherbivores such as elephants still do in Africa. Moreover, highly social, migratory ungulates, such as bison, grazed and browsed in huge numbers. Carnivores were probably not effective regulators of the megaherbivores and the migratory ungulates. Today, however, top predators appear to regulate many ecosystems (Terborgh et al. 1999), preventing hyperabundance in herbivores and mesopredators.

Our principal premise is that rewilding is a critical step in restoring self-regulating land communities. Recall that viable populations of large predators require both large core areas and connectivity, thus bolstering the resilience and via-

## Glossary

**Genetic and demographic rescue** The arrival of immigrants into a small population can sometimes be beneficial by slowing the rates of loss of genetic variation and inbreeding and by lowering the chance of extinction caused by small numbers of individuals.

**Succession** The (sometimes) predictable and sequential change in species composition within a habitat.

**Beta diversity** The amount of change (turnover) in species composition in a local landscape when sampling across habitats.

**Focal species** Organisms whose requirements for survival represent factors important to maintaining ecologically healthy conditions; types of focal species include keystone species, umbrella species, flagship species, and indicator species. Focal species are helpful in planning and managing reserves.

**Keystone species** Organisms whose influence on ecosystem function and diversity are disproportionate to their numerical abundance.

bility of reserve networks. Also, large predators initiate chains of far-reaching and manifold ecological interactions; in the absence of these keystone species, many ecosystems will become degraded and simplified. Extensive networks of cores and habitat linkages also sustain a vast range of natural processes, thus minimizing the need for human management. Once large predators are restored, many if not most of the other keystone and "habitat-creating" species (e.g., beavers, prairie dogs), "keystone ecosystems" (deMaynadier and Hunter 1997), and natural regimes of disturbance and other processes will recover on their own.

## Rewilding as a Responsibility

In addition to the scientific justifications for rewilding there are ethical and aesthetic justifications, although some are specific to the North American situation. First, there is the ethical issue of human responsibility. In many regions the deliberate government policy has been to exterminate large carnivores. Unfortunately, this practice continues. The federal agency charged with this task, Animal Damage Control (recently renamed Wildlife Services) still exists. Because carnivores are generally long-lived, produce few young, and nurture those young over a long period of time, their capacity to recover from over-hunting or extirpation campaigns is relatively limited (Noss et al. 1996, Weaver et al. 1996). This underlines the need, if only temporary, for benign human intervention in the form of reintroduction or augmentation of carnivores.

Second, by insuring the viability of large predators, we restore the subjective, emotional essence of "the wild" or wilderness. Wilderness is hardly "wild" where top carnivores, such as cougars, jaguars, wolves, wolverines, grizzlies, or black bears, have been extirpated. Without these components, nature seems somehow incomplete, truncated, overly tame. Human opportunities to attain humility are reduced.

Nonetheless, rewilding is not the only goal of most regional reserve design efforts. The Wildlands Project encourages planning groups to address the major "wounds" or ecological insults caused by abusive land uses of the past that require redress, a notion that is easily traced to Aldo Leopold and other early ecologists (Foreman, in prep.). Among the most common of these wounds to wildlands is the extirpation of large predators, but there are several others that often require treatment, including overgrazing and destruction of riparian habitats, irrigation and hydroelectric projects, poor forestry practices, over-fishing, habitat abuse and stress in animals from mechanized recreation, introduction of exotic species, draining or pollution of wetlands, and habitat changes stemming from decades of fire suppression. Rewilding does not address all of these, but it is one essential element in most efforts to restore fully functioning ecosystems. Repairing all past insults requires a comprehensive effort. We encourage the use of focal species (Miller et al. in press) when addressing these wounds.

The greatest impediment to rewilding is an unwillingness to imagine it.

## Biodiversity Protection Plus Rewilding Equals Conservation

Ecosystems are constituted of species arrayed along environmental gradients in a shifting mosaic of vegetation. This means that if one protects representative samples of all features, landforms, or vegetation types and successional stages in the reserve network, then most of the biodiversity must also be sequestered—a kind of habitat umbrella effect or "coarse filter" (Noss 1987). The major argument for representation of vegetational or habitat diversity is that it captures and, we would like to think, protects most of a region's species. Certainly, the representation of all vegetation types in a reserve system would seem more efficient than preparing a protection strategy, one by one, for each of the thousands of species that occur in most regions. This is why many regional conservation groups are using a representational methodology as a first stage in the design of reserve proposals, particularly if data on the kinds and geographic distributions of ecosystems, vegetation types, and special biotic elements already exist (for instance, from gap analysis projects; Scott et al. 1993). Such data also can provide the framework on which to hang other kinds of information, and on which to base other studies.

A reserve system based on representation requires several kinds of scientific knowledge, including knowledge of the distribution of vegetation types or physical habitats—or species groups used as surrogates—and knowledge of the frequency and geographic distribution of large-scale disturbances. A more inclusive strategy incorporates special elements and phenomena such as hotspots of endemism, important migratory stopovers or breeding areas, old-growth patches, or roadless

areas (Noss 1996). Many of these elements have such restricted distributions that they would not be captured by a representational approach alone.

It does not necessarily follow, however, that the representation of vegetation types or protection of special elements, for which data can easily be accommodated in a geographic information system (GIS) methodology, is the only way to design a reserve system. Several situations allow for non-representational methodologies, at least in preliminary stages. In unpopulated or sparsely settled "frontier" areas, such as most of Canada, for example, reserve planning is proceeding from a basis of securing entire unlogged or undeveloped watersheds, in part because such large, topographically diverse watersheds will contain virtually all of the vegetational diversity within the region (Diamond 1986). Another justification for large watershed protection in the temperate rainforests of North America is the premise that commercial logging in such watersheds can contribute to the local extirpation of a keystone species guild—anadromous fishes.

In one region, at least, reserve design has emphasized rewilding and ecological restoration rather than representation or other biodiversity-focused goals. Conservationists designing a nature reserve network for the Sky Island-Greater Gila region of the southwestern US have based their work on the needs of focal species, some of which are large carnivores and ungulates, and some of which are indicators of the ecological resilience and restoration of particular systems or processes that have suffered from mismanagement; abuses of this landscape include the extirpation of some ungulates and large carnivores, the suppression of fire, and extensive overgrazing, particularly in riparian zones. It remains untested, however, whether such reserve networks will capture a similar proportion of species and habitat diversity as would those based on a representational methodology.

Several authors have codified procedures for securing representation of biodiversity (Pressey and Nicholls 1989, Bedward et al. 1992, Pressey et al. 1993, 1996, Church et al. 1996, Noss 1996, Faith et al. 1996, Csuti et al. 1997). One trend has been the development of algorithms for quantifying the degree of representation in any particular system of reserves and for achieving representation most efficiently (see above references). In the hands of the ecologically naïve, however, such powerful technologies can produce myopic dependence on spatially explicit, quantitative data. Moreover, some of the researchers who employ linear programming and economic models for the selection of reserves ignore population viability concerns and rely on ecologically dubious assumptions about the long-term consequences of habitat fragmentation.

The current emphasis on quantitative analysis and GIS mapping in conservation planning often leads to the exclusion of other important considerations. We know of situations where certain carnivore species were excluded from consideration because "a database" or "layer" for that species was lacking. A case in point is the oft-heard question from activists, "How can we include grizzly bears (or jaguars, cougars, wolves) in our model if we lack information on their demography?" "Besides," they continue, "our region is too small to sustain a viable population of such large animals." These concerns can be symptoms of letting the tail of technology wag the dog of common sense. Both ethics and science require that large carnivores be included in conservation planning, even if the needs of these species can only be considered qualitatively at first.

Insufficiency of wildlands in a region is not justification for ignoring large carnivores. Granted, few places south of the 50th parallel are large enough to maintain viable populations of large carnivores at present. This is all the more reason why each regional planning group must be responsible for its link in the chain of nature protection. It is only by coordination of planning in the entire, continental network that full return of land vitality is achievable. The point is that each reserve design group in the network (Soulé 1995) has an obligation to all of the land, not only to their particular region, province, or state.

Politics can also wag the dog. For instance, some activists are excessively anxious about the attitudes of certain stakeholders, particularly those with negative perceptions of wolves or other carnivores. There is a danger in granting too much weight during the design phase to such considerations, and letting politics interfere prematurely with reserve planning. A conservation plan cannot give equal weight to biocentric and socioeconomic goals, or the former will never be realized. Biology has to be the "bottom line." We acknowledge that rewilding is thought by some conservationists to be impractical, particularly in relatively built-up regions of North America. Moreover, many people are uncomfortable in proposing the reintroduction of large and politically troublesome carnivores. But this is no excuse. Timidity in conservation planning and implementation is a betrayal to the land. Even in relatively populated regions like most of the eastern United States, the land cannot fully recover from past and present insults and mismanagement unless its bears, cougars, and wolves return. The greatest impediment to rewilding is an unwillingness to imagine it.

## Conclusions

Biodiversity and rewilding are not competing paradigms; rather, they are complementary strategies. Just as a pure representation approach to conserving nature, if it ignored the issue of long-term viability of wide-ranging keystone species, would be unsatisfactory, a pure rewilding approach might miss some ecosystems and special elements, thus sacrificing significant ecological and species diversity. The Wildlands Project has always emphasized a comprehensive, yet flexible, strategy for the protection of living nature. The representation of ecosystems can be an excellent starting point, but without the consideration of the ecological context, the history of land use in the region, top-down interactions, plus the requirements for large connected spaces, we have little confidence in the long-term viability of ecological reserves.

Moreover, there may be situations where a representational approach might not be adequate because it does not justify the protection of sufficient space for a viable, regional network of natural areas. In locations where vegetation diversity is low, a system of ecological reserves based only on vegetational diversity could end up being small, fragmented, and vulnerable (Flather et al. 1997). In Idaho, for example, a reserve system that protects samples of all vegetation types might sequester just eight percent of the state, much of it highly fragmented (Noss and Cooperrider 1994, Kiester et al. 1996). This is not sufficient area for the persistence of large carnivores, nor for the buffering of edge effects and area effects. On the other hand, a network of connected reserves in Idaho (or elsewhere) that maintains the viability of wide-ranging predators might require one-third or more of the landscape (Noss and Cooperrider 1994, Noss et al. 1996).

Other factors may militate against too much reliance on vegetation as a coarse filter. One of these is the pattern in which species are distributed across the land. For example, in much of Mexico, the mammalian faunas are quite dissimilar over relatively short distances (Arita et al. 1997), an example of high beta diversity. In such places, vegetational diversity may seriously underestimate biodiversity at the species level in some taxa.

Because ecological and cultural contexts differ, local conservationists and biologists are in the best position to develop tactics for the recovery of wilderness and ecological values in their regions. In practice, this means that many grassroots conservation groups will emphasize representation of habitats or protection of special elements in their reserve designs, at least in the preliminary stages. But it is a mistake to stop there. Sooner or later it is necessary to find the resources to incorporate wilderness and the entire pre-Columbian set of carnivores and other keystone species into reserve designs. Absent these, the long-term success of the continental conservation network in North America is doubtful.

A cynic might describe rewilding as an atavistic obsession with the resurrection of Eden. A more sympathetic critic might label it romantic. We contend, however, that rewilding is simply scientific realism, assuming that our goal is to insure the long-term integrity of the land community.

Rewilding with extirpated carnivores and other keystone species is a means as well as an end. The "end" is the moral obligation to protect wilderness and to sustain the remnants of the Pleistocene—animals and plants—not only for our human enjoyment, but because of their intrinsic value. The "means" refers to the vital roles of keystone species in maintaining the ecological structure, diversity, and resilience of the entire fabric of living nature. It is not helpful, however, to claim that rewilding, or any other conservation tool, is the only means we have to protect and heal the wounds of the land. In a project as complex as saving living nature, a diversity of approaches, often complementary and context dependent, will be needed.

*Thanks to Brian Miller, M. A. Sanjayan, Barbara Dugelby, Dave Foreman, Steve Gatewood, David Johns, Rurik List, Harvey Locke, Kevin Crooks, and John Terborgh for comments and suggestions.*

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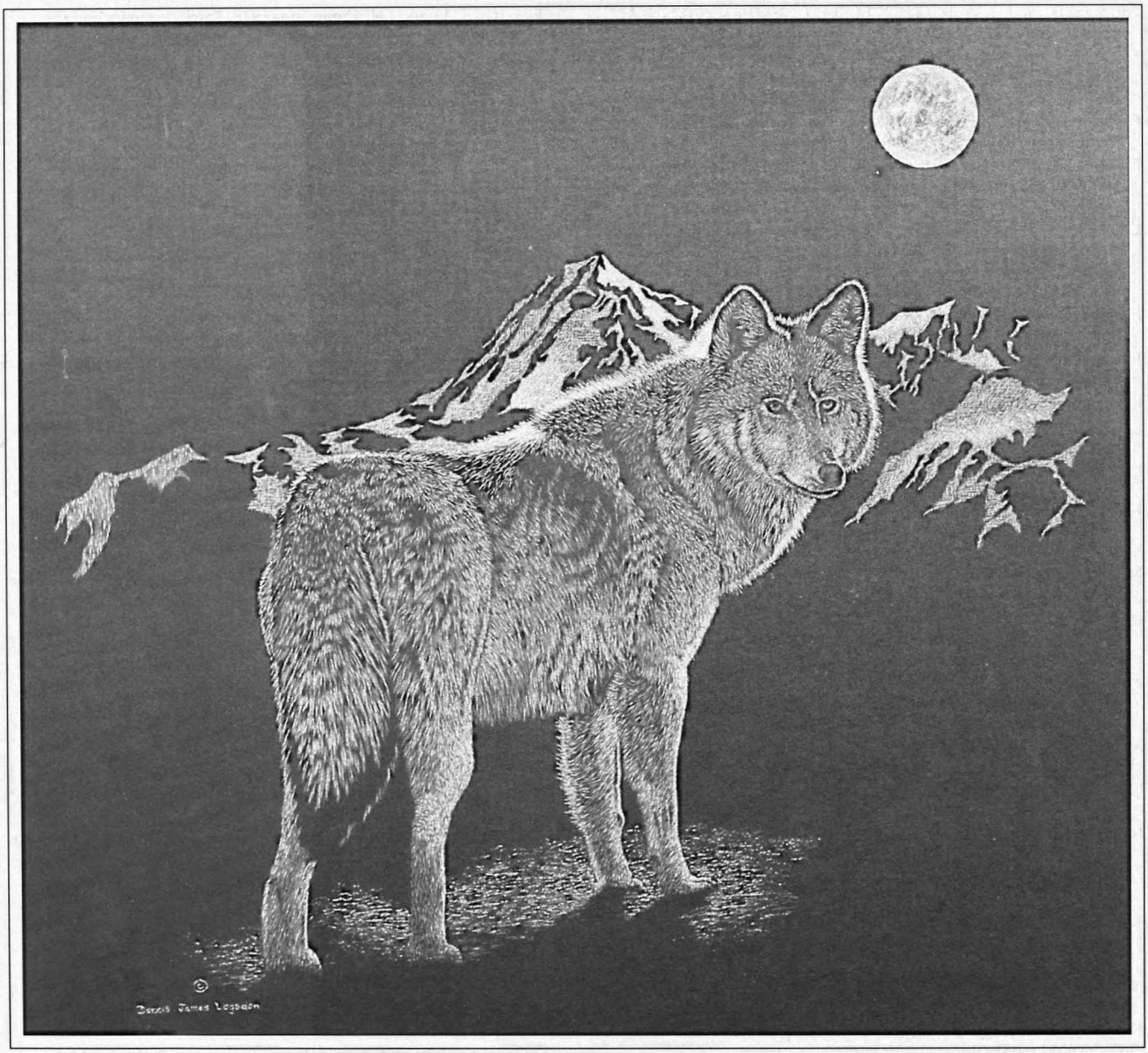


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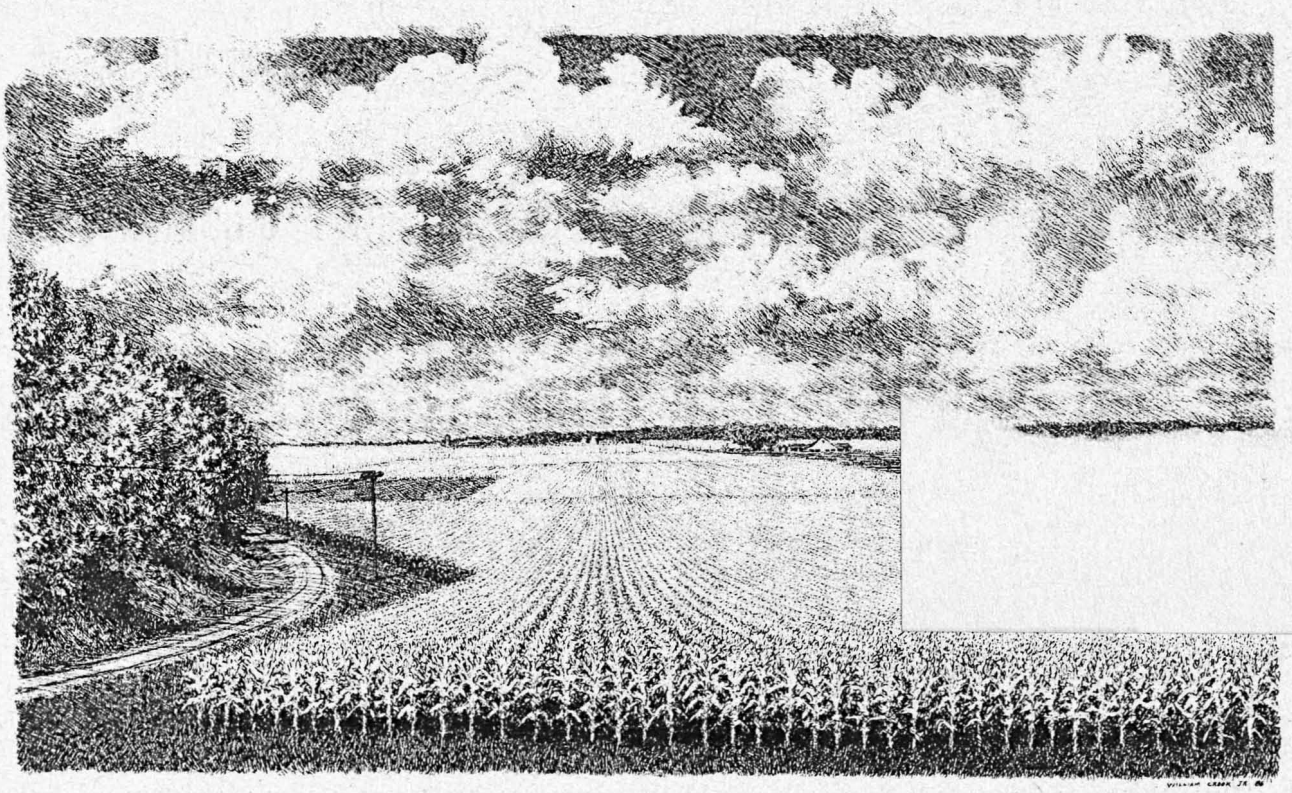
# Landscape and Imagination



by Scott Russell Sanders

Like all landscapes, that of Indiana is a palimpsest, written over for centuries by humans and for millennia by the rest of Nature. Every fence, highway, billboard, and clearing is an utterance, more or less eloquent, more or less durable. You can see, for example, in the checkerboard layout of crops and the right-angle turns of local roads the marks of a surveying grid that was imposed on all the country north and west of the Ohio River by the Land Ordinance of 1785. It was an unprecedented gesture, a Newtonian abstraction, reflecting the Enlightenment belief in reason, to ignore Nature's own contours and inscribe on the land a uniform pattern of mile-square boxes. The map of the Midwest came to resemble graph paper, each block of which, in keeping with Jeffersonian ideals, was to support a citizen-farmer. The grid encouraged the establishment of isolated, self-sufficient

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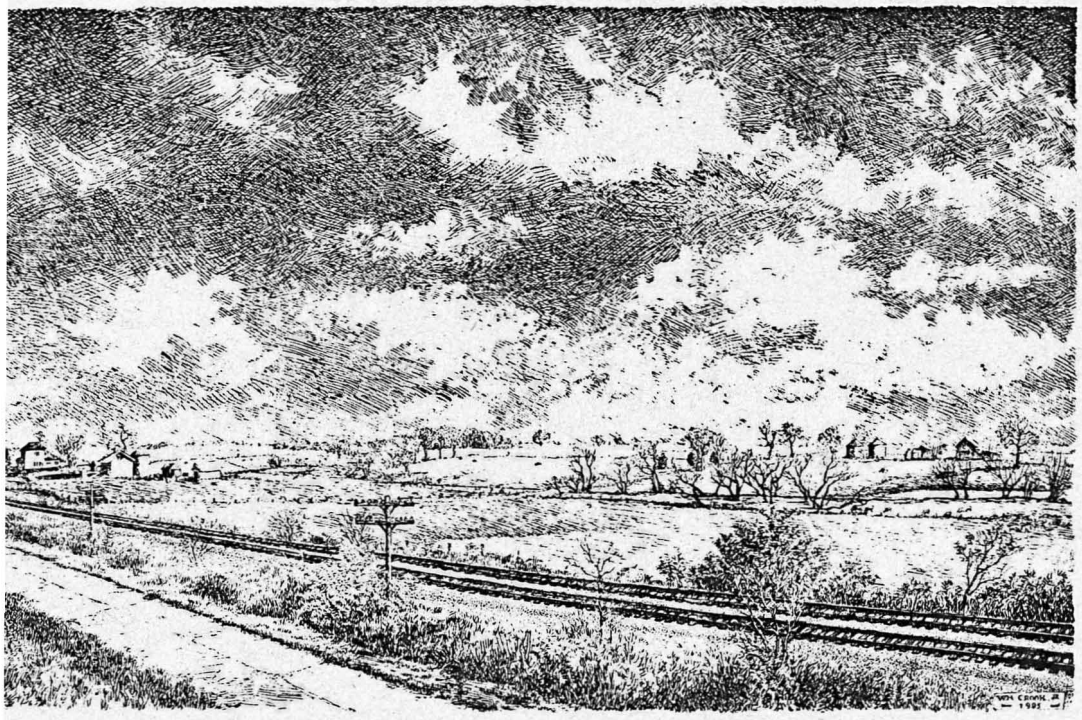
illustrations by William Crook Jr.



...to know the pleasures of an unspectacular landscape...requires an uncommon degree of attentiveness and insight. It requires one to open wide all the doors of perception. It demands an effort of imagination...

homesteads, in contrast to the village culture of New England or the plantation culture of the South. During the period of settlement, what one did on his or her property was private business, and it remains largely private to this day, which is why zoning boards and planning commissions have such a hard time here, and why in many places the Indiana countryside is a hodgepodge of contradictory visions: grain fields alternating with strip mines, stretches of woods interrupted by used-car lots, dumps in ferny ravines, trailer courts in the middle of meadows, gas stations and motels plopped down wherever the traffic flows thickly enough. In much of Indiana, the isolated freeholdings have gradually been combined into larger and larger parcels, the remnants of forest have been cut down, the hedgerows cleared, the meandering creeks straightened, the swampy lowlands drained, thus further rationalizing the landscape, pushing it toward an industrial ideal of profitable uniformity.

Native creatures inscribe their own messages on the landscape, messages that one can learn, however imperfectly, to read. Deer trails mark out subtle changes in slope. The population of butterflies and owls and hawks is a measure of how much poison we have been using; the abundance of algae in ponds is a measure of our fertilizer use. The condition of trees is a gauge of the acidity in rain. Merely finding out the name and history of a plant may deepen one's awareness of a place. For years I had admired the coppery grass that grows in knee-high tufts along Indiana's roadsides before I discovered that it is called little bluestem, a survivor from the prairies. Now I admire those luminous grasses with new pleasure, for I see them as visitors from a wild past.

I also know from books that, except for dunes and prairies and swamps near Lake Michigan, all of what would become Indiana was dense with forest when the first white settlers arrived. This means that almost every acre of soybeans and corn represents an acre of trees cut down, stumps pulled out or left to rot: oak and beech, hickory and maple, dogwood, sassafras, buckeye, elm, tulip poplar, ash. In two centuries, a mere eyeblink in the long saga of the planet, Indiana has been transformed from a wilderness dotted by human clearings to a human landscape dotted by scraps of wilderness. Today, only the southern third of Indiana is heavily wooded, but the speed with which redbud and locust and cedars march into abandoned pastures convinces me that the entire state, left to itself, would slip back into forest again within a few decades. The highways, untraveled, would succumb to grass. The barns and houses, unroofed, would succumb to rain. It does not trouble me to see our clearings as ephemeral, our constructions as perishable, for that is the fate of all human writing, whether on paper or on earth.

Despite our centuries of scrawling on the landscape, we can still read the deeper marks left by Nature—especially, in Indiana, the work of water and ice. For millions of years, while the Appalachians were being uplifted to the east and the Rockies to the west, the land that would become Indiana was forming grain by grain in the bed of an ancient ocean, as limestone, siltstone, sandstone, dolomite, shale, slate. It was and remains a placid region, at the core of the continental plate. These sedimentary rocks have never been folded, never heaved up into mountains nor deeply buried and cooked into granite or marble, never burst open by volcanoes. When the waters reced-

ed, the bedrock, exposed to wind and rain, was carved into low hills. Beginning roughly a million years ago and ending some ten thousand years ago, glaciers bulldozed down from the north, flattening the hills and filling the valleys and burying much of the Midwest beneath a fertile layer of dust and pulverized rock. In their retreat, the glaciers gouged out the stony bed of the Great Lakes and filled them with water, altered the flow of rivers, and left behind a trail of gravel and sand. In Indiana, only a thumb-shaped area stretching about a hundred miles north from the Ohio River escaped the glaciers. The limestone exposed there is laced with caves and underground rivers, pock-marked by sinkholes. Knowing even this much geological history, I look at the flat expanses of black loam, or the polished quartz in a creekbed, or the strata of shale in a bluff with a chastening sense of Nature's slow rhythms and our hasty ones.

WITHOUT THESE LESSONS IN SEEING, FROM PEOPLE AND memories and books, I might view the landscape before me as little more than a straggle of postcards. In fact, without benefit of instruction, in a territory as unglamorous as the Midwest I might fail to appreciate even the two-dimensional postcard views. Of all the regions in America, this one has inspired, I would guess, the least smugness from local people and the least rapture from travelers. People do not move here for the scenery. They do not commonly even visit here for the scenery. I have no way of checking, but I would venture that fewer landscape snapshots are taken per square mile in the Midwest than in any other part of the country, including the deserts. Millions of people drive through Indiana every year without lifting their gaze from the highway. Those who do glance aside from the line of motion tend to see only indistinguishable fields and humble hills.

I have spent enough time in the mountains of Oregon and Tennessee, the redwood forests of California, the mesa country of New Mexico, the moss-festooned bayous of Louisiana, and along the stony coast of Maine to know the pleasures of spectacular landscapes. How could anyone equipped with nerves fail to rejoice in such places! On the other hand, to know the pleasures of an unspectacular landscape, such as that of Indiana, requires an uncommon degree of attentiveness and insight. It requires one to open wide all the doors of perception. It demands an effort of imagination, by which I mean not what the Romantics meant, a projection of the self onto the world, but rather a seeing of what is already there, in the actual world. I don't claim to possess the necessary wisdom or subtlety, but I aspire to, and I work at it.

Wherever we live in America, many of those who preceded us were so bent on changing the land to suit their needs that they scarcely looked at what was native. We have only recently begun to realize how much was lost in that refusal to look. Those who preceded us here found an astonishing wealth, not only in lumber and loam and oil, but in the intricacy and beauty of life. Yet they valued almost exclusively what could be used or sold. Generations of settlers treated the land as a storehouse, to be ransacked before moving on. The fact that we dislodged Indians from their home grounds and herded them onto reservations a thousand miles away reveals how little our ancestors valued the sacred connection between a people and a landscape. We are still suffering from the Puritan habit of regarding wild Nature as demonic, a realm to be conquered and saved from the Devil. The secular version of this view treats land as raw material for profit; whatever does not yield a return in dollars stands in need of "development," which is an economic form of salvation. Thus a chorus of angry voices cries down every proposal for the creation of Wilderness Areas or the preservation of wetlands or even for restrictions on the clear-cutting of trees.

Insofar as we are nomads, adrift over the earth and oblivious to its rhythms, we cease to acknowledge the fecund mystery that sustains our existence. We take inordinate pride in our own doings. Acting without regard for the effects our lives will have upon a place, we become dangerous, to ourselves and our descendants. If our own senses fail to teach us, then disasters will, that the land is not merely a backdrop for the human play, not merely a source of raw materials, but is the living skin of the Earth. Through this skin we apprehend a being that is alien, a life unfathomable and uncontrollable, and at the same time a being that is kindred, flesh of our flesh.

It is a spiritual discipline to root the mind in a particular landscape, to know it not as a visitor with a camera but as a resident, as one more local creature alongside the Red-tailed Hawks and sycamores and raccoons. The explorations from which we return to see our home ground afresh may be physical ones, or they may be journeys of the mind, such as those we take through stories and photographs and paintings. By renewing our vision of the land, we rediscover where it is we truly dwell. Whatever the place we inhabit, we must invest ourselves there with our full powers of awareness if we are to live responsibly, alertly, wisely. ▮

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# Agriculture and Nostalgia

**by Frieda Knobloch**

The difficulty of a critique of agriculture is compounded by its cultural significance. Because agricultural development in the United States and elsewhere presents serious technological, political, and ecological questions, we need to be sure that definitions of agricultural problems and solutions to them are not part of the larger culture of agriculture that created these problems in the first place. For conservationists, agriculture is a compelling subject because it sustains growing human populations, and because all technologies of food production are powerful agents in environmental change. Agriculture welds people and the material world together inescapably, but more than this, agriculture is an especially telling reflection of people's relationship with the non-human world. Agriculture is as much about ideas as it is about food, technology, and ecological relationships. Not surprisingly, these ideas shape what food production actually looks like. They can, unfortunately, also provide what appear to be tantalizing prospects for change that do not actually challenge the basic logic of agricultural thinking.

Agriculture welds people and the material world together inescapably, but more than this, agriculture is an especially telling reflection of people's relationship with the non-human world.

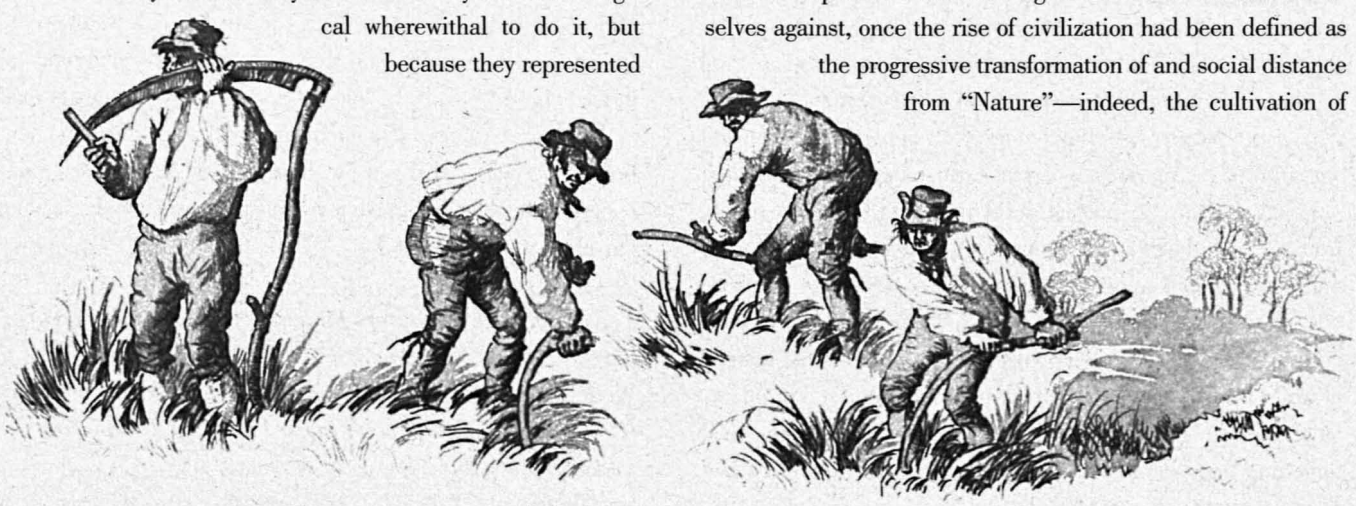
Agricultural history gives us a pretty reliable map of people's changing ideas about Nature, and of how culturally specific these ideas are. "Agriculture," as a word, is of relatively recent origin; derived from roots meaning simply cultivation of fields, it emerged in the seventeenth century to denote a particular system of food production. Its appearance marked a shift in European crop production that favored commodities for trade over food for local use. Agriculture, as distinct from food production, entailed a specific understanding of the land as untamed Nature that could be made more valuable, productive, and habitable by the exercise of technological control over its own biological activity. This shift in the purpose of crop production and conception of Nature helped further the expansion of European capitalism, both within Europe and abroad. Agriculture was central to European economic growth, through the increased production of European grain, as well as in the cultivation of sugar in the Caribbean, and rice, indigo, and later cotton in North America. Agricultural development was supported by the ambition and sophistication of emerging scientific ideas about the composition, purpose, and control of Nature, and increasing interest in agricultural experimentation. This agricultural expansion supported growing urban industrial centers on both sides of the Atlantic, brought African people into a system of trade and exploitation as laborers and as commodities, and justified the permanent establishment of colonies all over the world. (The purpose of a "colony" was inherently agricultural; the word itself is derived from the Latin word for farmer in the sixteenth

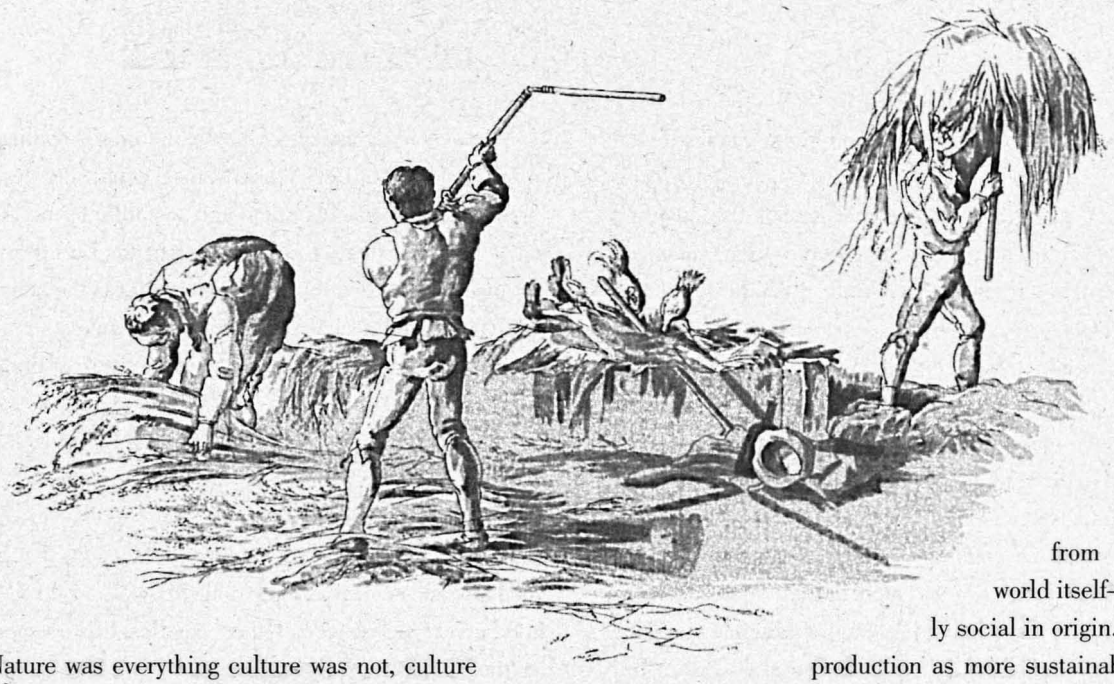
century, a time of changing patterns of crop production and land use in Europe.) Emerging European ideas about "race" and European racial superiority—as "natural" categories—justified wholesale removal of non-European people from colonized places, a history that has given us a perennially hazardous set of relationships among people now accustomed to identifying themselves by race, and between colonizing and formerly colonized nations.

Should we go looking for the evils of agriculture, they are not hard to find in the seventeenth and eighteenth centuries, and many agricultural practices that have received critical attention in the present became standard operating procedure at that time. The tendency to favor large monocultural fields cultivated by machines rather than human labor, for example, was the desired end of generations of agricultural innovators. Jethro Tull developed a grain drill and methods of mechanical tillage, publishing his findings for the benefit of other scientific farmers in 1731. Tull's work is fascinating partly because of his astute perception that grain production was a commercial activity, and might be modeled on the oldest agricultural industry in Europe—the cultivation of grapes. Grape vines were raised in rows, in permanent vineyards, as any grain might be as well. Tull was also an exemplary antidemocrat, convinced that widespread adoption of methods and machines like his would solve the problem of labor, which was simply that gentleman farmers had to depend on it at all. Farmers of means would replace the hostile and ungrateful hired hands they employed with machines.

Interest in agricultural productivity and the idea that some people are more valuable than others were of course not conceived in seventeenth-century Europe; what was new was the effort to explain natural and social phenomena in scientific terms, identifying "laws" by which the human and non-human world operated. Europeans were not justified in developing colonies merely because they had the military and technological wherewithal to do it, but because they represented the pinnacle of a *natural* development towards civilization away from savagery, a development that could be described in increasingly precise historical and scientific terms. Agriculture carried a great deal of cultural weight for European colonists because it embodied this very history: it was the singular activity that allowed a civilization to demonstrate its mastery over Nature, reenacting its emergence from Nature at the same time that commercial crop production sustained dominant social and economic systems. Nature was the ground from which civilizations developed in predictable ways, towards greater centralization, commercialization, technological sophistication, and cultural refinement. Civilizations (usually ancient) that had developed arts and sciences comparable to those of Europe were held in relatively high esteem. Other societies, less commercial, less technologically "developed," less concentrated in large permanent settlements, were regarded with contempt as children of Nature, whose evolution was not yet (or might never be) complete. The presence or absence of the plow determined whether a society was on its way towards glorious advance, or hopelessly mired in the backwardness of time. Teaching non-Europeans to farm was essential work, not merely to absorb indigenous people into new economies, but to encourage their cultural development in the broadest terms, launching them on the long path out of a state of Nature toward cultural fulfillment.

It is this problem of Nature—what it is, who its children are, what it's good for—that makes assessments of agriculture difficult. Not only have we inherited a set of technological, political, and commercial habits regarding the land and each other, but we've also inherited the tantalizing idea of "Nature" that appears so antithetical to what we've become, precisely because this is what defines the whole history of agricultural development in the first place. Inventors, traders, colonial administrators, and ideologues could not celebrate their achievements without a specific understanding of Nature to measure themselves against, once the rise of civilization had been defined as the progressive transformation of and social distance from "Nature"—indeed, the cultivation of





Nature. Nature was everything culture was not, culture being the defining point of reference. So if cultural evolution resulted in complex, ordered, urban societies, Nature represented everything that was disorderly, rural, or wild. Moreover, since the development of civilizations was progressive and inevitable—and "natural"—Nature provided the origin in *time* as well as place for the growth of human societies. Nature is what the past is made of. A more effective trap for the nostalgia of later generations is hard to imagine, because this kind of progressive, cultivating civilization cannot be what it is without Nature to transform, or the past to measure itself against, both processes which are increasingly difficult to sustain the more successful the transformation has been.

Anthropologist Renato Rosaldo argues that nostalgia, the sentiment that the past was more promising and abundant than is the future, expressed by the very people who benefited from or aided in the transformation of the past, is peculiar to imperial cultures. As we imagine more just human societies predicated on a better relationship with the land, insofar as we retain the very ideas about Nature that were born in the seventeenth century along with "agriculture," we will not have accomplished much. If it is this "Nature" we wish to reclaim from the colonizing forces of European and neo-European societies, technologies, and economies, we have missed an opportunity to understand that agricultural ideas are as unsustainable as agricultural practices. That the present develops naturally and inevitably from the past, that Nature produces and is forever altered by the natural development of civilization, that some people are more advanced in this process than others—these ideas have affected our political lives as deeply as they have altered the material world we live in. It is a mistake to cast agricultural problems as problems about understanding ecological relationships only, forgetting that Nature—as an *agricultural idea*, quite distinct from the material world itself—is profoundly social in origin. Organic food production as more sustainable than commercial, pesticide-dependent agriculture, multi-cropping to better mimic natural ecosystems, a return to nineteenth- or eighteenth-century agricultural technologies, or the retiring of agricultural land for the reason that it should never have been cultivated—all common enough agro-environmental positions, and inspiring an increasing volume of supportive scientific inquiry—do not by themselves adequately describe the *social* imperatives of agricultural change.

If we can understand the cultural work that European agriculture did, providing the iconic embodiment of specifically cultural values that justified centuries of colonial reorganization of other societies and technological and industrial innovation at the expense of working people and subsistence farmers, we can demand more from agricultural reform than healthier food and farmlands. We can also demand more than simply a "return" to some agriculture of the past. Any genuine agricultural reform has to be social at heart, understanding that the relationships we've inherited between colonizers and colonized, commodities and food, landowners, laborers, and consumers—as well as between people and what we have learned to call Nature—are largely social in origin, no matter what their environmental impacts have been. If the logic of agriculture tempts us to look at the past, at Nature, at its own origin for that imagined moment before everything changed for the worse, we can resist it, and choose instead to change what is unjust or unsustainable among ourselves in the present. ❙

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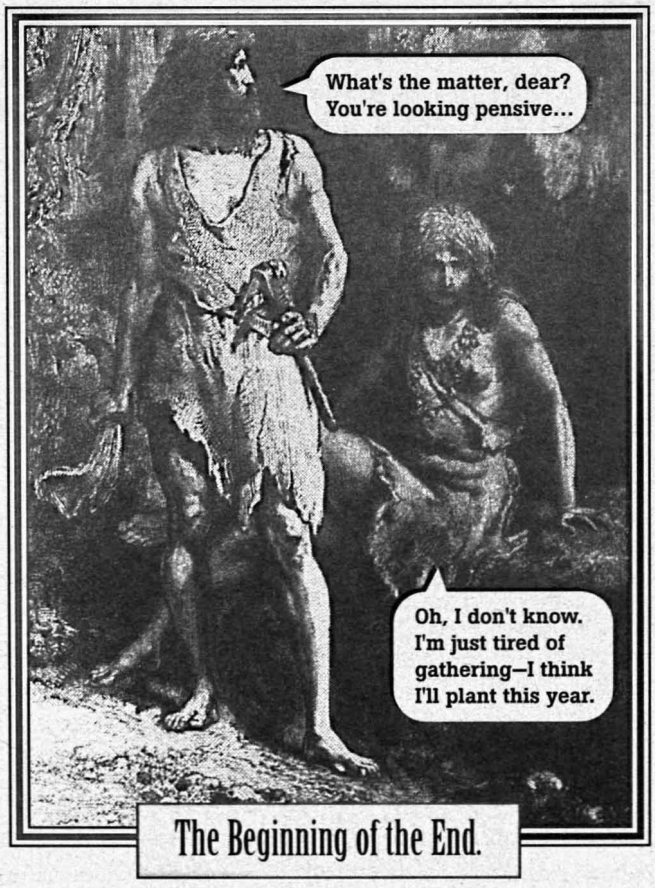
# ROMANCING the POTATO

**by Paul Shepard**

The transformation from hunter/gatherer to agrarian economies took place over the past twelve thousand years. This length of time is insignificant in terms of geological history—or, for that matter, in terms of human history which began with the appearance of *Homo sapiens* some four hundred thousand years ago, our genus, *Homo*, at two million years, and our family, Hominidae, six million years ago. Accompanying changes in the face of the land and lifestyle of the people was a concomitant alteration in perceptions of the agrarian participants. The game of comity of life and death, which the hunter/gatherers entered in the great savannas, accepting the nature of Nature, was altered by agrarian thought: from a core process of chance to one of manipulation, from reading one's state of grace in terms of the success of the hunt to bartering for it, from finding to making, from sacrament received to negotiations with humanlike deities. The transformation took place slowly and for various reasons, but the result was to concentrate populations in certain areas and make them dependent on the products of domestication.

Between about twelve thousand and eight thousand years ago this transformation in human culture took place in the eastern Mediterranean and Near East. We begin with small, semimobile groups living in what we would now call "wilderness," upon which their impact was small. Then, here and there, little patches of wheat grasses, intensified monitoring of some wild goats or sheep, and the hangdog shadows of scavenging wolves whose offspring were sometimes captured and tamed, all made little pockets of the first agriculture. The topography of ancient Mesopotamia, composed of arid lowlands, mountains, and aggrading streams whose gravel bars were the homes of annual plants in different altitudinal zones, had already resulted in different human economies. The details of the first agriculture are still being debated, but the outlines seem clear. Seminomadic hunter/gatherers in this part of the world had long since seen the last of the elephant, hippo, and rhino. Before twelve thousand years ago the elk, reindeer, horse, and great auroch were disappearing because of climatic changes. A trend in foraging was toward crabs, clams, turtles, fish, snails, waterfowl, and the cereal plants.

The first domestic plants and animals were wheat, barley, goats, sheep, and dogs. Humans have been around thirty-three times as long as the dog. Domesticated cattle are recorded at




The Beginning of the End.

*These excerpts are from Chapter VI, "Romancing the Potato," in Paul Shepard's final book,* Coming Home to the Pleistocene, *forthcoming from Island Press (800-828-1302). Printed with permission of Island Press.*

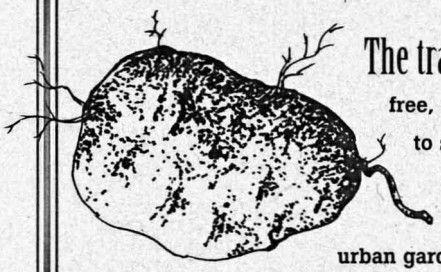
nine thousand years, and horses at six thousand. Almost any typical wild species for which there are fossils are hundreds of thousands [or millions] of years old. From an evolutionary and geological perspective, the animals and plants that share our homes and our fields came into our lives only yesterday and exist because of the protective care we have given them.

Stones, the first tools of agriculture, originally used for grinding seeds for meal, or ochre for body painting, became important implements for grinding harvested grains, and flint sickles were used for harvesting. Wild species diversity diminished. The seed heads of the grasses were selectively modified for storage and planting. Sheep, gazelle, and onager were driven and penned. Planting, storing, and keeping caprine animals and bovines spread from upper grassy slopes to intermontane plains and marshy areas. Irrigation made its appearance in the lowlands. Life was no better for humans than it had been, but the economy demanded more people to reshape production.

Domestication changed means of production, altered social relationships, and increased environmental destruction. From ecosystems at dynamic equilibrium ten thousand years ago the farmers created subsystems with pests and weeds by the time of the first walled towns five thousand years ago.[1] At least six millennia of mixed tending and foraging followed the earliest domestications, preceding the wheel, writing, sewers, and armies. In varying degrees primal foraging blended with early farming. Before cities, the world remained rich, fresh, and partly wild around the little gardens and goat pens. Extended family and small-scale life incorporating the rhythms of the world made this "hamlet society" humane and ecological. Village horticulture, relatively free of commerce and outside control, may have been an ideal life.

Keeping the hoofed animals out of the seed patches and guarding stored food reduced human mobility. The trampling of human feet and hooves around home sites, the progressive use of local wood for fuel and construction, and the accumulation of implements too bulky to carry were among the first material signs of hamlet life and domestication. Fleas, tapeworms, and other parasites were acquired from, and shared with, kept animals. Modification of the surrounding plants into "pioneer" or weed communities simplified and destabilized the environment. As the techniques for storing and corralling became part of the cultural skills, cattle and vegetables were added. Fences made their appearance, and domestic plants and animals created a new company of altered forms.

Wild things retreated into the distance, and the mix of garden, pasture, dwellings, weeds, kept animals, lice, cockroaches, bedbugs, house mice, rats, and other inhabitants of simplified



**The transition from a relatively free, diverse, gentle subsistence to suppressed peasantry yoked to a metropolis is a matter of record. Today's urban gardeners and neo-subsistence people clearly long for genuine contact with the nonhuman world of Nature, independence from the market, and the basic satisfaction of a livelihood gained by**

communities filled the phenomenal and economic world. With irrigation, cultivation, and the rest of the routine round of obligatory labor, the human environment probably seemed in any one lifetime inevitable and unchanged. The ancient human acceptance and affirmation of a generous and gifting world was replaced by dreams of plenty in circumstances that made their fulfillment possible only in boom years. Domestication would create a catastrophic biology of nutritional deficiencies, alternating feast and famine, health and epidemic, peace and social conflict, all set in millennial rhythms of slowly collapsing ecosystems.

The complexity of social problems associated with domestication are difficult to understand but may have been due to sedentism. Was it because primitive peoples quit being nomadic that they became subject to scarcity and greed for things? There seems to be little doubt that political complexity increased with sedentism, but was that the result of power struggles over resources or the subtle effect of the proximity to one's neighbors, of being fenced in?[2] Perhaps the containment and the struggles for property and power cannot be disentangled. The potlatch people, sedentary fishermen, have the same troubles of power and influence that beset planters. Social conflict and competition arise in both cases, implying that sedentism is indeed at the heart of the problem.

Genetically the process of domestication is no different than adaptive change among wild species, a parallel which Charles Darwin intuitively recognized and which accounts for his interest in domestic pigeons and other farm animals. It takes only about fifty generations to alter a group of animals to the extent that it can be distinguished from its wild cousins. The production of new breeds and varieties of cats and dogs by humans demonstrates how rapidly "evolutionary" change can occur when directed by human selection.

The crucial factor in the keeping of animals that results in their biological alteration and renders them unfit to live in the wild is not simply captivity. Their genetic makeup is not altered by confinement. It is *breeding* in captivity that changes their

illustration by Justin Chapman

**their own hands. But the side-effects of agriculture cursed the planter from the beginning. Faced with forced farming, Chief Washakie of the Shoshones said: "God damn a potato." Sooner or later you get just what the Irish got after they thought they had rediscovered England in a spud. —PAUL SHEPARD**

genetic constitution. Selection of animals for visible "desirable" traits (size in dogs, milk in cows, wool in sheep) may make them unfit in other unseen ways (smaller brains, bone and skeletal problems, abnormal development, etc.). There is a self-culling in inbreeding, as some die or will not reproduce in captivity, but this does not offset undesirable traits that may be passed on.

Wild ecosystems have a higher diversity index (number of species per number of individuals), more niches, greater stability, higher net primary productivity (with less effect on the whole by the removal of a single species), higher structural and functional complexity, and greater population stability than cultivated systems.[3] The consequences for captive and domesticated animals were reduction in size, piebald color, shorter faces with smaller and fewer teeth, diminished horns, weak muscle ridges, and less genetic variability.[4] Poor joint definition, late fusion of the limb bone epiphyses with the diaphyses, hair changes, greater fat accumulation, smaller brains, simplified behavior patterns, extended immaturity, and more pathology are a few of the defects of domestic animals. All of these changes have been documented in direct observations of the rat in the nineteenth century, by archaeological evidence, and by animal breeders in the twentieth century.[5]

The total number of species domesticated is minuscule compared to the number of wild forms. But weedy, wild forms, incidental parasites, and other plant, insect, arthropod, and rodent fellow travelers accompanied the domestic organisms and became interlocked with them as agriculture spread. An association of plants and animals emerged together with the human social and technological accoutrements of agriculture. As this human-dominated association replaced wild communities, drastic alterations were wrought in the microbial flora and invertebrates of the soil and water. So long as there were relicts of the wild habitats, the smaller, unobtrusive wild forms survived at the fringes or in the wild places between human settlements, while the larger mammals and birds tended to be excluded as competitors or were overhunted. But as people began to till the earth, other species were categorized as the enemy.

SPECIALIZED FARMERS HAVE ALWAYS BEEN BASIC adjuncts to large societies and, hence, are linked by psychological as well as economic ties to urban dwellers. The agrarian mode was (and is) unstable. City anxieties about food are therefore independent of city control. "Sooner or later," observes Robert Allen, "increasing population and demands on land resources led to subdivision and fragmentation and relapse toward bare subsistence economy...checked by the reorganization of agriculture on an estate or feudal basis with the inevitable consequences of serfdom and slavery...which, unless placated with 'bread and circuses,' represented a continual menace to the ruling classes and the security of the state."[6]

The fantasy of agriculture as bucolic is the city person's fiction, who sees nothing of the resentments, the drudgery, or the intellectual vacuum. Perhaps it should be called "the wooden shoe delusion"—that cute object sold in gift stores which conjures up the clean little Dutch boy with his finger in the dike, beautiful fat cows in the background, while in reality the wooden shoe was the precursor to the rubber boot, worn by those who had to walk about in wet manure. Economists have their own pipe dream. Douglas C. North and Robert Paul Thomas see agriculture as man's "major breakthrough in his ascent from savagery to modern civilization" leading to individualized property rights and improved labor efficiency.[7] Like others they seem unable to get past the notion that maximized productivity is the ultimate good.

The historian's assumption that farming favored more security, longer life, and greater productivity has been challenged by a student of foragers, Marek Zvelebil, who says that "when the reassessment [of postglacial hunting and gathering] is complete, foraging in postglacial forests will be considered a development parallel with agriculture and one that, for a time at least, was equally viable as a form of subsistence."[8]

The rural countryside seems a wonderful escape both from Nature and from the city. The first sentence in the preface to an anthology on domestication by Ucko and Dimbleby begins: "The domestication of plants and animals was one of the greatest steps forward taken by mankind."[9] After all, the idyll of the family farm, the Jeffersonian yeoman, the mental and spiritual relief of rural existence is a heritage of civilization. It seems to have what hunting/gathering does not: retrievability. The agrarian life is only a generation or two away—indeed, only a few miles away in bits of countryside in Europe and America. After all, it may incorporate some hunting and gathering, as though creating the best of all possible worlds. Such a gardenlike, subsistence-oriented horticulture shades almost imperceptibly from a foraging life. At this boundary farming was probably once relatively benign, a satisfactory way of being human without the colossal

illustration by Jay Tatara

destructiveness to which "modern" agriculture and its urban doppelgänger have led us.[10]

Even so, if there is a single complex of events responsible for the deterioration of human health and ecology, agricultural civilization is it. At its worst, agriculture is industrial and corporate, poisoning the whole planet with chemical compounds not found in Nature. It has made plants and animals into what geneticist Helen Spurway calls "goofies," the deformed animals whose wild genetic homeostasis has been destroyed.[11] ▌

*The preceding essay is adapted from* Coming Home to the Pleistocene, *completed by Paul Shepard just before his death in 1996, and edited by Florence Shepard. The book is scheduled for release by Island Press/Shearwater Books in September 1998. Paul Shepard was Avery Professor Emeritus of Human Ecology at Pitzer College and the Claremont Graduate School. His books include* The Others, Traces of an Omnivore, Nature and Madness, *and* The Tender Carnivore and the Sacred Game.

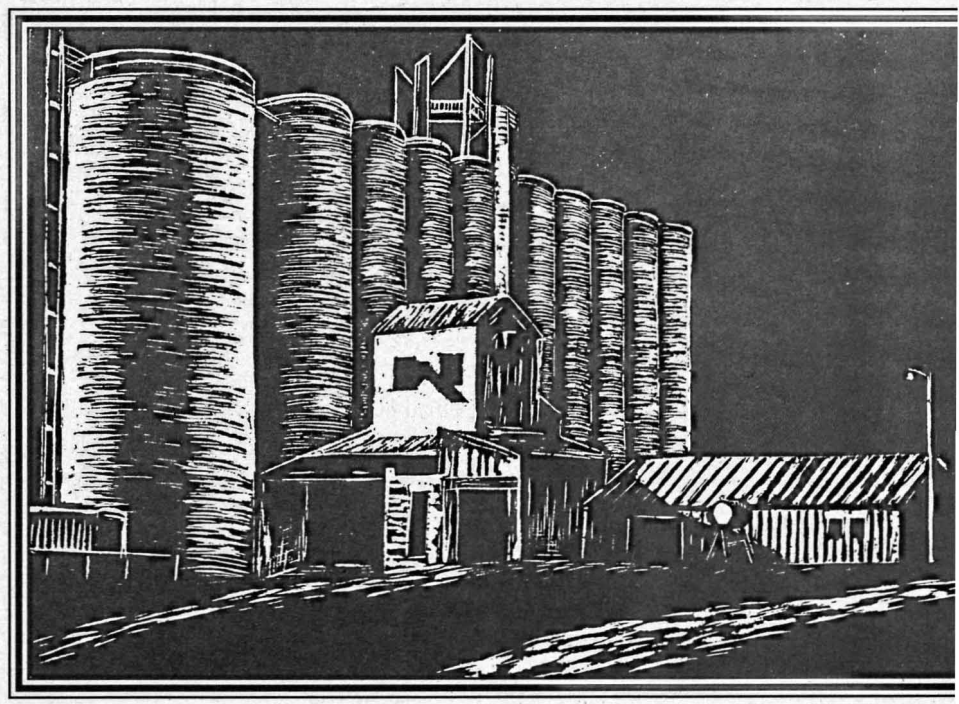


illustration by Lezle Williams

**NOTES**

1. Kent Flannery, "Origins and Ecological Effects of Early Domestication in Iran and the Near East," in Peter J. Ucko and G.W. Dimbleby, eds., *The Domestication and Exploitation of Plants and Animals* (Chicago: Aldine, 1969), pp. 73-100.
2. Susan Kent, "Cross-Cultural Perceptions of Farmers and Hunters and the Value of Meat," in Susan Kent, ed., *Farmers as Hunters* (New York: Cambridge University Press, 1989), pp. 1-17.
3. David R. Harris, "Agricultural Systems, Ecosystems, and the Origin of Agriculture," in Peter J. Ucko and G.W. Dimbleby, eds. *The Domestication and Exploitation of Plants and Animals* (Chicago: Aldine, 1969), p. 4.
4. Inherited pairs of chromosomes that are different in their genetic makeup (heterozygous) provide the organism with a wider range of characteristics for responding to environmental circumstances and changes. Whereas this is more apt to be the case among wild populations of animals and normal human populations where breeding is not controlled, the chromosomal pairs in domestic animals that are inbred are more likely to have the same genetic constitution (homozygous) and thus have less genetic variability and ability to adapt to environmental changes.
5. R. J. Berry, "The Genetical Implications of Domestication in Animals," in Peter J. Ucko and G.W. Dimbleby, eds., *The Domestication and Exploitation of Plants and Animals* (Chicago: Aldine, 1969), pp. 207-217.
6. Robert Allen, "Food for Thought," *Ecologist,* January 1975, pp. 4-7.
7. Douglas C. North and Robert Paul Thomas, "The First Economic Revolution," *Economic History Review* 30(2) (1977):229.
8. Marek Zvelebil, "Postglacial Foraging in the Forests of Europe," *Scientific American,* May 1986, p. 104.
9. Peter J. Ucko and G.W. Dimbleby, eds., *The Domestication and Exploitation of Plants and Animals* (Chicago: Aldine, 1969), p. ix.
10. Among those who see in garden agriculture not only a worthwhile existence but a more practical solution to the difficulty of arranging our individual lives (rather than talking about hunting and gathering) are three American writer-farmers whom I admire enormously. They are Gary Snyder, the poet in the Sierra Nevada of California, who speaks so eloquently of the ties with the earth gained in place with the work of one's own hands; Wes Jackson, whose genius has flowered at his Land Institute in the prairies of central Kansas for shifting crops away from cultivation, from the use of chemical fertilizers and pesticides, and omitting overbred crop varieties; and Wendell Berry, the poet-farmer on his land in Kentucky, celebrating the best synthesis of Nature and culture in the performance of such independence and virtues that subsistence fosters. I have repeatedly inveighed against all three for not pushing the thesis of an undiluted model of primal life to its conclusion. But of course I have known all along that there is no way, literally, for many people to achieve that final recovery of our truest being: to live wholly an authentic Pleistocene existence. And I know that simple farming with the protection of the immediate habitat is still possible for thousands of people—indeed, for millions, even in cities—if we can drive the corporate interests off the land. In the next-to-best of all possible worlds, I would welcome a triune of Berry, Jackson, and Snyder, empowered to take charge of the use of the continent, because I know that in spite of their grasses, legumes, or even potatoes that the wild world would survive in peace around them. May their Neolithic consciousness prosper—and prevail.

    I have criticized them all, but I confess to a kind of in-house bickering. The quality of life that they themselves live, as nearly as one can see it from the outside, is superb. If the world could be put in their hands it would recover much of the best of the precivilized world of the Pleistocene. The bones I have to pick with them are surely those remaining from a shared hunt and meal—pieces to be mulled over (to mull, from a root word meaning "to grind" or "to pulverize"), which I take to mean that we are sitting at a fire together, breaking the femurs of deer to get at the marrow of things.

    Snyder has said that the intent of American Indian spiritual practice is not cosmopolitan. "Its content perhaps is universal, but you must be a Hopi to follow the Hopi way." This is a dictum that all of us in the rag-tag tribe of the "Wannabes" should remember. And he has said: "Otherworldly philosophies end up doing more damage to the planet (and human psyches) than the existential conditions they seek to transcend." But he also refers to Jainism and Buddhism as models, putting his hand into the cosmopolitan fire, for surely these are two of those great, placeless, portable, world religions whose ultimate concerns are not just universal but otherworldly. Yet from what I have seen of his personal life, there is no contradiction. I suspect that Snyder, like Berry and Jackson, is not so much following tradition as doing what Joseph Campbell called "creative mythology."
11. Helen Spurway, "The Causes of Domestication," *Journal of Genetics* 53(1955):336-337.

# Can Agriculture and Biodiversity Coexist?

by Catherine Badgley

For the first time in 65 million years, the world is in the early phases of a mass extinction that, like earlier mass extinctions, is geographically, ecologically, and taxonomically broad (Wilson 1992, Jablonski 1991). The human population continues to grow, and more people are consuming greater amounts of meat (Brown et al. 1995)—raising the demands upon the agricultural productivity of the world. Furthermore, agricultural lands are increasingly dominated by the industrialized model of agriculture, which is neither ecologically nor socio-economically sustainable. These trends are linked. Most of the world's biodiversity resides in the ecosystems of developing countries at low latitudes, where rates of human population growth and conversion of land for agriculture are relatively high. In these tropical and subtropical regions, current levels of habitat transformation threaten the extinction of 10 to 25% of the world's species within the next century (Wilson 1992). The appropriation of land for agriculture is also extensive in temperate regions, including Europe, North America, and China, but fewer species face outright extinction because of lower species diversity and generally larger geographic ranges of species at higher latitudes (Rapoport 1982, Stevens 1989).

One of the many reasons to implement more sustainable forms of agriculture is to reduce the effects of agricultural practices on native biodiversity. (Here, agriculture refers to intensive farming of domesticated plants or animals, and includes the pasturing of animals.) More than any other human activity, agriculture has the greatest collective negative effect on Earth's biodiversity—through habitat transformation, displacement of populations of native species, introduction of non-native species, and pollution of terrestrial and aquatic ecosystems with agricultural inputs and by-products. Yet, agricultural practices that could reduce this conflict are well within our grasp.

More than any other human activity, agriculture has the greatest collective negative effect on Earth's biodiversity.

## Global Impacts of Agriculture

The primary cause of current species extinctions and the listing of species as Endangered is habitat destruction (Vitousek et al. 1997). It has been estimated that as much as 40% of global net primary productivity—the base of all food chains—has been appropriated by humans and their commensal species (Vitousek et al. 1986). On land, the lion's share of this appropriation involves agriculture. Of the 8.9 billion hectares (ha) of the Earth's land area that are capable of supporting substantial vegetation, 1.5 billion ha are currently used for production of agricultural crops and 3.3 billion ha are used in pasturing livestock (Wackernagel and Rees 1996). Agriculture is the leading cause of habitat destruction in terrestrial ecosystems.

Globally, humans use over half of the freshwater runoff that is reasonably accessible (Postel 1992, Vitousek et al. 1997); about 70% of this water goes to agriculture. Agriculture also contributes to the amplification of two of the major biogeochemical cycles—the nitrogen cycle and the carbon cycle. Agricultural activities at present are doubling the global rate of nitrogen fixation (Matson et al. 1997) and contributing to the global increase in the concentration of $CO_2$ through deforestation, the associated burning, and the fossil-fuel use in farming.

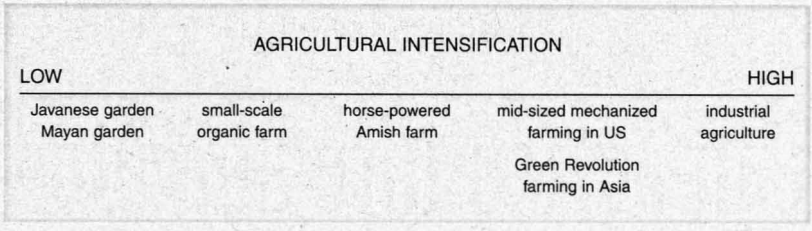



**Figure 1.** **Farming methods along a spectrum of agricultural intensification, loosely based on Vandermeer and Perfecto (1995). The main concept here is the degree of transformation of the agroecosystem from the original ecosystem, not yield per unit area or sustainability.**

Patterns of food consumption exacerbate the environmental impacts of agriculture. While affluent societies enjoy unprecedented levels of variety and quantity of basic and luxury foods, about 15% of the human population is chronically malnourished (Brown and Kane 1994). Most underfed people live in developing countries at low latitudes, generally areas of high biodiversity. The per-capita consumption of animal products is on the increase, especially as standards of living rise in many developing countries. Much more land is required to grow food in the form of animal products than in plant products, because of the energy loss through food chains. Hence, animal products are ecologically expensive compared to plant foods.

The driving forces of agriculture's impact on biodiversity include three interlinked factors: the size of the human population and basic human needs for sustenance; political and economic barriers to food and land security for the rural poor, resulting in continuing encroachments on pristine habitat; and the prevalence of industrial, Green-Revolution agriculture.

Below, I review the range of modern agricultural practices and describe contexts in which agriculture has a negative impact on biodiversity. Then I present some of the more ecologically benign agricultural practices employed today. These practices, particularly if taken together, should allow a much greater accommodation of local biodiversity than now occurs over much of the world.

## Modern Agricultural Practices

By its very nature, farming displaces populations of some species to favor the access of others—usually domesticated or non-native—to local resources; thus, it represents managed ecological competition between the agricultural species and the pre-empted species. This is the primary basis for the conflict between agriculture and native biodiversity.

Farming has been practiced for about 10,000 years, and the diversity of agricultural practices today reflects some of the stages in this history. In less industrialized regions of the world, some widely used farming methods differ little—in terms of the lands cultivated, the crops planted, and the tools and labor involved—from practices in the same region over the last several thousand years. By contrast, in industrialized regions, the intensive, large-scale production of monocultures involves crops, machinery, and soil additives that are products of the second half of the twentieth century.

Farming practices can be placed on a spectrum of agricultural intensification (Vandermeer and Perfecto 1995). (A single spectrum does not capture all of the important variation in practices but will suit our purposes here.) At one end of the spectrum are the agroecosystems that bear a strong resemblance to the native, pre-agricultural ecosystems of a region. Practices that give rise to these agroecosystems are often called "traditional" or "indigenous." They include the family subsistence farms of many cultures and often support many kinds of plants and animals. In some regions of the world, traditional farmers cultivate many native species as well as introduced crop species.

At the other end of the spectrum are the highly regulated monocultures of modern industrial agriculture, dependent on synthetic fertilizers, pesticides, and heavy machinery. These agroecosystems do not resemble any natural ecosystems and represent the most substantial transformation of the original native ecosystem, both in terms of displacing native biodiversity and altering soil-forming processes. Modern industrial agriculture is prevalent in the industrialized nations and is expanding in many developing nations.

Many practices are intermediate in terms of agricultural intensification. For example, Amish horse-powered farming in the United States and Canada usually involves conversion of original forest to fields of grain or pasture, but the use of horses rather than tractors and of manure rather than synthetic fertilizer usually results in sustained soil structure and texture (Berry 1977). Figure 1 demonstrates the position of several kinds of farming on a spectrum of agricultural intensification.

Figure 2 illustrates how several ecosystem properties may vary in relation to this spectrum. These patterns are hypothetical, because few studies address these issues quantitatively.

Soil health (fig. 2a) refers to the physical structure and chemistry of soil that permit high rates of nutrient cycling and water retention, as well as low rates of erosion, as occurs in most undisturbed ecosystems. In agroecosystems, soil health declines as a function of the frequency and magnitude of physical and chemical disruption (Matson et al. 1997). Relative to undisturbed soils, soil health probably declines under any agricultural regime. The decline is relatively small under low-intensity

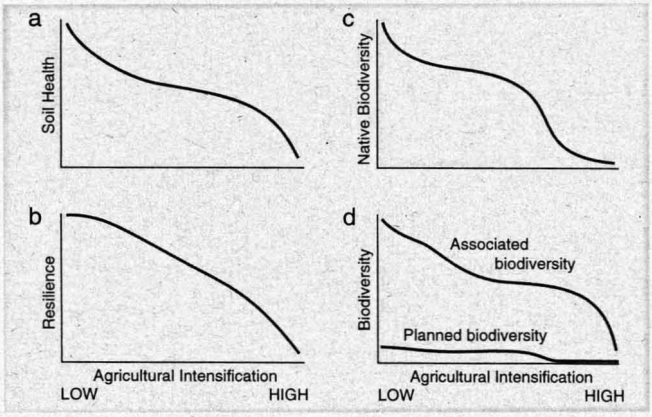
farming and increases at a variable rate with different farming practices. Soil health should decline sharply in proportion to the scale and frequency of mechanized farming.

Resilience refers to the ability of an ecosystem to recover from a substantial perturbation, such as a fire, hurricane, or clearcutting of the natural vegetation. Resilience should be high under low-intensity agriculture (fig. 2b), especially if the physical structure of the native ecosystem is maintained (Soule and Piper 1992). Resilience should decline as the agroecosystem departs to a greater degree from the natural ecosystem. The decline is especially rapid under mechanized farming because soil health decreases as well.

Figure 2c-d illustrates trends in biodiversity along this spectrum. Three aspects of biodiversity are relevant. The first is the original **native biodiversity**—the array of plants, animals, and other organisms that inhabit a particular area—prior to farming. This array of species is dynamic but fluctuates around a characteristic level for each ecosystem. In terrestrial ecosystems, most of the native biodiversity consists of insects and plants (Wilson 1992). Agroecosystems have "planned biodiversity" and "associated biodiversity" (Vandermeer and Perfecto 1995). The **planned biodiversity** is what the farmer intentionally raises, and typically consists of introduced species or domesticated varieties of local wild species. The **associated biodiversity** includes species that interact with the planned biodiversity, through processes such as pollination, predation, and competition. The associated biodiversity is drawn mainly from what remains of the native biodiversity; if non-agricultural, introduced species—such as starlings or purple loosestrife in parts of the United States—are at large in the ecosystem, then they are part of this component.

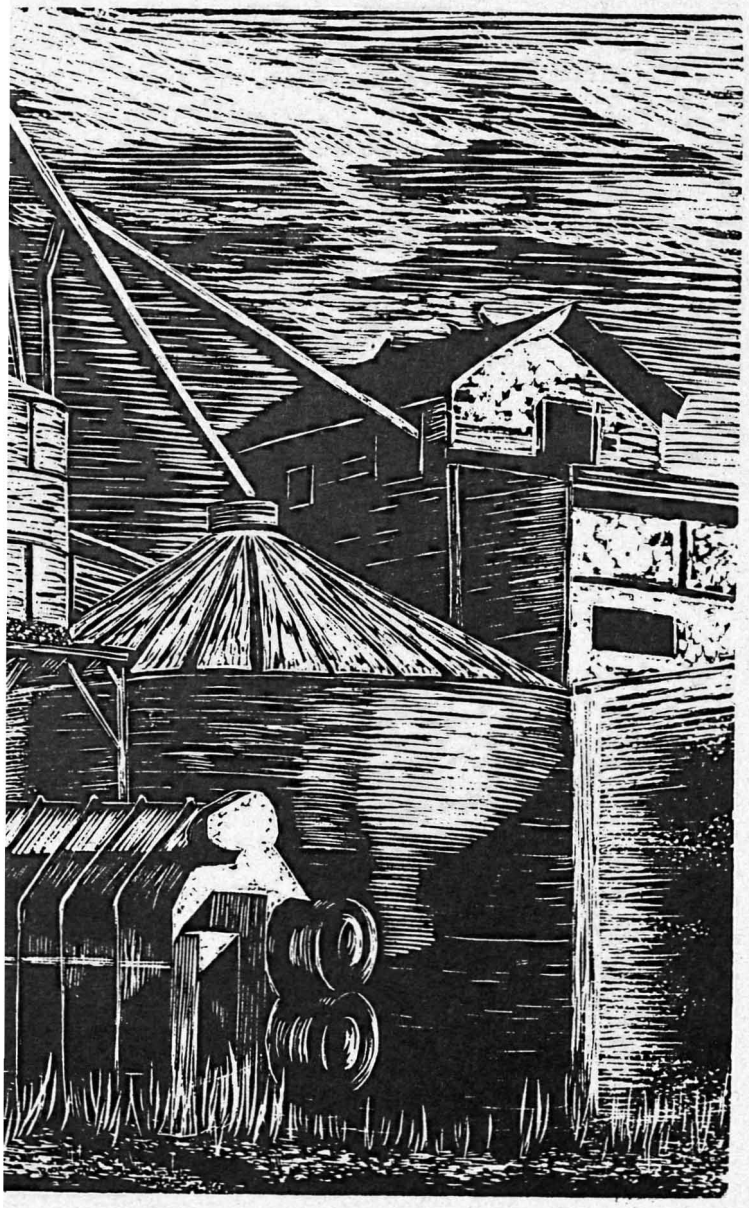
Native biodiversity tends to be displaced within agroecosystems. Its curve should show an initial drop, even under low-intensity farming (Vandermeer and Perfecto 1995; fig. 2c). Additional declines are probably gradual up to the point of mechanized farming. The extensive use of chemical pesticides affects not only the targeted pest species but also many non-targeted species, so native biodiversity should decline substantially under industrial agriculture. The planned biodiversity of agroecosystems—which can entail tens to hundreds of species, including native ones, under some forms of indigenous agriculture (Vandermeer and Perfecto 1995)—is still low compared to native biodiversity (fig. 2d). The planned biodiversity should remain nearly level across most of this spectrum to the point of mechanized farming. Mechanized farming favors the large-scale production of monocultures, with extremely low planned biodiversity. The associated biodiversity should be relatively high across much of this spectrum, with a slow decline as intensification increases. A major drop should occur when chemical pesticides are routinely applied, because many non-targeted species are affected. Whether pesticides are applied by one person with a hand-powered sprayer to individual plants or by a crop-dusting airplane over many square kilometers, much of the associated biodiversity is severely reduced.

**Figure 2.** **Changes in ecosystem properties in relation to agricultural intensification. Horizontal axis is the same as in Fig. 1. Fig. 2 (a) Soil health (texture, structure, biota, nutrient cycling). (b) Resilience, the ability to recover from perturbation. (c) Native biodiversity—the plants, animals, fungi, and other biota of the original ecosystem. (d) Planned biodiversity—the agricultural plants or animals intentionally raised in an agroecosystem. Associated biodiversity—species in addition to the planned biodiversity that inhabit the agroecosystem. The relationships depicted are speculative.**




Sustainability in the context of farming refers to the ability of agroecosystems to persist in a productive manner for many human generations. Low-intensity agriculture may have high sustainability, because natural ecosystem processes are little modified. But even many indigenous practices have proven unsustainable on the time scale of centuries to millennia, particularly under semi-arid climates. Southwick (1996) summarizes examples of formerly prosperous, rich farmlands in the Middle East, North Africa, China, and North America that are now almost uninhabitable because farming practices of centuries ago (under non-mechanized agriculture and at fairly low population densities) led to desertification.

Sustainability should decline at a low rate across a range of small-scale agricultural practices, then decrease rapidly under regimes of mechanized farming. A major weakness of modern industrial agriculture is that extraordinarily high productivity is maintained by adding to the system greater and greater quantities of energy and materials, as soil health becomes degraded. Without regular inputs of fossil-fuel based fertilizers, the fertility plummets; and because rates of soil erosion are quite high under industrial agriculture, even degraded soils are disappearing rapidly. Thus, these systems do not have the ability to persist for many generations.



These ecosystem features decline in relation to agricultural intensification, but the pattern of decline may vary in relation to numerous factors. The curves in fig. 2 are hypothetical in the sense that they are based on general observations over a wide range of circumstances but not on a large accumulation of measured variables. Important goals of future research are to quantify these relationships with case studies in different regions and to identify thresholds in the decline of native biodiversity.

## Losses of Biodiversity Due to Agriculture

Estimates of current extinction rates range from two to four orders of magnitude greater than "background" extinction rates (e.g., Southwick 1996). Facing extinction are 11% of birds, 18% of mammals, 5% of fish, and 8% of plant species (United Nations Environment Program 1995). Wilson (1992) estimates that 27,000 species per year are now being lost due to tropical deforestation alone. The major processes that cause extinction or endanger species are physical removal of habitat, displacement by introduced species, pollution of habitat, and overharvesting, according to the International Union for the Conservation of Nature and Natural Resources. Habitat destruction—including clearing of vegetation, supplanting one kind of vegetation with another, urbanization, and pollution—is a significant cause of extinction or endangerment for over 90% of the affected species.

Several activities specifically associated with agriculture contribute to the loss of biodiversity at the regional or local scale:

**Habitat Loss and Fragmentation.** Many ecosystems have been significantly reduced in area, primarily because of conversion of the original vegetation to farmland or pasture (Noss and Peters 1995). Examples include the North American prairie and many kinds of lowland tropical rainforest. The reduction in habitat size, accompanied by fragmentation of the native vegetation, results in smaller, scattered populations of native species in patches of the original ecosystem. Populations in each individual patch are much more vulnerable to disappearance than are larger populations over a greater area, especially for species with low dispersal abilities. Species with very small geographic ranges or small population sizes are especially vulnerable to extinction under these circumstances. In Australia, several species of native marsupials and native rodents are extinct or endangered as a result of overgrazing by introduced livestock and habitat conversion for agriculture (Strahan 1995).

**Disruption of Natural Processes.** Soil degradation and erosion, contamination of local aquatic systems with silt or pesticides, and loss of micro- and macrobiota may result from agricultural practices. In Michigan, three species of stream fishes have been extirpated and another three reduced to relict populations as a result of siltation of stream habitat or pesticide contamination from adjacent agricultural lands (Smith 1990). In monocultural agroecosystems, insect pest species are fewer in number but greater in abundance than in untransformed ecosystems (Matson et al. 1997). Fertilizer applications may contribute to outbreaks of pathogens or insect pests.

**Extirpation of Large Mammals.** In North America, most native ungulates and large carnivores have experienced substantial range reductions resulting from habitat conversion, hunting, or government-sponsored predator control programs that benefit livestock producers. Examples include bison, bighorn sheep, elk, grizzly bears, and wolves (Matthiessen 1987). In the United States outside



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Alaska, wolves were nearly exterminated not because they posed a direct threat to people but because they occasionally preyed on livestock. As a result, prey species (e.g., deer, rodents) of these predators increase in population densities and may become subject to additional control programs. Thus, loss of predators is also a loss of important ecological interactions among species.

**Exotics.** Competition with introduced species may result from the highly managed support of agricultural crops as well as from the less managed or unintended spread of other exotic species. Arid grazing lands in the western United States were seeded with non-native grasses that now dominate native grasses in many areas (Ferguson and Ferguson 1983). Bees introduced both for honey and pollination of crops strongly compete with native bees and bumblebees for nectar and pollen (Buchmann and Nabhan 1996).

**Soil Degradation and Pesticides.** All agriculture involves some disturbance of the soil. Plowing, tilling, cultivating weeds, harvesting crops, and grazing livestock are all disruptive processe, particularly if performed too often or with very heavy equipment, as under most mechanized farming. As soil structure and texture are degraded, the soil holds less water, recycles nutrients more slowly, and is more prone to erosion by wind or water. Eventually, the soil biota diminishes—leading to a further decline in soil structure and function. Severely degraded soil may take decades to millennia to recover (Wilken 1995). Soil erosion is a substantial problem: 80% of agricultural lands show moderate to severe soil erosion (Pimentel et al. 1995). In the United States, the average rate of soil erosion is the equivalent of one inch in 20 years; to form an inch of soil requires 300 to 1000 years (Southwick 1996).

Synthetic insecticides and herbicides contribute to the loss of biodiversity through reduction or elimination of both targeted and non-targeted species. Worldwide, five million tons of pesticides are applied to crops every year (Matson et al. 1997). Few pesticides are species-specific, so their application generally affects many more local populations than the intended ones; soil organisms are often among the unintended victims. Some pesticides remain in the exposed organisms after application and then accumulate in the tissues of their predators and the predator's predators and so on. This process of bioaccumulation means that pesticides may ramify extensively through the food webs of a local ecosystem (Carson 1962). Many pesticides are endocrine disrupters (Colburn et al. 1996). Genetic engineering of crops is now at the cutting edge of industrial agriculture. While publicized as safe and ecologically benign, many such crops contain genetically engineered resistance to a particular pesticide so that more of that pesticide can be applied to weeds in the same field (Union of Concerned Scientists 1997).

Some of these negative effects have accompanied agriculture through its history, whereas some are more recent. Certainly modern industrial agriculture represents a new level of intensification, with its synthetic inputs and heavier equipment (Soule and Piper 1992). Also, the average farm size has increased under industrial agriculture, with fewer families engaged in farming. As farm size has increased, woodlots, hedgerows, and shelter belts have been removed, resulting in reduced protection against soil erosion and reduced habitat for wildlife.

Biodiversity is not the only victim of the intensification of agriculture in the twentieth century. The trend toward larger and larger farms has impoverished many rural communities in industrialized countries (Jackson 1996). Pressure to adopt the industrial model of agriculture is increasing in the developing world as well, frequently assisted by large corporations based in industrialized nations (Vandermeer and Perfecto 1995). The globalization of commerce in food has meant that the negative ecological and economic effects of the current system of food production are invisible to most consumers. The ecological, economic, and social costs of industrial agriculture are not accurately represented in the prices of food.

## Alternatives

Alternatives to the acute conflict between agriculture and biodiversity can be accomplished by changes in farming practices and by a reduction in the land area devoted to agriculture. Such changes would require different incentives and regulations for agriculture and would be effective only if consumer habits supported them.

### Changes in farming practices

1) *Preserve areas of native habitat on farms.* This is the most effective way to maintain local biodiversity, because a large number of species and species interactions as well as ecosystem processes are held together. (Most regions with extensive agriculture do not have large expanses of relatively undisturbed habitat, but often there are areas of second-growth native vegetation in middle to late stages of succession.) This kind of preservation happens on many small farms in the form of maintaining a woodlot for firewood, fenceposts, and recreation (Logsdon 1994). Hedgerows and riparian vegetation along streams are often remnants of the native vegetation.

For a given ecosystem, it should be possible to estimate what area of native habitat would preserve a high proportion of the local biodiversity, based on principles of island biogeography, the spatial heterogeneity of species across the landscape, and the ecology of individual species. Incentives—in the form of reduced taxes or purchase of development rights by the township or county—could be given to farmers to maintain relatively undisturbed areas of suitable size. Such areas could still be lightly harvested for wood and other resources.

Small areas of native habitat would in many cases be more effective in preserving local biodiversity if they were connected to each other by habitat corridors. These would facilitate dispersal of individuals from one area of habitat to another and reduce the likelihood that populations of rare species would disappear completely. In areas with little remaining native habitat, ecological restoration of native vegetation would be a slow but effective way to promote native biodiversity. For many ecosystems, a more concerted effort to preserve linked areas of native habitat, including wildlands, interspersed with sustainably managed farmland would go a long way toward maintaining local biodiversity, especially for species with large geographic ranges (Brown and Lomolino 1998).

2) *Incorporate native species into agroecosystems.* Much of the world's agriculture consists of a dozen usually non-native species grown in massive quantities. Exotic species generally do not support as much of the associated biodiversity of a farm as would native species, which engage in a set of ecological interactions that have arisen over many hundreds of generations in the context of a particular climate and substrate. Exotic species have to cope with collaborators and competitors that are different from those of their original ecological and evolutionary contexts. Native species tend to be more resistant to climatic stresses, diseases, and disturbance than are exotics. Native populations often have greater genetic diversity than do agricultural exotics, because the natives can breed with members of local wild populations, whereas the exotics usually have no such option. Diversified mixtures of native and non-native species would be an intermediate stage in the movement toward agroecosystems based predominantly upon native species and varieties derived from them by artificial selection.

In the United States, native species that could play a more prominent role in agriculture are trees that bear fruits, nuts, or sap; perennial grasses; and herbs that produce edible seeds, fruits, or leaves. Many important crops are based on native species already; these plants should be emphasized more. The same principle applies to farm animals too. Native ungulates and birds tend to forage more efficiently on the local vegetation than their introduced equivalents. Deer and bison are more ecologically sensible sources of meat than cattle on the Great Plains and in the eastern deciduous forest.

Many indigenous people practice diversified, small-scale agriculture based on native species. North American examples are described in Nabhan (1982), Soule and Piper (1992), and Vandermeer and Perfecto (1995). Indigenous agricultural systems should be studied closely in this regard.

3) *Use mixtures of perennials.* Appropriately designed mixtures of plants can have substantial complementarity, in nutrient cycling and water use, for example. The use of perennials rather than annuals means that the soil is plowed less than once per year. Perennial mixtures should sponsor greater soil health and greater biodiversity, particularly of microbiota and insects, than do annual monocultures. This approach becomes even more effective if the agroecosystem mimics the structure and function of the native vegetation. Bill Mollison's "permaculture" and Wes Jackson's "natural systems agriculture" are examples of this approach. The rationale is that such agroecosystems should be well suited to the climate, topography, and soils of the region and therefore possess long-term stability and resilience. In these systems, plants are grown in multi-species associations (polyculture) rather than in monoculture, perennials are emphasized over annuals, and the structure of the native vegetation is reproduced. Where the native vegetation is prairie, as in Kansas, the agroecosystem is modelled upon the prairie. In southern Michigan, the agroecosystem would be modelled upon a single-canopy deciduous forest. In southwestern deserts, the agro-ecosystem would be modelled upon a mixture of annuals, herbaceous perennials, shrubs, and small trees, sparsely distributed over the landscape. These systems should accommodate considerable native biodiversity, especially if the agricultural species are predominantly natives.

Permaculture is a system of ethics as well as an approach to agriculture and human settlements (Mollison 1991). It involves designing farms (or other settlements) in accord with the characteristics of local climate, topography, hydrology, soils, and the native biota. Small-scale, intensively managed agroecosystems that maximize use of local climatic and biotic energy cycles are emphasized. The numerous species of plants and animals, many of them native, each provide something useful (shade, fertilizer, pollination) to other species on the farm. Permaculture models are presented for all of the major agricultural regions of the world.

Natural systems agriculture at The Land Institute in Salina, Kansas, has focused on the creation of "domesticated prairie" (Jackson 1990, Soule and Piper 1992). The native prairie is a diverse mixture of perennial grasses—including cool-season and warm-season species, leguminous herbs (broad-leaved herbs of the pea family), and composites (plants of the group that includes sunflowers and goldenrods). The proportions of these four kinds of plants vary among soil types and climatic conditions where prairie occurs. These kinds of plants take advantage of different seasons in which maximum growth and seed setting occur. Legumes provide nitrogen to root systems, where over half the biomass of vegetation lies. These complementary properties contribute to the resilient, dynamic aspects of prairie vegetation. The Land Institute has experimented with simplified mimics, consisting of mixtures of native and non-native species to represent the four main components of prairie vegetation. Mixtures of four or more species are found to have the ecologically beneficial characteristics of maintaining soil health, using precipitation efficiently, and showing resistance to drought and diseases. Natural systems agriculture is in the early phases, and the ideal crops to grow in perennial polyculture may require many generations of artificial selection. Experiments at The Land Institute to date have demonstrated the potential for agricultural mimics of the prairie to have high seed yields, to produce higher biomass in mixtures than in monoculture, and to cope well with weeds and pests without synthetic pesticides (Piper 1998).

4) *Eliminate practices most destructive to associated biodiversity.* The practices recommended above would have little positive effect on biodiversity if they entailed substantial use of synthetic pesticides and fertilizers. Rather, use of non-synthetic fertilizers and pesticides would promote the soil biota, avoid putting toxins into groundwater, and reduce the impact of pesticides on non-targeted species. To maintain soil fertility, having as much of the nutrient cycling within the system as possible—via composting, animal manures, and crop residues—is critical. A diversity of species in the agroecosystem should reduce the vulnerability of crops to pests and disease, and biological-control methods that rely as much as possible on native predators and parasites should be employed.

Current farming methods that accommodate more biodiversity than mechanized, chemical agriculture include organic farming, intercropping, and no-till farming (Soule and Piper 1992). Organic farming excludes the use of synthetic fertilizers or pesticides. Animal manures and some mined fertilizers are used instead of synthetic fertilizers. Typically, cultivation or deep mulching of plants replaces the use of herbicides for weed control, and biological control of insect and microbial pests replaces synthetic pesticides. Biological control may involve cultivating the natural enemies of insect pests or introducing an exotic predator or parasite to reduce the pest population. (However, the use of introduced species for biological control may create secondary problems, if the introduced predator becomes successfully established outside the agroecosystem.) In other cases, synthetic hormones are introduced to disrupt the reproductive cycles of insect pests. Organic farming avoids the destructive indirect effects of synthetic pesticides and fertilizers and usually results in sustained soil health.

Intercropping refers to the practice of raising two or more crops in the same field. This approach is based upon the symbiotic or complementary interactions of the different crops with each other or with other aspects of the environment. For

illustration by Lezle Williams

example, one plant may attract the predators of the second plant's pests, while the second plant may fix nitrogen that is then available for uptake by the first. This practice increases both the planned biodiversity and the associated biodiversity of the agroecosystem by a small amount.

No-till farming refers to planting crops in a field that has not been mechanically tilled. Instead, crop residues from an earlier season are left on the field to decay, and seeds are inserted into the undisturbed ground in small holes. This method was devised to combat the substantial soil erosion that results from repeated tilling and removal of crop residues after harvest—which leave bare soil exposed to wind or rain for months. No-till farming leads to improved soil structure and biota compared to conventional mechanized farming. But usually no-till involves the heavy application of herbicides, with consequent damage to much of the associated biodiversity; a chemical solution for weed control is traded for a mechanical approach.

By what standards should we evaluate the success of these activities in accommodating biodiversity? The presence of a significant number of the native species that occur in the particular native ecosystems represented should be a standard, but just how many species is difficult to determine without studying the effects of habitat fragmentation and the species-area relationships for a particular region. A survey of grasses, sedges, herbaceous plants, trees, fungi, insects, and terrestrial and aquatic vertebrates would provide a measure for the success of a particular farming strategy in sustaining both the farm and the native biota. The number of species present on the farm could be compared to the number of species present in the bioregion as a whole, standardized for farm size. Another important measure is the health of the soil, in terms of biota, texture, and chemistry.

**Consumer Habits.** Changes in society, not only on farms, will determine whether these recommendations can succeed. Reduced per-capita consumption of animal products would reduce the amount of land needed for growing grains. Grains make up about 80% of the world's food supply (Pimentel et al. 1995). Currently, almost 40% of the annual grain harvest is fed to livestock, worldwide. Within the United States, about 70% of the grain produced is fed to livestock (Durning and Brough 1992). A more bioregional approach to food consumption and less reliance on imported luxuries would focus more attention on the health of local farms and farmers, reduce the costs of transporting food, and reunite consumers with the sources of their food. Farm policies would need to provide incentives for farmers to preserve biodiversity and to design more ecologically sound agroecosystems. Farm policies that favor small, diversified, family farms over large, corporate-owned monocultures would be more socially and economically sustainable, as well as more supportive of biodiversity.

## Conclusion

Since agriculture involves favoring the growth of some species to the exclusion of others and may include the wholesale removal of native flora and fauna, the competition established between agroecosystems and the biodiversity in native ecosystems is often severe. Both need the same areas in which to persist. But the conflict need not be as severe as it is in most contemporary practice. By preserving patches of undisturbed habitat within farms and adopting a more ecological approach to the design of agroecosystems, a more cooperative and less antagonistic relationship can be created. Examples of such relationships occur in many small-scale indigenous agroecosystems around the world and in experiments such as The Land Institute's domesticated prairie. Many more variations on these themes are possible.

The changes in agroecosystems recommended here will do little to stem the current mass extinction without substantial changes in the politics and economics of agriculture in the world today. These recommendations are likely to be more feasible on small to medium farms than on large (>1000 acres or 400 hectares) farms. Small farms tend to be diversified already. Large farms tend to depend on extensive chemical inputs, mechanization, and monocultures; they present a much greater challenge.

What are the benefits of having more biodiversity on the farm? One is to be surrounded by indicators of healthy ecosystems as models for agroecosystems. Another is the personal aesthetic and recreational enjoyment of living amidst abundant natural diversity. The utilitarian benefits are substantial. Fewer off-farm inputs are required under more sustainable farming methods. Fewer outbreaks of pests and pathogens occur in polycultures than in monocultures. Improved soil function means that farming can be sustained in a particular area for a much longer time. From the consumer's standpoint, food is healthier with reduced use of synthetic pesticides. Finally, designing a farm to promote native biodiversity while also growing food is an enactment of Aldo Leopold's land ethic (1949)—which could serve as a guide for more ecologically benign agricultural practices. In his essay, "The Farmer as Conservationist," Leopold wrote, "the landscape of any farm is the owner's portrait of himself" (Flader and Callicott 1991, p. 263). We all help to determine whether those portraits will be cast in an impoverished gray or richly hued in the many colors of biological diversity. ❙

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# Sowing

**In the stilled place that once was a road going down**
**from the town to the river, and where the lives of marriages grew**
**a house, cistern and barn, flowers, the tilted stone of borders,**
**and the deeds of their lives ran to neglect, and honeysuckle**
**and then the fire overgrew it all, I walk heavy**
**with seed, spreading on the cleared hill the beginnings**
**of green, clover and grass to be pasture. Between**
**history's death upon the place and the trees that would have come**
**I claim, and act, and am mingled in the fate of the world.**

**—WENDELL BERRY**


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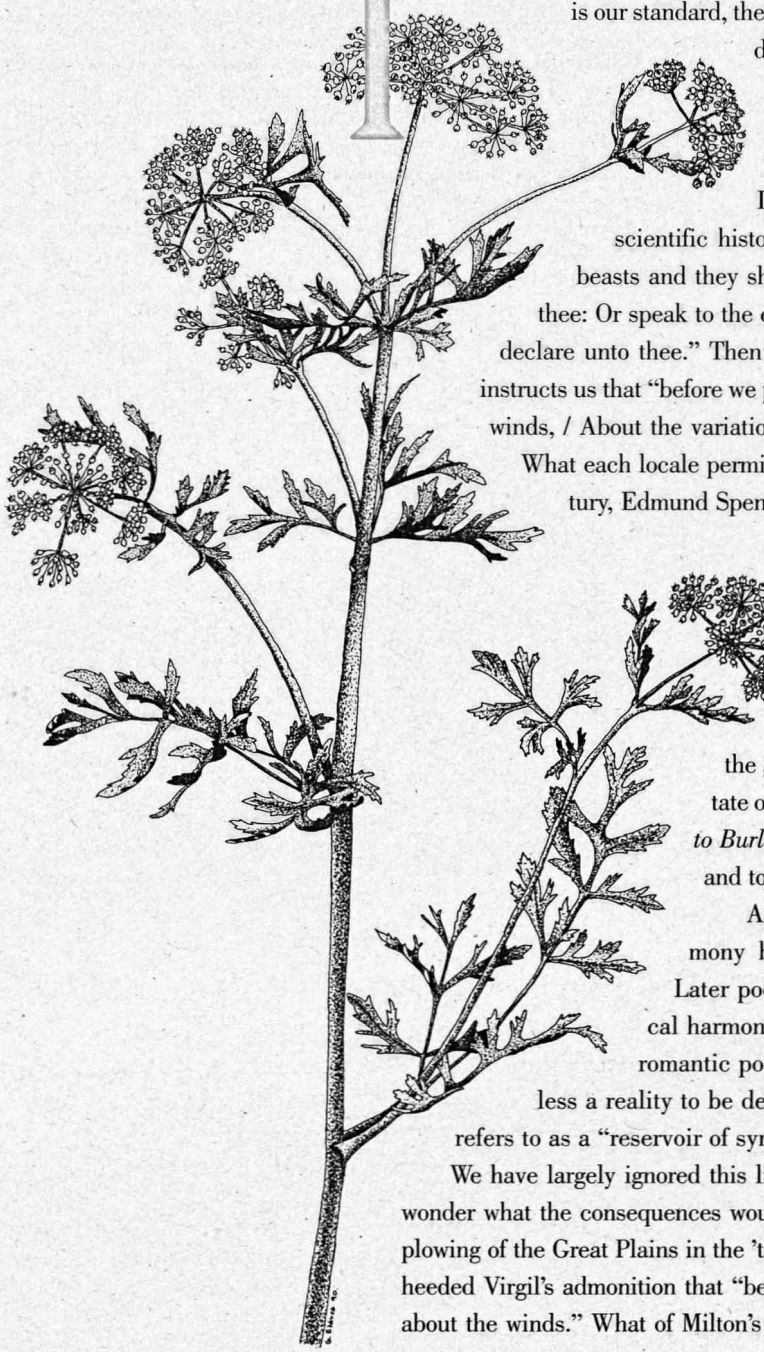
illustration by Lezle Williams

# Nature as Measure

by Wes Jackson



In our work at The Land Institute, ecology is our primary field of interest because Nature is our standard, the model we use as we design our experiments. Nature as standard, as "measure," is not a new idea. As Wendell Berry points out, the notion goes back to at least two thousand years before Jesus of Nazareth. In a memorable speech delivered at the dedication of our new greenhouse at The Land Institute in 1988, Wendell Berry traced the literary and scientific history of our work.[1] He began by quoting Job: "Ask now the beasts and they shall teach thee, and the fowls of the air, and they shall tell thee: Or speak to the earth, and it shall teach thee; and the fishes of the sea shall declare unto thee." Then Virgil who, at the beginning of *The Georgics* (36–29 BC), instructs us that "before we plow an unfamiliar patch / It is well to be informed about the winds, / About the variations in the sky, / The native traits and habits of the place, / What each locale permits, and what denies."[2] Toward the end of the sixteenth century, Edmund Spenser called Nature "the equall mother" of all creatures, who "knittest each to each, as brother unto brother." Spenser also saw Nature as the instructor of creatures and the ultimate earthly judge of their behavior. Shakespeare, in *As You Like It,* has the forest in the role of teacher and judge. Milton, in *Comus,* has the Lady say of Nature, "she, good cateress, / Means her provision only to the good / That live according to her sober laws / And holy dictate of spare Temperence." Finally, Alexander Pope, in his *Epistle to Burlington,* counseled gardeners to "let Nature never be forgot" and to "Consult the Genius of the Place in all."

After Pope, Berry points out, this theme of a practical harmony between man and Nature departs from English poetry. Later poets see Nature and humanity radically divided. A practical harmony between land and people was not on their agenda. The romantic poets made so central the human mind that Nature became less a reality to be dealt with in a practical way and more what Wendell Berry refers to as a "reservoir of symbols."[3]

We have largely ignored this literary tradition, of course. Nevertheless I cannot help but wonder what the consequences would have been if the settlers and children of settlers whose plowing of the Great Plains in the 'teens and twenties gave us the Dust Bowl of the thirties had heeded Virgil's admonition that "before we plow an unfamiliar patch it is well to be informed about the winds." What of Milton's insight about the good cateress who "means her provision



prairie parsley by Gary Eldred

only to the good / That live according to her sober laws / And holy dictate of spare Temperence"? Virgil was writing about prudent agricultural practices, Milton about prudent consumption, the spare use of Nature's fruits. For both, Nature gave the measure, the standard, the lesson.

Our nation has not yet even begun seriously building a science of agricultural sustainability with Nature as the measure. A few scientists have spoken in terms that echo the poets. In the paper already quoted, Wendell Berry noted that after the theme "Nature as the measure" went underground among the poets in the last century, it next surfaced among the agricultural writers who had a scientific bent. Liberty Hyde Bailey's *The Outlook to Nature* appeared in 1905.[4] That grand old Cornell dean described Nature as "the norm": "If nature is the norm then the necessity for correcting and amending abuses of civilization becomes baldly apparent by very contrast." He continues: "The return to nature affords the very means of acquiring the incentive and energy for ambitious and constructive work of a high order." Later, in *The Holy Earth* (1915), Bailey advanced the notion that "a good part of agriculture is to learn how to adapt one's work to nature....To live in right relation with his natural conditions is one of the first lessons that a wise farmer or any other wise man learns."[5]

Our nation has not yet even begun seriously building a science of agricultural sustainability with Nature as the measure.

Sir Albert Howard published *An Agricultural Testament* in 1940. Howard thought we should farm as the forest does, for Nature constitutes the "supreme farmers":

> *The main characteristic of Nature's farming can therefore be summed up in a few words. Mother earth never attempts to farm without live stock; she always raises mixed crops; great pains are taken to preserve the soil and to prevent erosion; the mixed vegetable and animal wastes are converted into humus; there is no waste; the processes of growth and the processes of decay balance one another; ample provision is made to maintain large reserves of fertility; the greatest care is taken to store the rainfall; both plants and animals are left to protect themselves against disease.*[6]

Earlier, in 1929, J. Russell Smith in his *Tree Crops* stated that "farming should fit the land." He was disturbed by the destruction of the hills because "man has carried to the hills the agriculture of the flat plain."[7] (An agriculture modeled on the prairie featuring perennials would make possible grain harvest on hillsides.)

Is our current emphasis on sustainable agriculture at The Land Institute part of a succession in which Nature is the measure? It is, in a way, for as Wendell Berry said about the poets and scientists he quoted, there is a succession in thought but only in the familial and communal handing down in the agrarian common culture, not in the formal culture, where it exists only as a series. It is interesting but not surprising that the common culture had a succession, but teachers and students in the literary or scientific tradition could only manage to provide a series. Why they never built on the writings of those who had gone before is an important question, one that needs to be answered.

But there is more to the problem. Those who popped up from that common culture to form that series, whether poets or scientists, did not make us *their* successors, or, put another way, we have not made ourselves their successors. So here is the challenge. We have a chance to begin to build that formal succession now. For now, by trying to understand

prairie bush clover by Gary Eldred

agriculture in its own terms, we see what has happened and we can build on the science of ecology and evolutionary biology. But because our work gets down to experiments and data, we risk falling into Baconian-Cartesian reductionism. We need more people who will show us the *practical* possibility of a research agenda based on a marriage of agriculture and ecology. That agenda will require a push from those who, after examining the assumptions of modern agriculture versus what Nature has to offer, decide in favor of learning from Nature's wisdom.

We look to natural ecosystems because they have featured recycling of essentially all materials and have run on sunlight. I say "feature" because they have not been perfect in those recycling efforts. For that matter, not all life forms are powered by the sun. The exceptions, however, are trivial. Ecological standards based on studies of ecosystems that have experienced minimum human impact provide us with our best understanding of how the world worked during the hundreds of millions of years before humans arrived.

With this in mind, I have two stories. The first amounts to an ecological comparison of two land tracts. In 1933, a graduate student at the University of Nebraska carried out a research project near Lincoln in which he compared an upland, never-plowed prairie with an adjacent field of winter wheat. Prairie and wheat were growing on the same soil type, but when moisture fell, 8.7 percent ran off the wheat field while only 1.2 percent ran off the prairie. It turned out to be the driest year on record. All the wheat plants died, while the deep-penetrating perennial roots of the prairie survived. The upshot of this story is that prairie is "designed" to receive water efficiently and then to allocate that water carefully. An average day in the spring would find the wheat field losing nearly twenty-one tons of water per acre; on the same day the prairie would lose only a little over thirteen tons per acre. This economy was produced by such mechanisms as moderating wind speed and keeping temperature as low as possible. There are other interesting comparisons in that study, but let's stick with water.

For the second story, let's leave Nebraska and go to the tropics, to a tropical rain forest in Costa Rica where Jack Ewel and his colleagues from the University of Florida have compared agricultural fields with the surrounding forest. Here, water can be the nemesis of fertility, for when the forest is destroyed, valuable nutrients are leached downward. A rain forest, on the other hand, is "designed" to pump that water back to the atmosphere with great efficiency.

Thus with respect to water management, we have in these examples two opposite ecosystems. Both are keyed to the needs of their places. Nature's prairie holds water; the wheat field loses it more rapidly. Nature's tropical rain forest gets rid of water; agricultural patches in the tropical rain forest lose fertility because not enough water is intercepted and pumped away.

These stories not only describe realities in Nature, they provide lessons with which we humans must come to terms. First of all, the stories illustrate that when we humans mess around with an ecosystem, we tend to invert what Nature does well. Just as bad, we tend to ignore the question of why Nature features ecological mosaics that, until disturbed for human purposes, provide, in the words of John Todd, "elegant solutions predicated on the uniqueness of [each] place."[8] To much too large a degree this lesson has been ignored as agriculture, particularly industrial agriculture, tends toward the homogenization of landscapes. ❙

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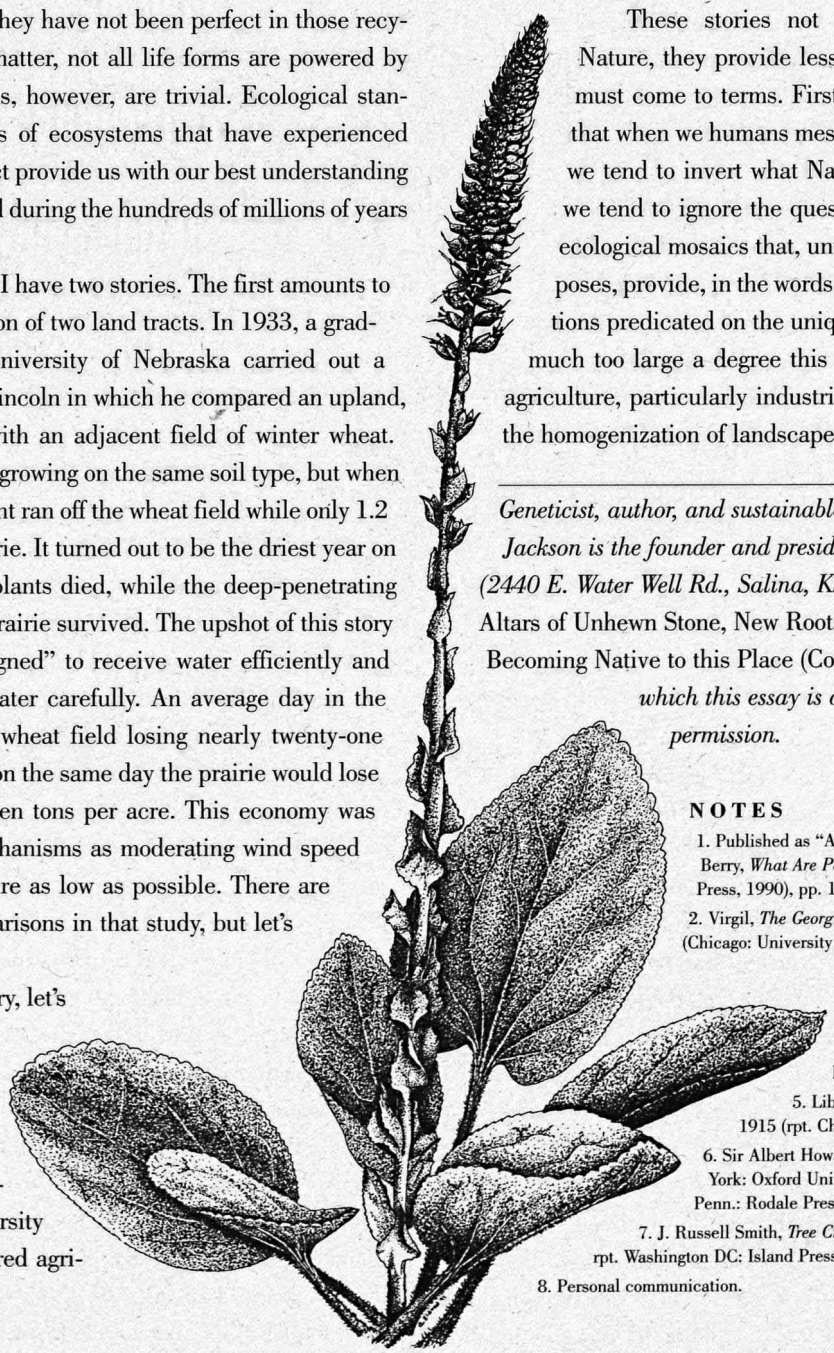
*Geneticist, author, and sustainable agriculture pioneer Wes Jackson is the founder and president of The Land Institute (2440 E. Water Well Rd., Salina, KS 67401). His books include* Altars of Unhewn Stone, New Roots for Agriculture, *and* Becoming Native to this Place (Counterpoint, 1994), *from which this essay is adapted and reprinted with permission.*



**NOTES**

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2. Virgil, *The Georgics,* trans. Smith Palmer Bovie (Chicago: University of Chicago Press, 1966), p. 5.
3. Berry, "A Practical Harmony."
4. Liberty Hyde Bailey, *The Outlook to Nature* (New York: Macmillan, 1905).
5. Liberty Hyde Bailey, *The Holy Earth,* 1915 (rpt. Christian Rural Fellowship, 1946).
6. Sir Albert Howard, *An Agricultural Testament* (New York: Oxford University Press, 1943; rpt. Emmaus, Penn.: Rodale Press, 1976), p. 4.
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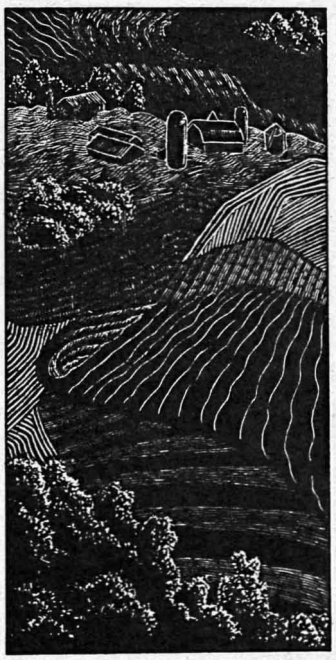
8. Personal communication.



kitten tail by Gary Eldred

# An Open Letter to Wildlands Advocates from the Sustainable Use Community

by Mark Ritchie



We wish to open a dialogue with supporters of The Wildlands Project (TWP) on involving private landowners, especially farmers and ranchers, in the implementation process of bringing the vision of North American Wilderness Recovery into reality. This is not a new suggestion. Although the very first discussions about core reserves and corridors included consideration of private landowners, especially those associated with buffer zones, serious work on buffers has been limited.

Non-industrial private forest owners, tribal councils, and small-to-moderate-sized farmers and ranchers hold much of the land in the United States, especially valuable habitats such as river bottoms. The farming, ranching, and forestry practices used on these private lands have an enormous impact on the water, soil, air, and habitat quality of the entire country. Active participation by a significant number of these small landowners will be critical to the long-term success of The Wildlands Project. Since these lands often contribute substantially to the family income of owners or operators, it is important to address the economic issues that would be faced by those producers who voluntarily change their production practices to be consistent with the overall design. Here are a few approaches that should be considered.

## Sustainable Production Certification and Labeling

Many consumers are looking for food, fiber, and forestry products produced with serious consideration for ecological protection. For example, organic farmers use a special label that certifies that their product was grown without pesticides or chemical fertilizers—practices for which many consumers are willing to pay a premium price. A large national debate is taking place over the US Department of Agriculture's proposed organic standards that would need to be met before farmers could use the organic label. The first USDA proposal has been sent back to the drawing boards by over 250,000 negative comments from the public. In future drafts of USDA or other organic label criteria we should work to include explicit biodiversity and habitat conservation measures. A couple of food labels already being used in the marketplace specifically address habitat protection, such as the "salmon safe" label from Oregon and the new Wolf Country Beef label from New Mexico that identifies "wolf-friendly" livestock producers.

A key label approach in forestry is coming from the Forest Stewardship Council (FSC), with global headquarters in Oaxaca, Mexico. The FSC is now writing their certification standards for sustainable forestry in each bioregion. This process could be shaped to put a strong emphasis on forestry consistent with the habitat conservation objectives of TWP, especially for forests in or near corridors and reserves. For example, in the draft criteria for FSC standards for the Great Lakes-St. Lawrence Region, produced under the leadership of The Wildlands League from Ottawa, there is explicit language included for "Establishing Connectivity Corridors" in the section on Forest Management and Biodiversity Conservation. This section describes the need for

illustration by Evan Cantor

We must develop strategies that will ensure that the way land is used by farmers, foresters, and ranchers is contributing to the protection and enhancement of landscapes that work for all species.

connectivity and calls for use of the precautionary principle in regards to caring for the habitat of most wildlife and plant species. The draft standards go on to state the following:

> *In developing landscape level forest management plans, movement corridors or linkages need to be provided which extend from riparian ecosystems across the landscape to adjacent riparian ecosystems. The goal is to have functional connections on the landscape rather than have ribbons of uncut forest running between patches of cut forests.*

They also call for the protection of "Areas of Natural and Scientific Interest" and "Environmentally Sensitive Areas or other similar designations."

Now is the time for wildlands groups to get involved in the FSC standard-setting process. Effective participation in this process of criteria setting by wilderness proponents will be crucial to ensuring that biodiversity protection and promotion are effectively incorporated into the process. This work by The Wildlands League is a good starting point, and is available on the internet at www.web.net/fscca or by mail (208 St. Patrick St., Ottawa, Ontario K1N 5K3). Contact Lorne Johnson, Certification Coordinator, by fax at 613-244-4249 or by phone at 613-244-1989. The League is a chapter of the Canadian Parks and Wilderness Society.

## Conservation Associations and Nature Cooperatives

Beyond the certification and labeling of sustainable products, another useful approach to protecting habitat with the help of private landowners is the formation of conservation associations, or, as they are called in Europe, nature cooperatives. Under this system, farmers and other small landowners band together to negotiate directly with government agencies, birdwatching groups, and fishing clubs to increase biodiversity by protecting and restoring habitat and by reducing soil and water erosion and contamination. This is often done at the level of an entire watershed or complete landscape to maximize efficiency and effectiveness.

For example, the farmers in the district called "waterland" close to Amsterdam receive payments from local governments and national environmental agencies in direct proportion to the number of nests of endangered birds and varieties of endangered wildflowers counted on their lands. These payments are in exchange for the care that is given by the farmers for these birds and flowers. Other farmers receive payments from fishing organizations based in Amsterdam for farming in ways that increase the populations of specific fish species. These payments for "producing nature" now make up a significant portion of farm income in many of northern Europe's ecologically sensitive regions.

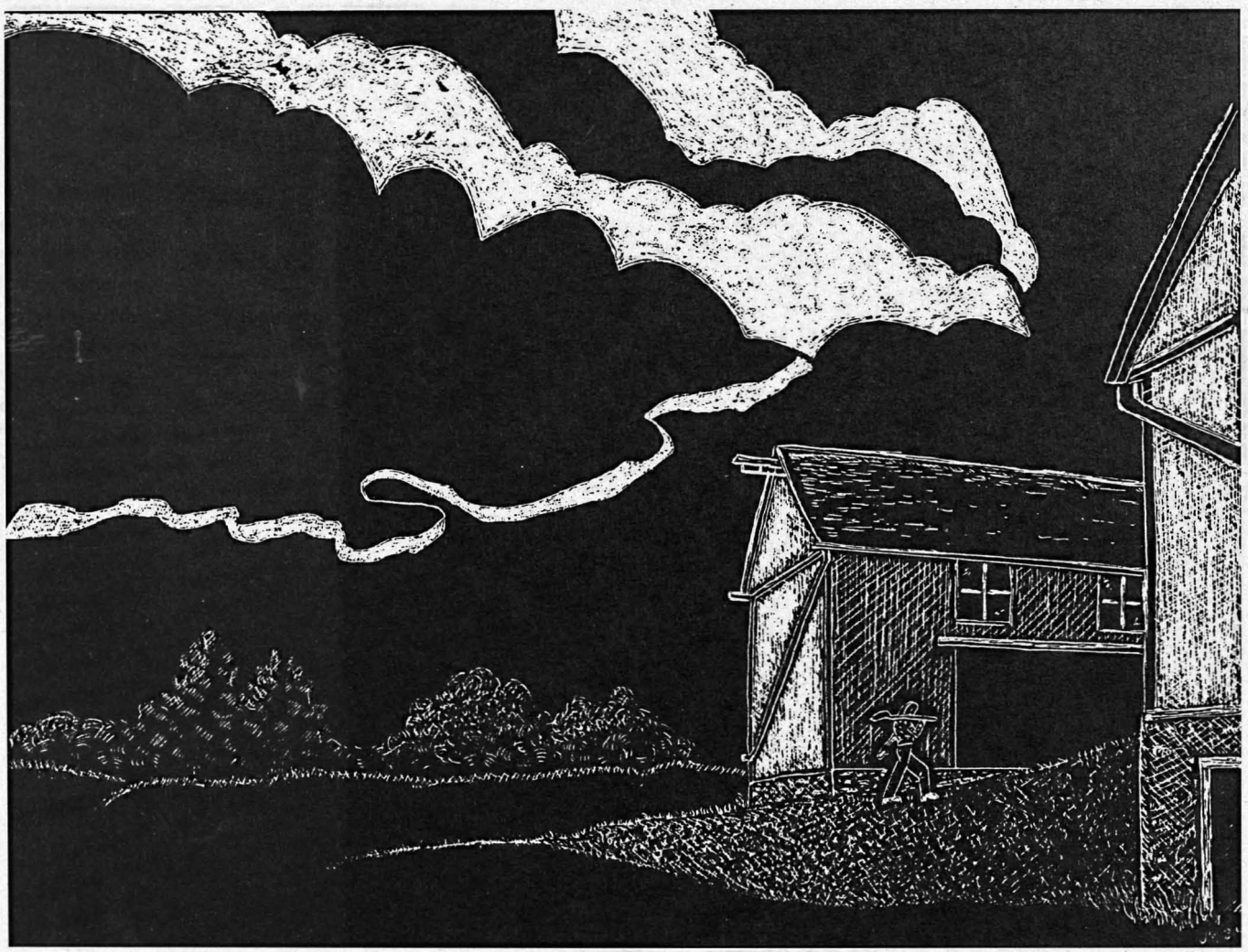
In the US, this approach could be used to create or protect corridors, reserves, or buffer zones. A landowners' group could create an association for the purpose of negotiating with the proper agencies or institutions to establish permanent or long-term easements to protect the reserves or corridors.

## Redirecting Government Programs

A third approach, in addition to labels and cooperatives, would be to influence government programs, especially those in the areas of water quality protection, wetlands restoration, and soil erosion reduction. At present, somewhere between eight to ten billion dollars are spent each year by various government agencies, including local, state, federal, and special districts, for a wide range of natural resource conservation and pollution prevention/clean-up initiatives.

For example, the State of Minnesota will receive $180 million over the next few years from the USDA through the Conservation Reserve Enhancement Program; farmers in the floodplain of the Minnesota River will receive financial incentives to create and maintain wooded buffer zones on 100,000 acres along the river. The funding will buy 50-year conservation easements, but could and should be extended to perpetual easements with an emphasis on wildlife habitat restoration and protection.

If only ten percent of the total available funds were targeted to places that are critical to the success of wildlands initiatives, it would bring nearly a billion public dollars per year into this process. Other incentives, such as property tax rebates and cost sharing, could be used in addition to direct payments. All of these related expenditures linked to strong biodiversity conservation and habitat protection criteria would have a tremendous impact.



## Starting the Conversation

Certifying and labeling goods produced with ecological considerations, creating conservation cooperatives, and linking government funding to specific conservation objectives are only three examples of methods that private landowners—with the help of public laws and agencies—could utilize to protect their land in a way that is both ecologically and economically viable. Many more approaches need to be developed. The key issue is getting a conversation going between Tribes and First Nations, private landowners including farmers and ranchers, and wildlands advocates. We must start today to develop strategies that will ensure that the way land is used by farmers, foresters, and ranchers is contributing to the protection and enhancement of landscapes that work for all species.

It is important to remember that many of these individuals, especially organic farmers, eco-forestry practitioners, and predator-friendly ranchers, have the knowledge, practical experience, and day-to-day contact with a changing environment and terrain that are absolutely needed to create a workable design. Dave Foreman and The Wildlands Project are already tapping into the farming and ranching community to gain their support for protecting biodiversity, as are others such as Gary Nabhan, who heads the Forgotten Pollinators Program at the Arizona Sonora Desert Museum in Tucson. We need to re-double our current efforts, develop new approaches to open a dialogue with these audiences, and create written and other resource materials to help move the discussion along.

Planning is under way to include some farmers at future TWP meetings including the Grassroots Rendezvous this October. These gatherings should set in motion the kind of longer-term conversation needed to bring more farmers and ranchers into the wildlands movement. ❙

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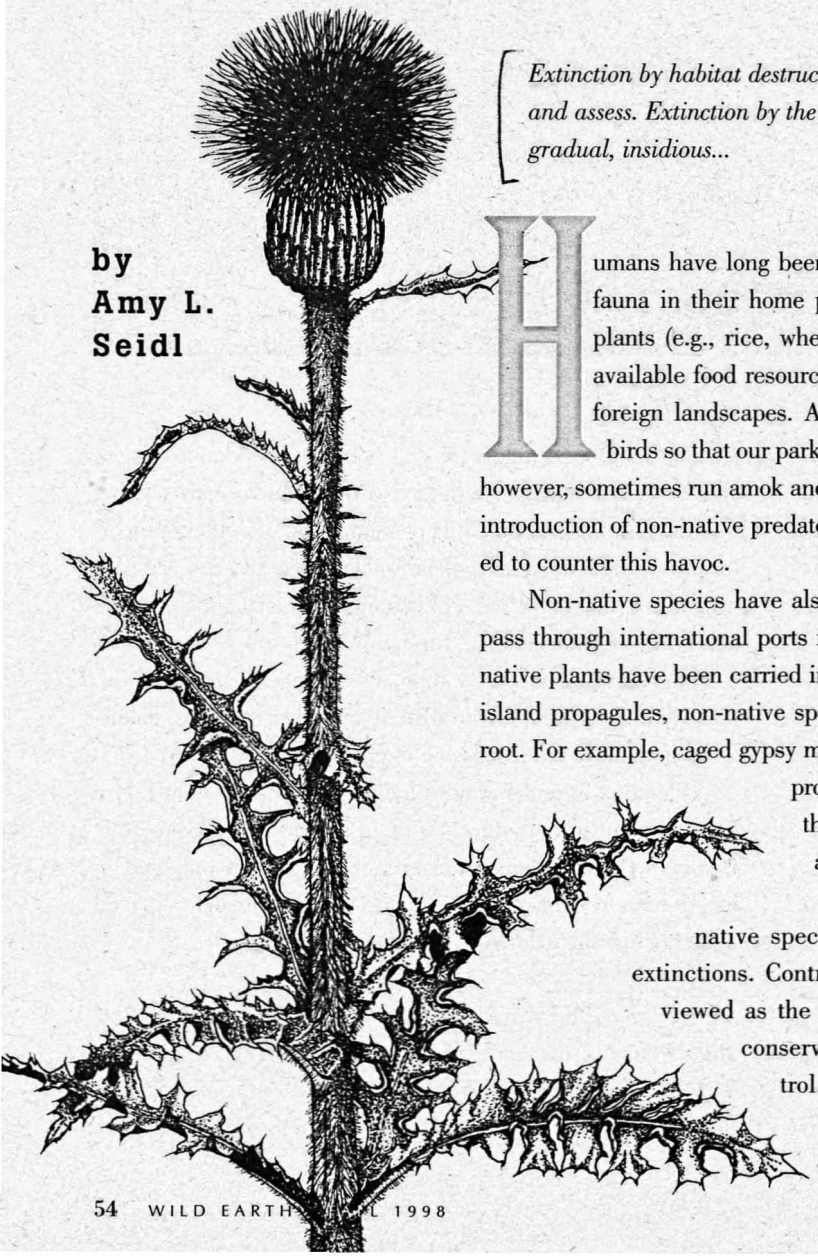
*Mark Ritchie is the President of the Institute for Agriculture and Trade Policy (2105 1st Ave. S., Minneapolis, MN 55404; 612-870-3400; mritchie@iatp.org) and serves as the Ecological Agriculture Program Officer at the Foundation for Deep Ecology.*

illustration by Jeff Muse

# Of Weevils, Thistles, and Biological Control

## Is the Introduction of Non-native Predators a Sustainable Practice?



*Extinction by habitat destruction is like death in an automobile accident: easy to see and assess. Extinction by the invasion of exotic species is like death by disease: gradual, insidious...*

—E.O. Wilson, 1997[1]

by Amy L. Seidl

Humans have long been enticed by non-native species and desired exotic flora and fauna in their home places. As agriculturalists, we have intentionally introduced plants (e.g., rice, wheat, potatoes) and animals (e.g., pig, goat, ostrich) to expand available food resources. As horticulturists, we have planted ornamentals to mimic foreign landscapes. And as literary connoisseurs, we have introduced non-native birds so that our parks resemble a favorite author's landscape. These exotic species, however, sometimes run amok and create havoc with native ecosystems. Biological control—the introduction of non-native predators and herbivores that control introduced species—is intended to counter this havoc.

Non-native species have also arrived unintentionally. Marine invertebrates, for instance, pass through international ports in the ballast water of shipping vessels, and seeds from non-native plants have been carried in the pockets and shoe heels of tourists and immigrants. Like island propagules, non-native species unwittingly transported into foreign territory often take root. For example, caged gypsy moth larvae brought to the United States for their potential silk production escaped and established a population that spread throughout the Northeast, defoliating enormous tracts of forest and drastically changing the landscape.[2]

Whether by intent or accident, the introduction of non-native species threatens regional distinctiveness and promotes local extinctions. Controlling introduced species with natural enemies has been viewed as the most ecological approach to curbing invasives. Yet many conservationists have begun to debate the merits of biological control. This debate addresses whether the introduction of non-native predators and herbivores further disrupts native



thistle by Gary Eldred

ecosystems. How much more ecological is biological control than the use of herbicides or pesticides? How good is evolutionary theory in predicting the outcome between pests and their predators, plants and their herbivores? Ultimately, we have begun to ask: Is biological control a sustainable practice?

## The Science of Biological Control

Biological control is a scientific discipline whose central premise maintains that natural enemies, taken from the region where the non-native originated, can control invasives. In effect, biological control is applied population dynamics: a species' natural enemy controls its prey (or host) at low levels, and is maintained in a regulated fashion. In turn, the prey acts as the limiting resource for the predator and thus controls the predator's own population dynamics.

The practice behind biological control is based on ecology, evolution, taxonomy, ethology, and physiology, and predicts self-sustaining relationships between nonindigenous plants and animals (primarily invertebrates) and their specialized herbivores and predators. Successful biological control programs are based on the assumption that the pest and predator have coevolved—that predator and prey have acted as reciprocal agents of selection such that the predator now specializes on the prey. Because the predator is a specialist, it is predicted to search for its recognized target as efficiently in a foreign environment as in its native habitat. A fundamental premise of biological control, and of population dynamics, is that the predator will *not* eradicate its prey but will control them at noninjurious levels. Eradication of the pest or host would result in its local extinction, thus risking the extinction of its natural enemies and permitting reinvasion of the habitat by the pest.

However, a recent approach to biological control claims that the introduction of any antagonistic predator, one which is naive to the prey and has no evolutionary ties with it, can be as effective as using a specialist. This method, termed *neoclassical biological control,* increases the chance that non-target species will be negatively affected. For instance, a generalist predator may find non-target species more attractive, easier to capture, and with higher nutritive value than the target pest, resulting in adverse effects on non-target species.

# An Invasion of Plants

**by Ana Ruesink**

"The greatest service which can be rendered any country is to add a useful plant to its culture." So declared Thomas Jefferson more than 200 years ago as he gratefully acknowledged a gift of rice seeds from Africa. Jefferson would never have heard of invasive plant species such as purple loosestrife (*Lythrum salicaria*), cheatgrass (*Bromus tectorum*), or hydrilla (*Hydrilla verticillata*), and in his enthusiasm for global trade he failed to predict the profound ecological disruptions that can occur when exotic species are introduced into ecosystems in which they did not evolve.

Thousands of exotic plant species have been introduced to the United States for crop production, as ornamental species, or as accidental imports. Many of these plants remain quiescent in agricultural fields or flower gardens where they behave like polite guests in their new landscape. Some of them—approximately 4000

*continues*

purple loosestrife by Rebecca Merrilees

## True Stories

The introduction of non-native species to control pests began centuries ago: domesticated cats were introduced to medieval Egypt to protect grain reserves from rodents, and Linnaeus himself introduced predaceous beetles and ants to citrus groves to control fruit pests.[4] Successful biological control has been and remains an attractive option to agriculturalists and others interested in a chemical-free and strategic approach to controlling invasives.

One of the most successful biological control initiatives involved a vadalia beetle, *Rodolia cardinalis,* that successfully controlled the cottony-cushion scale, *Icerya purchasi,* a citrus pest of California's orange crop.[4] The scale insect had been inadvertently introduced to California from Australia where ecologists determined one of its native enemies to be *R. cardinalis.* In the 1940s, a population of fewer than two hundred vadalia beetles was introduced to control the scale pest in California. The beetle population quickly spread, since both larvae and adults feed on the immobile scale, and within a year the orange harvest was free of the pest. In the 1950s, as chemical pesticides became the *modus operandi,* DDT was sprayed to control citrus pests but simultaneously eradicated the beneficial beetle predator. The scale insect returned post-spray and agriculturalists, dismayed by the failure of DDT, re-introduced the beetle.

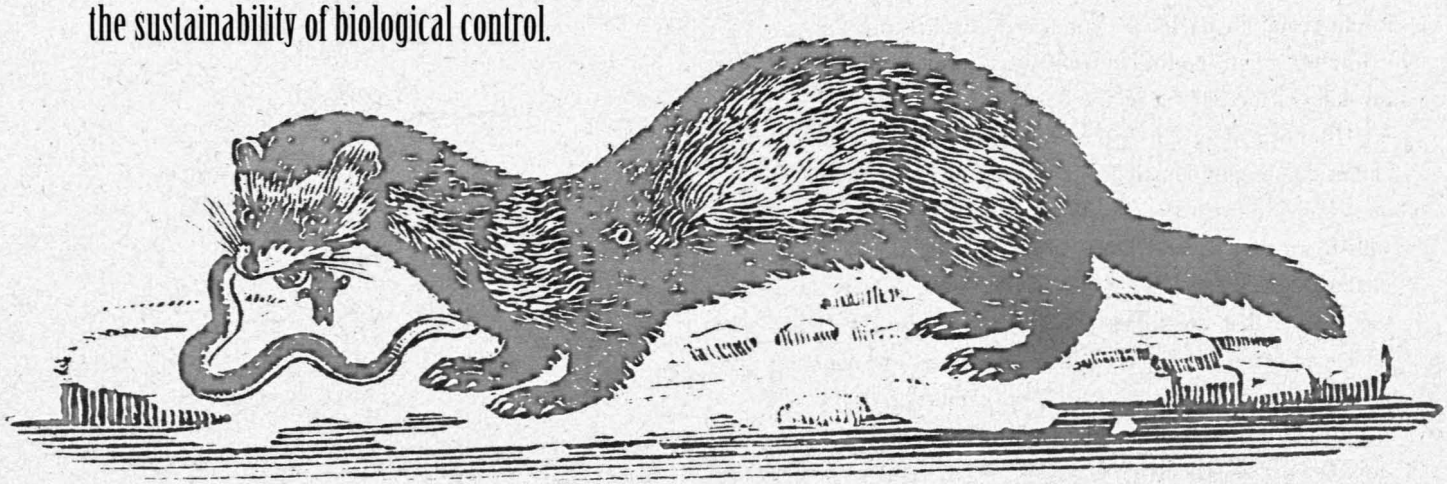
Another biological control success story is the suppression of Klamath weed, *Hypericum perforatum,* by two species of Chrysomelid beetle.[4] Klamath weed is native to Europe and north Africa and was introduced to rangeland along the Klamath River in the northwestern United States. Its weedy characteristics make it a good colonizer, and after its introduction, the plant quickly spread through overgrazed rangelands, outcompeting native grasses. Klamath weed is noxious to cattle and to most insect herbivores due to its constitutive phototoxic ingredient, hypericin, a compound that initiates blistering and open sores in nonadapted herbivores, including cattle. Chrysomelid beetles in the genus *Chrysolina,* however, have adapted to Klamath weed and are able to break down hypericin into innocuous compounds. Once introduced, the beetles fed voraciously on *H. perforatum* and brought a halt to the weedy scourge.

These examples of successful biological control are often cited in ecology textbooks and in lectures on integrated pest management and agroecology. They are instructive in several ways: 1) they illustrate how *specialized* herbivores and predators that regulate their hosts and prey are the most effective biological control agents, and 2) they illustrate that when predator and prey exist at low but stable levels, their population dynamics become linked such that both are maintained but neither explodes.

These are the conventional lessons—and yet they do not address the ecological unpredictability of introducing non-natives or the unintended disruptions of native communities that have resulted from biological control. How will a predator evolve once introduced? Is evolution towards generalism and away from specialization a possibility for the predator? How do shifts in host by the herbivore or predator affect non-native and non-target species? Will the target organism itself evolve evasive behaviors (e.g., feeding at night, leaf rolling, or dispersal into refugia) that will make it less visible to its predator? How then will the predator respond to these changes?

The situations where biological control initiatives have disrupted ecosystems are numerous. One of the best examples is

**It is the complexity and unpredictability of ecological systems that throws a wrench into the sustainability of biological control.**



that of the Indian mongoose, *Herpestes auropunctatus.* In the nineteenth century the mongoose was introduced to the Hawaiian islands to control rats rampant in the sugarcane fields.[5] Unfortunately, the mongoose is a diurnal animal, whereas the Norwegian rat is strictly nocturnal, and never did the two meet. Instead, the mongoose, an effective predator, began to decimate the islands' flightless birds and ground-dwelling mammals.

In the case of the mongoose, biological control had profoundly negative consequences due to unintended effects; the species' biology was not well known and the potential effects on the island community were inadequately considered. Rarely do we find that the disruption of an ecosystem stops at a single non-target species. Ecosystems are complex entities with unclear boundaries and cascading effects. For instance, a European tachinid fly, *Compsilura concinnata,* was introduced to parasitize gypsy moths in the United States, one of several attempts to control what has become a national problem.[6] Tachinid flies lay their eggs in a host on which the larvae feast and ultimately kill. Tachinid parasites were intended to biologically control the exotic gypsy moth; unfortunately, the flies were later reared not only from the moth, but from several hundred species of butterfly, non-target organisms often in need of protection.

A second example illustrates how the use of biological control against *native species* can interfere with highly evolved ecological roles. In the 1800s *Myxoma* virus was released to control the rabbit population in Great Britain.[7] The rabbits, confined to increasingly smaller spaces, were making quick work of the lush English landscape. As the virus infected the rabbits, plants grew back and open spaces became densely vegetated. At the same time, researchers noticed that the Lycaennid butterfly *Maculina arion,* a pale blue butterfly found in southern Great Britain, was becoming increasingly rare. Like many Lycaennid butterflies, *M. arion* is part of an ant-butterfly mutualism: the butterfly-loving ant, *Myrmica sabuleti,* carries *M. arion* larvae into its underground nests where the larvae develop and are fed by the ants. In turn the larvae provide a sweet secretion to the ants, creating a positive relationship for both species. The ants, however, prefer to inhabit open areas with exposed soil, conditions that are maintained by the presence of rabbits feeding on the vegetation. By eliminating the rabbit population, managers had inadvertently brought about the extirpation of the ant and its Lycaennid mutualist.

species, botanists claim—have become naturalized, settling in as regular components of the native ecosystem. But some invasive plants can seriously upset natural processes. According to a recent report by the US Office of Technology Assessment, one out of every seven plant introductions results in severe harm to this nation's economy or ecology.

Many of the economic costs of plant invasion accrue as non-natives compete with plants in cultivation. Half of all agricultural weeds are foreign to the United States, and introduced weeds cost Americans between $3.6 and $5.4 billion every year due to lost production and herbicide use.

Consider the case of tropical soda apple (*Solanum viarum*), an impenetrable South American nightshade that entered Florida with a shipment of contaminated grass seed in the mid-1980s. Control efforts cost the Florida cattle industry more than $10 million annually. One of the most well-publicized plant invaders is kudzu (*Pueraria lobata*), an Asian vine that was propagated by the US Soil Conservation Service and planted widely during the 1930s and 1940s for erosion control. As it spread throughout the Southeast, "miracle vine" grew thickly in fields and forest understories, disrupted electrical service, and covered houses and gardens with a blanket of vegetation. Today this federally listed noxious weed costs farmers and woodlot owners more than $100 million a year.

Most invasive plants flourish in areas such as plowed fields, fragmented forests, expanding cities, and overgrazed pastures where human impact is heavily felt. But wildlands are threatened as well. One estimate suggests that our public natural areas are being lost at a rate of 4600 acres per day to invasive plants.

Biodiversity—comprising wild genes, species, and ecosystems—is also under siege. A recent publication by the World Conservation Union identified non-natives as one of the single greatest threats to biodiversity worldwide, second only to the

*continues*

Morrow's honeysuckle by Rebecca Merrilees

## Thistles, Weevils, and Complexity

It is the complexity and unpredictability of ecological systems that throws a wrench into the sustainability of biological control. Ecological communities are evolving entities and their components (species) are subject to natural selective pressures that may be abiotic, such as climate and weather, or biotic, such as competition and predation. A nonindigenous component thrust into an ecological community may become problematic, interrupting the relative balance between species that has been maintained through ecological time. An introduced predator can easily alter this balance and displace a native predator. Similarly, an introduced herbivore can displace native plant feeders. The European ladybird beetle, for instance, introduced to control the Russian wheat aphid in the Midwest, has now displaced its American counterpart.[7] And the honey bee, having colonized the majority of the Americas, has displaced native bees to near obscurity.

An introduced species may also evolve. Although biological control agents are often thought of as evolutionarily static organisms, they are as animate as native species. They experience mutations and undergo natural selection, processes that allow them to tolerate abiotic factors and expand their range by acquiring new hosts. Introduced species, like all living organisms, have some level of genetic variation that allows them to adapt to changes in their environment. As environments change and as non-native species disperse into new habitats, they may encounter different hosts, prey, and plants. The ability to utilize novel environments will be favored and selected for, and the non-native species may evolve and shift, often expanding their host range or taking a wider variety of prey.

Host range expansion can cause considerable disturbance in communities. Recently the range expansion of the flowerhead weevil, *Rhinocyllus conicus,* has threatened native plant communities.[3] *R. conicus* was released in Ontario in 1968 to control a species of European musk thistle, *Carduus nutans,* a plant thought to have been accidentally introduced to the United States with the importation of grain. The weevil larvae feed on thistle seeds, reducing the thistle's reproductive output by making the seeds either inviable or nonexistent. Biological control advocates had screened the insect for years before its introduction and found that although the weevil would oviposit on other thistle genera, including *Cirsium,* a genus for which the United States has several native species, its preference was for *Carduus.* Based on this evidence, the weevil was introduced to the United States in the 1970s and has since spread or been formally introduced to twenty states. By 1978, the weevil had infested native *Cirsium* species. Three of six native *Cirsium* species in Rocky Mountain National Park were found to be infested, some as high as 70%. The weevil was also found in the flowerheads of *Cirsium* in Mesa Verde and Wind Caves National Parks. Recently, the weevil has been documented on Platte thistle, *Cirsium canescens,* an endemic species restricted to the Sandhills prairie of western Nebraska. Platte thistle is closely related to Pitcher's thistle, *Cirsium pitcheri,* an endemic restricted to the Great Lakes sand dune ecosystem and federally listed as Threatened. Although the weevil has not been found on Pitcher's thistle, the pattern of infestation on native *Cirsium* and the thistle's susceptibility to the weevil leaves little doubt that it will be colonized soon.

It is apparent that even careful research on the diet limitations of biological control agents may fall short in predicting how introduced insects will act in the field. Although this flowerhead weevil's preference for *Carduus* may be strong in European habitats, its preferences have broadened in North America, and it clearly acts as a generalist in the United States. But this isn't the end of the story: Like many plant-insect interactions, thistles and weevils are enmeshed in a complex trophic structure that involves numerous other players.

Picture-winged flies with patterned wings and shiny metallic bodies also feed on thistle. *Paracantha culta,* a native picture-winged fly, has decreased in the Sandhills prairie ecosystem, and *Orellia occidentalis* has disappeared from thistles found in Mesa Verde National Park.[3] The decline of picture-winged flies illustrates how introductions may have unintended and unpredictable repercussions. How will their absence affect the Sandhills prairie and Mesa Verde ecosystems? Does the absence of picture-winged flies have an effect on other species? These questions are unanswerable because we do not know all the ecological details of picture-winged flies, weevils, and thistles, or their evolutionary trajectories. What we do know is that the human introduction of an exotic plant—followed by release of an exotic insect to control it—has clouded the fate of these native fly species. Like toppling dominoes, these changes have begun to reverberate through the landscape.

## Recommendations & Conclusion

Although the harmful effects of biological control have been illustrated here, some recommendations can still be made for its future use.

**1)** *Specialist predators and herbivores are the best organisms for biological control.* Coevolved adaptations essentially limit an organism's ability to use alternate hosts. By using specialists as biological control agents, we can employ what natural selection has fine-tuned to our advantage.

**2)** *Rigorous ecological and evolutionary research on the biological control agent is essential prior to its release.* Although we cannot predict all of the consequences of introducing non-native species, rigorous research can test some basic questions of host use, dispersal distance, and life history, research which can help us assess the ecological risks of introduction.

**3)** *Neoclassical control methods should be severely questioned.* Aggressive predators and herbivores may appear to be an immediate remedy for controlling invasive species, and their voracious appetites and reproductive success contribute to this perception. Yet these are the same traits which make them destructive agents in novel environments, out of check and out of control. Their use should be limited if not abandoned.

Biological control once appeared to be a panacea in our fight against invasive species. For all intents and purposes, this method was the ecologically sound alternative to chemical sprays and their adverse effects on beneficial non-target organisms. In principle, biological control is simple and elegant: predator follows prey, herbivore forages on plant, species' interactions are two-way affairs. In practice, we have learned how truly complex ecological communities are and how plastic species' response to novel environments can be. Thus, prudence and caution are warranted when biological control methods are contemplated. ❙

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destruction and degradation of natural habitats. Considering plants and animals together, exotics have contributed to the decline of 42% of Threatened and Endangered species listed under the US Endangered Species Act.

Many consequences of plant invasion are more difficult to quantify than management costs, lost recreation areas, or imperiled species. By substantially altering community composition, structure, and function, invasive aliens can change the very fabric of the natural world. For example, through its dense light-capturing canopy and chemical effects, Norway maple (*Acer platanoides*) can eliminate native herbaceous species in forest understories of the eastern US, while invasive woody honeysuckles such as Morrow's honeysuckle (*Lonicera morrowii*) can create dense shrub layers where none previously existed.

Tamarisk (*Tamarix spp.*), a Eurasian tree introduced by western settlers in the 1800s, has contributed to major hydrological alterations in the desert southwest by guzzling water from deep within the ground.

Although the most successful invasive plant species are few in number, they are enormous in impact. Invasions can spread over wide areas and engulf a range of habitats. The most insidious effect of plant invasion may be biogeographic breakdown—a process by which landscapes are becoming increasingly homogenized, losing their biological distinctiveness and their deep legacy of evolutionary and geographic separation. The introduction of alien invasive plants is not a service, as Jefferson would have us believe, but an outrage, leading to a biological world that is simpler—and poorer. ❧

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**RESOURCES**

**The National Association of Exotic Pest Plant Councils** (8208 Dabney Avenue, Springfield, VA 22152) is an umbrella organization that oversees a handful of nonprofit organizations operating in Florida, Tennessee, California, and the Pacific Northwest that are dedicated to building public awareness about the invasive plant problem and developing support for the control and management of exotic plants.

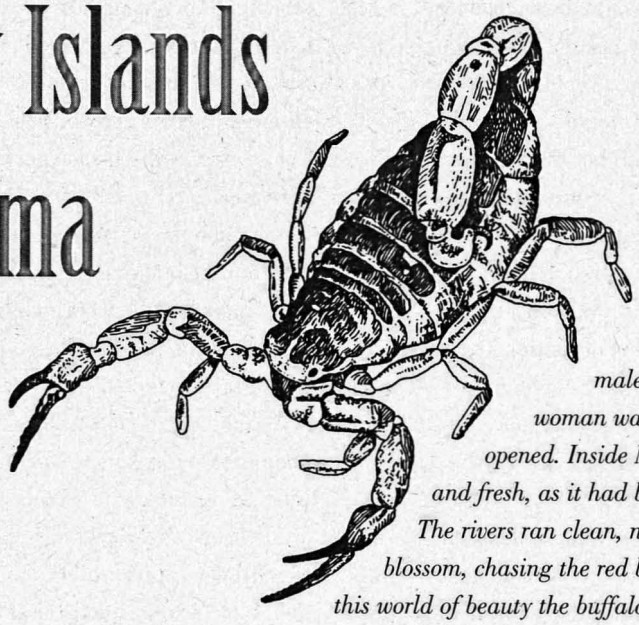
**The Animal and Plant Health Inspection Service** (US Department of Agriculture,12th and Independence Avenue, SW, Washington, DC 20250; http://aphisweb.aphis.usda.gov/) is charged with preventing the importation of noxious weeds and designated foreign pests into the United States.

Seventeen federal land management agencies have pledged to coordinate the government's approach to managing exotic weeds on federal lands via the **Federal Interagency Committee for the Management of Noxious and Exotic Weeds** (1849 C Street, NW, Washington, DC 20240; http://refuges.fws.gov/FICMNEWFiles/FICMNEWHomePage.html).

A partnership of federal agencies and other public and private organizations, the **Native Plant Conservation Initiative's Exotic Plant Working Group** (4598 MacArthur Boulevard, NW, Washington, DC 20007; http://www.aqd.nps.gov/npci/epwg/) works to promote awareness of invasive exotic plant management issues.

**The Nature Conservancy's Wildland Weeds Management and Research Program** (Weed Sciences Program, Robbins Hall, University of California, Davis, CA 95616; http://tncweeds.ucdavis.edu/) promotes the sound management of pest plants on Nature Conservancy-managed lands and other lands with significant biological diversity.

# Conservation and Natural History in the Sky Islands of Oklahoma



*...straight into Mount Scott the leader of the herd walked. Behind him came the cows and their calves, and a few young males who had survived. As the woman watched, the face of the mountain opened. Inside Mount Scott the world was green and fresh, as it had been when she was a small girl. The rivers ran clean, not red. The wild plums were in blossom, chasing the red buds up the inside slopes. Into this world of beauty the buffalo walked never to be seen again.*

**—Kiowa legend, connected to the destruction of the great southern herd**

**by Andrew Kroll and Dwight Barry**

Rising from the level face of the Great Plains, the Wichita Mountains of Oklahoma are a captivating contrast to the expanse of flatland extending to every horizon and a fertile oasis of mystery and potential. Rich in biological and cultural history, the Wichitas loom largely in the legends of the Great Plains: holy hills for the Kiowa, territory visited by the Apache, Cheyenne, and Comanche, and a place of solace for storied chiefs such as Satanta, Guipago, and Quanah Parker, the last war chief of the Kwahadi Comanche. In 1907—under the watchful eyes of Parker—the bison were returned, restored to a landscape where they had once roamed in thundering herds. A Kiowa prophecy heralded this event as a sign that the once powerful and feared Kiowa Nation would rise again and reinhabit their ancestral mountains.

While the Kiowa have not regained their former eminence on the Southern Plains, the Wichitas do represent an overlooked opportunity to realize the profound biological heritage of the Great Plains. Located in rural Comanche, Kiowa, and Caddo counties in southwestern Oklahoma, the Wichitas were designated a forest preserve in 1901 and a wildlife refuge in 1905, and today the Wichita Mountains Wildlife Refuge is viewed as one of the crown jewels of the National Wildlife Refuge System. Although long recognized by people in the region as the premier locale for camping, hiking, hunting, and fishing, the Wichitas remain an unknown entity on the national conservation scene, and are in need of advocacy and a prominent place in restoration plans for the Great Plains (see Daniel Licht, "The Great Plains: America's Best Chance for Ecosystem Restoration, Part 2" in *Wild Earth*, fall 1994).

The Wichita Mountains provide the best representation of the unique mosaic of ecosystems that occur in the area. A true biological crossroads, the Wichitas continually amaze: here the tall and shortgrass prairies meet and intergrade; the confounding woodlands of the Cross Timbers



scorpion by Evan Cantor

region form impenetrable hideouts for wildlife (Washington Irving likened travel through these woods to "struggling through forests of castiron"); the mountain hollows shelter vital and sometimes spectacular riparian habitats. A mountain range older than the Appalachians, the slopes of the Wichitas are dissected with ancient faults now eroded into crosshatch patterns of canyons and timbered thickets; rolling pastures are scattered across the landscape in a fire-derived mosaic of prairie grasses and oak woodlands.

Walking through this labyrinth of eroded stone and jumbled rock, one may encounter cacti and yucca representative of the Chihuahuan Desert, sugar maple of the Eastern deciduous forest, or the pecans, walnuts, and sycamores typical of southern bottomlands. At least fourteen species of oak occur in these mountains, including the northern extent of live oak. The deep prairies on the refuge support some of the healthiest grasslands of the southern Great Plains; side-oats grama (the state grass of Texas) appears to be more prolific in this small protected corner of Oklahoma than it is anywhere south of the Red River.

Protecting nearly 60,000 acres, the refuge is a true haven for the wildlife of the region. Only 22,400 acres of the refuge are open for public use, with over 5700 of these acres protected as federal Wilderness in the Charons Garden unit. In the mountains one may spend the day watching elk, have to give way to a lone bison on the trail, or see a tarantula or a scorpion scramble over a bedroll in the evening. On the sandy bars of the creekbeds one may find the tracks of an otter beside those of a mountain lion. Swift, gray, and red foxes occur in the Wichitas, and the rising of the moon is greeted nightly by the fanfare of crying coyotes. On the grasslands, prairie dogs duck and dash across the scuffed dirt of their towns and the nearby roadsides, ever wary of coyotes and Ford half-tons. Tucked into the oak groves is the largest breeding population of the federally Endangered Black-capped Vireo in Oklahoma; they share the woods with Red-headed Woodpeckers and Great Horned Owls. Windy fall days find the sky alive with Red-tailed, Rough-legged, and Swainson's Hawks, Northern Harriers, American Kestrels, and occasionally a Golden or Bald Eagle (the latter species winters in a restricted part of the refuge).

Great Horned Owl by Evan Cantor

The Wichitas have been the focus of many restoration efforts over the course of their history as a game preserve, with equal amounts of success and failure. The great social and biological success of the bison's return led to the reintroduction of Rocky Mountain elk in 1911 to replace the extirpated (and now extinct) Merriam's elk; Wild Turkey were reestablished by 1914. The majority of the refuge is off-limits to casual human use, which protects critical calving areas for bison and elk. These two species are managed through auctions and hunts, respectively (the elk herd is so prolific that the State of Oklahoma issued nearly 200 permits for an off-refuge hunt in the fall of 1997). Efforts to introduce pronghorn and Greater Prairie Chicken failed, as did a misguided attempt to bring bighorn sheep to the refuge. In late 1997 and early 1998, the historically present river otter was reintroduced to the refuge; the habitat and environment are conducive to breeding success, but it is too soon to tell if they will survive.

The top mammalian predators have at one time or another been extirpated from southwest Oklahoma; the litany of species removed from the Wichitas reads like the history of wildlife in any western state. Although there is no confirmation that the grizzly bear roamed these mountains, local legend says that the grizzly did occur here but was gone before the Civil War. The black bear went the way of its ursid cousin by the early 1930s. Mountain lion were extirpated by the early 1970s, but they have begun to recolonize the region naturally and now a small breeding population resides on the refuge. One of the great historic ironies of wildlife conservation happened here, although the managers of the time did not see it: in order to protect the anticipated bison herd, the last wolves that ranged through the Wichitas were eradicated by trap and bullet, and had disappeared completely by 1906. Today, the presence of the prolific bison and elk herds, combined with the abundant white-tailed deer population, makes the Wichitas a biologically appropriate area for gray wolf reintroductions in the Great Plains. The great variety of food sources (especially acorns) makes the refuge excellent bear habitat as well. The black-tailed prairie dog towns should also be investigated for their reintroduction potential for black-footed ferret.

Fort Sill, the US Army's Field Artillery Headquarters, lies immediately south of the wildlife refuge. At roughly 120,000 acres, Fort Sill is a sizeable area that will play a decisive role in the Wichitas' future. Although Fort Sill manages some of its land for wildlife values (actively protecting the Black-capped Vireo and maintaining huntable populations of deer, Wild Turkey, and Bobwhite Quail), the Army has done an inadequate job of protecting sensitive habitat on the base. Tracked vehicles are driven through riparian woodlands or wet meadows instead of being restricted to more resilient training areas; discarded refuse from training exercises is littered throughout the base; abandoned equipment is left behind to rust into the soil. Some of the fire-dependent ecosystems benefit from fire on a reasonable return interval, although the source of these fires (Fort Sill *is* an artillery base) is problematic; these ecosystems are adapted to sporadic fires of varying size and frequency, but the best way to reintroduce them into the system is not through artillery practice. Fort Sill should have a prescribed burning program that is at least informed by the one that the wildlife refuge is using. Current restricted areas on the base preclude a comprehensive ecological assessment of Fort Sill; however, conservationists should request that a broad-scale evaluation of the base be widely publicized. This information should be used to refine a joint management plan between the Army and the Fish and Wildlife Service, whose holdings are separated only by a game fence. The Army is already downsizing operations on the base; a land transfer between the two agencies may occur in the future and joint planning now would help ease the management transition.

The biggest challenge for conservationists in the Wichitas may be to foster a cultural and social environment that is responsive to the many values and benefits afforded by a large, fully protected reserve. A principal reason the refuge was established so early in the conservation history of this country was the ardent and widespread public support the proposed refuge enjoyed in the region. The people of southwest Oklahoma at the turn of the century clearly recognized the benefits they would derive from the refuge; several politicians advanced their careers with their political efforts to protect the Wichitas, and newspaper accounts of the return of the bison in 1907 are full of civic pride. This historical precedent can provide a foundation for a reawakening of conservation attitudes among local residents and visitors alike.

Licht (*WE*, fall 1994) details some of the tangible economic incentives for a conservation plan on the Great Plains; the agricultural landscape that surrounds the Wichitas in nearly every direction would probably yield economic figures similar to the ones that he cites for Iowa. While these are important for gathering national support, local residents must remind themselves of what an enlarged refugium in the Wichitas would provide: additional hunting opportunities for elk, white-tailed deer, Wild Turkey, Bobwhite Quail, waterfowl, and possibly bison. As hunting is a widespread and valued form of recreation in Oklahoma (we can attest to the fine Quail hunting available in the Wichitas), and public hunting areas are remarkably rare, conservationists must do their best to enlist hunters in proactive plans that conserve both large tracts of habitat as well as wildlife populations.

Because land conservation in the American West is often viewed regionally as "taking land out of production," conservationists must be willing to employ flexible and innovative methods to achieve their stated goals. To include surrounding landowners, a "grass bank" similar to what is being used on the El Malpais project in the American Southwest might be instituted. Such a program would allow private landowners (the majority of private lands around the mountains are used for livestock production) to graze cattle on an expanded refuge during drought years in exchange for placing a conservation easement on their land. Grazing on the refuge's land would be managed by personnel from the Fish and Wildlife Service and follow a strict management plan. Once again, methods that provide both economic and cultural benefits for local citizens must be a priority if effective conservation of the natural resources in the Wichitas will be attained.

While the free bands of Kiowa and Comanche may never again wander through the lovely light which settles on the Wichitas, we may have hope that another proud nation will return, a nation that values and preserves their biological heritage, understanding the multitude of rich rewards that such a heritage offers each new day. ▮

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*You can obtain more information about the Wichita Mountains Wildlife Refuge by contacting the refuge headquarters (Route 1 Box 448, Indiahoma, OK 73552; 405-429-3222) or the Association of Friends of the Wichitas (POB 7402, Lawton, OK 73506).*

# The Voluntary Retirement Option

## for Federal Public Land Grazing Permittees

by Andy Kerr

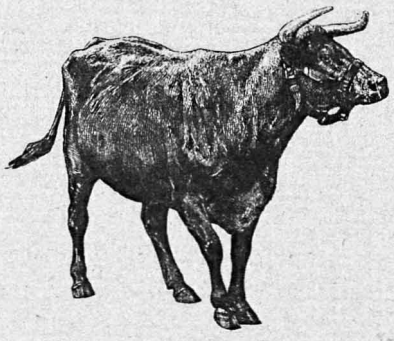

## ABSTRACT

*Allowing existing federal public land grazing permit holders to sell their livestock grazing privileges—without also having to sell the base property to which the permits are legally and financially attached—could significantly decrease conflicts over public land management, reduce federal spending, improve environmental values, allow better stewardship by the federal land managing agencies, and increase the wealth of permittees. Such a program can and must be implemented without changing public land livestock grazing from a privilege to a right. Conservationists are warming to the idea. Will livestock permittees, federal resource managers, and Congress?*


### The Present Federal Grazing System

Grazing on the public lands is not stable. Few, if any, bright spots are in the future of federal public land grazing permittees. Beef is losing market share to chicken, pork, seafood, cheese, and vegetables. Concerns about human health and food safety (*E. coli,* mad-cow disease, etc.) are affecting the beef industry. Subsidies to farm and ranching industries are being phased out on private lands, which does not bode well for subsidies on public lands. The average age of the permittees is rising. Conservationists are paying more attention to the ecological impacts of livestock grazing. Conflicts with recreationists are more frequent. Increased enforcement of water quality standards is likely. More endangered species listings are inevitable, and more litigation is probable. New planning and management processes by federal land management


illustration by R. Waldmire



**It would be less expensive, fiscally and politically... to simply buy out the problematic grazing permits and save extensive planning, monitoring, research, public involvement, appeal, litigation, and political costs.**

agencies will possibly reduce livestock grazing numbers and certainly place more restrictions on timing, location, etc. The latter scheme requires increased federal spending which is increasingly problematic to secure. Grazing fees are likely to rise. Bidding by environmentalists on state grazing leases will increase pressure to reform the federal grazing fee.

The system for grazing on Forest Service and Bureau of Land Management (BLM) lands in the American West was established by the Taylor Grazing Act of 1934. In most areas, qualifying ranches ("base properties") were assigned an exclusive amount of AUMs (animal unit months: forage for a cow and calf for one month), theoretically based on the land's carrying capacity.

Public land livestock grazing is a privilege, not a right. If the government chooses to discontinue a "giving," that does not constitute a "taking" as prohibited by the US Constitution. However, the real estate market—due to the near certainty that the federal government will transfer grazing permits to the new base property owner—recognizes the value of a federal grazing permit attached to a base property. The result is that the base properties have increased in market value to reflect the federal AUMs that are automatically transferred to the new purchaser.

In the rare, but increasing, occurrence when the government does reduce grazing, it is a loss of real money to the permittee; the permittee may suffer a loss of future subsidized grazing, and a reduction in the fair market value of the base property. It is understandable that ranchers—not to mention the banks that hold the mortgages on the base properties—fight so hard to keep their numbers of AUMs up. Given the vagaries of the cattle business, operators would benefit from the flexibility to not exercise their permits, or to be allowed to sell their interests in them. This is not possible under existing law, which mandates "use it or lose it."

## The State of Public Land Grazing

Public land grazing contributes only two percent of the forage consumed by the nation's cattle industry, and only then with a large subsidy from federal taxpayers. Despite overwhelming scientific information and renewed fiscal restraint, government policy toward public land livestock grazing has not changed significantly.

The Interior Columbia Basin Ecosystem Management Plan provides a useful example, as similar efforts will likely spread to all federal lands. While new studies by 170 government scientists to guide management of 75 million federal acres in the Interior Columbia Basin in seven states (and the Oregon portions of the Klamath Basin and Great Basin) acknowledge the ecological destruction livestock cause, *no grazing reductions are proposed* by government managers. Nonetheless, as more species are listed for protection under the Endangered Species Act (bull trout, westslope cutthroat trout, other fish, lynx, numerous birds, amphibians, reptiles, and plants, etc.), grazing reductions are inevitable.

The alternatives in the Columbia Basin plan vary, but all will make it more expensive for ranchers to graze public lands—not in the fee, but in herding, fencing, restrictions on timing and length of grazing, and other costs. In the plan, the federal government assumes a one percent annual decline in grazing due to economic factors, not environmental forces. The new plan further assumes that even if grazing is reduced by 50% to protect ecological values, sustaining the remaining grazing will cost the government at least $50,000 per permittee per year in the form of mitigation, monitoring, and management. This expense is in addition to the ongoing provision of below-cost forage. (The source for dollar figures in the

above paragraph is a leaked draft of the Eastside Draft Environmental Impact Statement being prepared for the Interior Columbia River Basin Ecosystem Management Project. Interestingly, no such information appeared in the published draft issued in May 1997.)

According to the official draft EIS, the 756,000 AUMs on federal lands on the "eastside" (Oregon and Washington east of the Cascade Crest) provide a total of 243 livestock owner, operator, and ranch hand jobs. While higher in certain other western states, the number of jobs provided by federal forage is still trivial. As federal budgets continue to tighten, agency decisions increasingly may be based on how much the new plans cost taxpayers. The least expensive alternative would have the greatest reductions in grazing and logging and would cost about half of what is being spent today to mismanage these lands. The most expensive alternatives are those which continue to prop up livestock grazing.

## The Value of Permits

Permits have a capital value. An estimate of their fair market value can be made by qualified real estate appraisers. The value ranges as much as the quality of the grazing land. According to Professor Robert Nelson, School of Public Affairs at the University of Maryland (formerly with the US Department of Interior Office of Policy Analysis for 18 years), the capital value of a public land grazing AUM across the West is $50-100. For the purposes of this discussion, let us assume an average value of $75/AUM or $900/AU (the real estate and ranching industries deal in "animal units" that equate to 12 AUMs).

## Economics of the Existing System

The public land range fee for 1997 was calculated by an arcane and irrelevant statutory formula at $1.35/AUM. Even though the BLM admits spending more on grazing than it takes in, the agency considers only a small proportion of the costs. According to Nelson, a conservative estimate of taxpayer expense in excess of revenue is $20/AUM. While this includes direct and indirect (overhead) costs, it does not include other subsidies from the US Department of Agriculture such as Animal Damage Control services. In contrast, the gross income the federal treasury receives from an AUM is less than $1.35. Depending on the legal classification of the rangeland, 50-62.5% of the $1.35 is dedicated to the Range Betterment Fund—moneys used for fences, water developments, and the like—and does not offset the federal taxpayer expenditure.

## A Proposal: The Voluntary Retirement Option

It would be easier—and more just—for the federal government to fairly compensate the permit holders as it reduces cattle numbers. Since the government spends substantially more than it receives for grazing, in a few years the savings realized by reducing livestock numbers can pay for the compensation. It would be less expensive, fiscally and politically, for the agency to simply buy out the problematic grazing permits and save extensive planning, monitoring, research, public involvement, appeal, litigation, and political costs.

Federal law should be changed to:

■ *Allow a permit holder to choose to not exercise any or all of the grazing permit.* There would be no penalty to the permittee for not grazing. This would give desirable flexibility to ranching operations, decrease livestock grazing damage, and potentially increase the value of the permit, in the event the permittee later wished to sell. An allotment with more forage is more attractive both to prospective livestock operators and conservation buyers.

■ *Allow existing permittees who hold federal grazing permits to sell or donate their permit to the federal government, which would then retire the allotment.* A permittee could choose to sell to the federal government, receiving fair market value for their interests in the permit. Money for tax deductions and for acquisition of permits by federal agencies could be funded by a variety of sources: from the Land and Water Conservation Fund, by reducing agency grazing budgets, by reallocating US Department of Agriculture Animal Damage Control subsidies, by using the Range Betterment Fund, or by earmarking that small fraction of the federal grazing fee that actually makes it into the federal treasury. Alternatively, a permittee could be paid to retire their permit by an individual environmentalist, a state fish and wildlife agency, a private conservation organization, a hunting and fishing club, or any other interested party. If retirement were in the form of a donation to the government, a federal income tax deduction would be available.

■ *Reaffirm that grazing the public lands is a privilege, not a right.* Any legislation must expressly state that this change in law in no way increases or diminishes any vested interest the permittee may or may not have in public land grazing; that grazing the public lands is still a privilege and any reduction in grazing

by the government is not a compensable loss to the permittee. Existing laws designed to protect the environment would not change. The administering agencies could still choose (or be ordered by a court) to reduce, eliminate, or place additional conditions on grazing to protect ecological or other public values.

## Will the Voluntary Retirement Option Work?

How successful might such a buy-out program be? Some examples from northern Nevada suggest it could work. Prior to the establishment of Great Basin National Park, statutes establishing National Parks in the West usually had sunset provisions for livestock grazing. In these examples, the handwriting was clearly on the wall, and in many cases, permittees opted to sell out early to the National Park Service or to conservation organizations specializing in property acquisition.

The 1986 law establishing Great Basin National Park not only grandfathered, but *mandated*, livestock grazing to continue. The Park Service had very limited ability to restrict grazing to protect park values. In 1995, at the request of the park's cattle grazing permittees, the Nevada Congressional Delegation (two Democrats and two Republicans) attached a rider to the FY96 Interior Appropriations Act to require the Secretary of the Interior to retire grazing permits in the park, if they were donated to the United States. Presently, The Conservation Fund is negotiating to pay the permittees the fair market value of permits in exchange for their donation to the government.

Permittees on the Sheldon National Wildlife Refuge in Nevada also recently opted to retire their permits, concurrent with mutually agreed-upon compensation by The Conservation Fund. The pressure was on because the US Fish and Wildlife Service had ended grazing on the nearby Hart Mountain National Wildlife Refuge in Oregon and was preparing to undertake a process that would likely have resulted in the same at Sheldon.

How much interest will there be among livestock permittees in such a program? There is no reliable way to estimate. Factors will include the financial viability of ranching operations, the personal situations of permittees, the existing and anticipated level of conflict regarding grazing on an allotment, the price of beef, etc. Anecdotal surveys suggest that about half of the ranchers who have taken advantage of buy-out offers have moved on to other work, and about half have purchased livestock operations not dependent on public land. The latter stayed in ranching, but wanted to be the masters of their own domains.

## The Benefits of The Voluntary Retirement Option

■ Species and ecosystems would recover at maximum rates and in the most cost-effective manner. As permits are retired, taxpayer costs of subsidizing forage are reduced proportionally. The Forest Service and BLM could more easily meet the environmental protection standards of state and federal law if livestock grazing were reduced, resulting in better stewardship.

■ Controversy could be severely diminished. There would be less litigation, less need for funds to be spent mitigating livestock grazing damage, and less call to overturn environmental protection statutes.

■ While not vesting a legal right to graze (something permittees have never had), such a program would provide more options to livestock permittees. A permittee could choose to sell a federal permit, but still live on and/or raise livestock on the base property. Very importantly, the choice to exercise the voluntary retirement option rests solely with the permittee; if a rancher didn't want to retire, he or she would be free to continue to take his or her chances in a dynamic economic, regulatory, budgetary, and political environment.

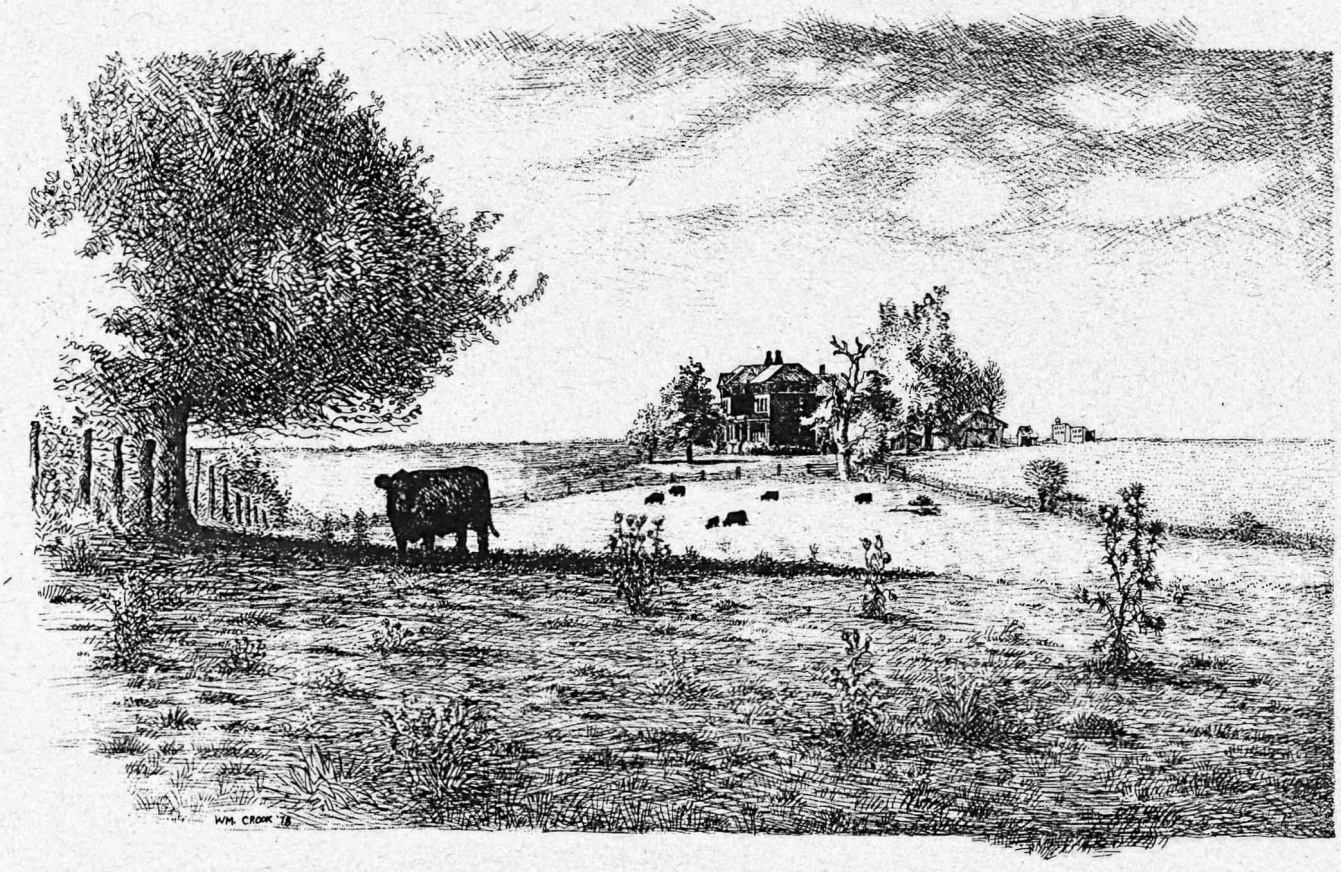
## The Costs of the Voluntary Retirement Option

A one-time increased cost to taxpayers is inevitable, but would be recouped in a few years by the elimination of ongoing subsidies. After recoupment, the continued savings could be used for national debt reduction and other beneficial activities such as stream restoration, erosion control, weed eradication, etc.

Under current budgeting policies, new expenditures must be offset by savings during the same budget year. This can lead to a penny-wise, pound-foolish result where, even though the investment of buying and retiring AUMs has an average payback of 3.75 years, it is budgetarily impossible to undertake. An exception is clearly justified in this case.

As livestock grazing decreases, there will be less need for direct agency staffing support (range conservationists, etc.) of public lands ranching operations. In an era of downsizing, staff reductions are already occurring.

Just as the public land grazing permittee presently has no option but to fight desperately to hold on to the AUMs attached to the base property, conservationists have no option but to exercise traditional environmental protection strategies in the arenas of administrative reform, judicial enforcement, and legislative




change. While these methods have been and can continue to be somewhat effective, they are not necessarily the most efficient use of resources; they can cause social and political stress, and are not always successful. To take advantage of the voluntary retirement option, some conservationists—and some ranchers—would need to rethink their traditional strategies.

Following implementation of the voluntary retirement option program, there would be less litigation needed to enforce the nation's environmental laws, as would there be less lobbying for a higher grazing fee, better regulatory standards, improved public processes, and/or abolition of livestock grazing. There would be more lobbying for funds to provide for permit acquisition from willing sellers. Existing fiefdoms would be affected. Environmentalists who believe as a matter of principle that it is wrong to allow livestock grazing permittees to profit from the privilege of grazing on the public lands will not be placated. For those permittees who desire to stay in public land livestock grazing, the status quo nominally remains.

If enough willing sellers exercise their option, however, remaining permittees will be affected. As their numbers decrease, so will their political influence and ability to maintain current subsidies. The public will increasingly see a stark contrast between recovering retired allotments and those still being grazed. This will also increase pressure on remaining permittees. Citizens who enjoy living in "ranching communities" will feel a loss as these communities accelerate their ongoing diversification. Ranchers who believe as a matter of principle that it is wrong to reduce livestock grazing on the public lands will feel threatened by this proposal.

## Conclusion

While the voluntary retirement option is a radical departure from the traditional debate on public land livestock grazing, it is equally rational. It addresses directly the market value of federal grazing permits, which is the major subtext in the debate over public land livestock grazing. It has the potential to achieve substantial ecological benefits on the ground, without additional government regulations. Politically, the fairness and rationality of the proposed policy change can appeal to conservationists, taxpayers, politicians, permittees, fiscal conservatives, compassionate liberals, and others. Since it is a solution outside the box we are all in, it will require leadership in all camps and a willingness to try something different. ▮

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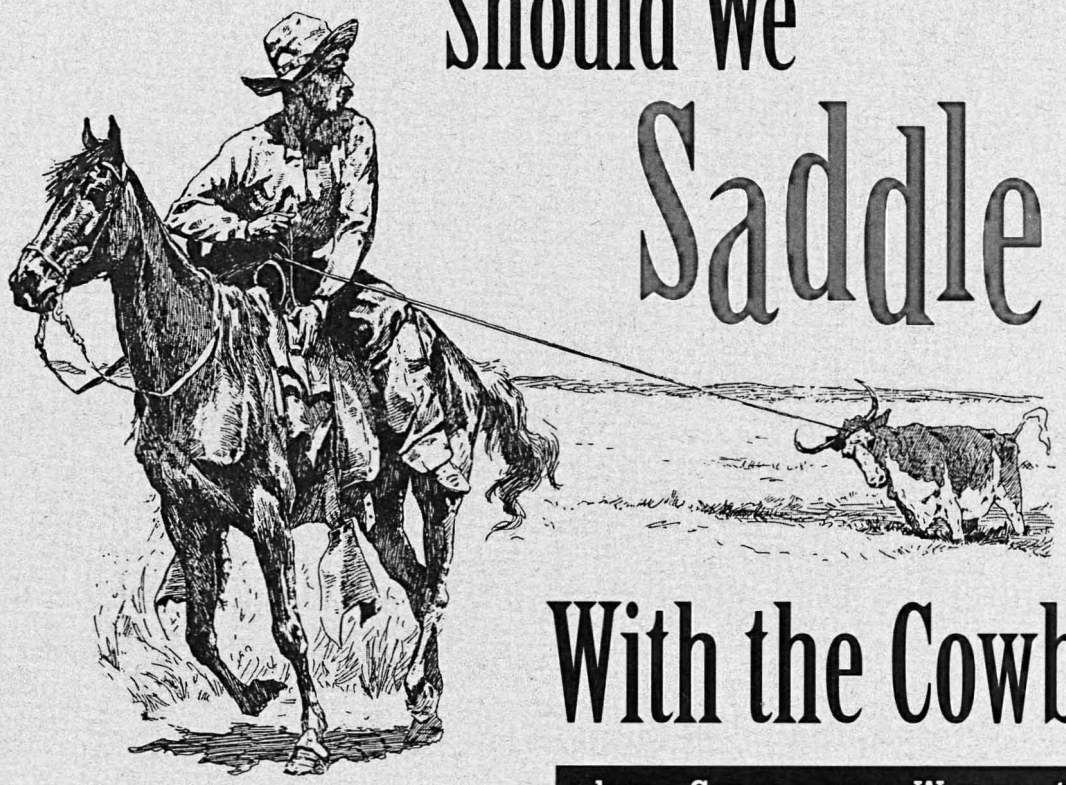
illustration by William Crook Jr.



# Should We Saddle Up With the Cowboys?

by George Wuerthner

Commentators on the West such as *High Country News* publisher Ed Marston, organizations such as The Nature Conservancy and Rocky Mountain Elk Foundation, and various natural resource interests suggest that conservationists and ranchers should work together to solve natural resource conflicts. Often, the rallying cry is "reform" and "better livestock management." If we only use the proper grazing methods with adequate range developments, conflicts between wildlife and livestock will disappear, or at least become so minimal as to no longer be a problem. It is assumed that wildlife supporters and livestock producers have the same ultimate goals for the land based upon "wise stewardship" (Frisina and Morin 1991, Alt et al. 1992, Savory 1988, Frisina and Mariani 1995, Butler 1995).

There are some circumstances where narrowly defined "benefits" to specific wildlife species and ecosystems may result from grazing by domesticated animals; however, these few positive influences are outweighed by the multitude of negative effects associated with livestock production (Fleischner 1994, Noss 1994, Wuerthner, 1995a). If one believes that livestock production is a foregone conclusion, or even necessary for the health of western ecosystems as some suggest (Savory 1988), then one might be tempted to saddle up with the ranchers to preserve their lifestyle and livelihoods. But I don't agree with either of these presumptions. Thus, I place myself in the camp of conservationists who have critically and carefully reviewed grazing impacts and are not soon likely to ride out with the cowboys to promote cooperative management efforts.

I am convinced that we cannot hope to protect *native biodiversity* and restore *landscape evolutionary processes* as long as the West is managed primarily as a feedlot for domestic animals. If indeed it is desirable from an ethical, ecological, and public policy basis to preserve wildlife

and wildlands, then I believe there is not room enough for economically viable livestock production *and* preservation of these other values on the arid public lands of the American West.

I cannot wholly agree with those who champion reform of grazing practices to make them more ecologically benign; we have different underlying assumptions about what constitutes "healthy" ecosystems, what activities represent the best use of the landscape, and what the ultimate goal of public lands natural resource management should be. These differences rest on two fundamental areas of disagreement: my skepticism about humans' ability to manage landscapes, and my ultimate goal for much of the western landscape—what I call a new vision for the West.

## Limits of Human Knowledge

Livestock proponents argue that we have the knowledge, wisdom, and perhaps even the duty to "manage" the landscape to make it better. I disagree. Our knowledge of how ecosystems operate is limited and imprecise; and even with greater knowledge, we demonstrate little ability to use information rationally. Is trying to grow a water-loving, slow-moving bovine of Asian descent in the deserts of the American West rational?

No credible scientist will claim that we fully understand the evolutionary and ecological processes that have given rise to our array of natural diversity, and so I'm dubious of assertions that we know enough to emulate them with any precision. Of course that hasn't prevented people from trying—clearcutting was said to "emulate" forest stand regeneration, and sport hunting to "emulate" natural predation. There are little data to support such claims. Nevertheless, numerous natural resource policies affecting timber, wildlife, and rangeland management are justified by saying that they mimic natural processes.

To guard against this very real arrogance on the part of humans tampering with natural systems, I support preservation of large wildlands ecosystems where natural processes are essentially *self-regulating* and *self-regenerating*. This is not a blanket rejection of all human intervention. Of course some manipulation is necessary if humans are to live on the Earth. And, manipulation may be directed at reestablishment of natural ecosystem function, including such efforts as reintroduction of extirpated species and natural fire regimes. It may involve eliminating or controlling exotic species—like cows. Most reserves are so small that the only way to maintain certain species or ecological processes is by direct human intervention. The goal should be to limit manipulation to as small an amount of the landscape as possible, and to always work toward self-regulating ecosystems governed by natural processes.

In effect, I question whether "wise stewardship" is the answer to the increasing loss of biodiversity in the US and worldwide. The root of the word stewardship literally means "the keeper of the sty" or pig pen. It implies a sense of proprietorship. In far too many instances, it implies a parental attitude toward the landscape—what I call the "Father Knows Best" syndrome. Wise stewardship may be motivated by the best intentions, but far too often it is still a domineering attitude whereby humans determine what is best for the land, rather than suggesting a cooperative, mutually enhancing relationship. It is a human-centered perspective that promotes human control of the natural world, albeit perhaps a bit kinder and gentler than an all-out assault.

## Manipulation and Ecosystem Health

A few years ago I toured the Audubon Society's Appleton-Whittell Research Sanctuary in southeast Arizona with a number of livestock proponents. Livestock grazing was terminated on the ranch in 1968 and the area is managed primarily for native species. The sanctuary is cited by some livestock proponents as an example of a degraded ecosystem (Savory 1988, Dagget 1994), based upon the assumption that no domestic livestock grazing leads to reduced vigor and loss of grassland vitality.

When I visited the ranch with these livestock proponents, they assured me that wildlife numbers had declined, based in part upon the fact that much of the grassland had assumed a mature state of growth. The grasses, they said, were "decadent" and "overmature" due to a presumed lack of herbivory pressure. They noted some of the dead grass, and proclaimed it as evidence of a dying landscape. The presence of large plants, instead of numerous small plants, was a clear example to these livestock advocates of a rangeland that was degenerating due to lack of grazing animal influences (read: cows). Such a view is widespread in the literature (Savory 1988, Dagget 1994, Alt et al. 1992, Jourdonnais and Bedunah 1990).

Meanwhile, I was not particularly bothered by the presence of old, mature plants, nor even the occasional dead grass plant. What species of invertebrate, fungi, or other creatures were living in the dead plants? What role did "wolfy" plants play in ecosystem dynamics? These are questions that most livestock proponents do not even begin to ask.

Furthermore, the alleged degradation of the ecosystem has not been verified by preliminary scientific research of the site. A number of studies at the Appleton-Whittell Research Sanctuary have documented significant changes in the numbers and distribution of plants and animals since domestic livestock

Rather than remake the West to fit the cow, a wiser course of action would be to let the West do what it does best—produce grizzlies, wolves, elk, bison, trout, scenery, wildlands, wild rivers, and wide open spaces.

grazing was eliminated, including an increase in diversity among some wildlife groups (Bock et al. 1984). But I caution to add that an increase in the number and kinds of species alone is not necessarily an indication of greater biodiversity—something that many people fail to appreciate. Quality of the landscape, including the presence of native species, evolutionary processes, and ecosystem function, is a more important criterion than the number of species alone (Noss and Cooperrider 1994). The most significant findings at the Audubon preserve were the increases among species that are generally rare in much of the West, in part due to their dependency upon ungrazed grasslands (Bock and Webb 1984).

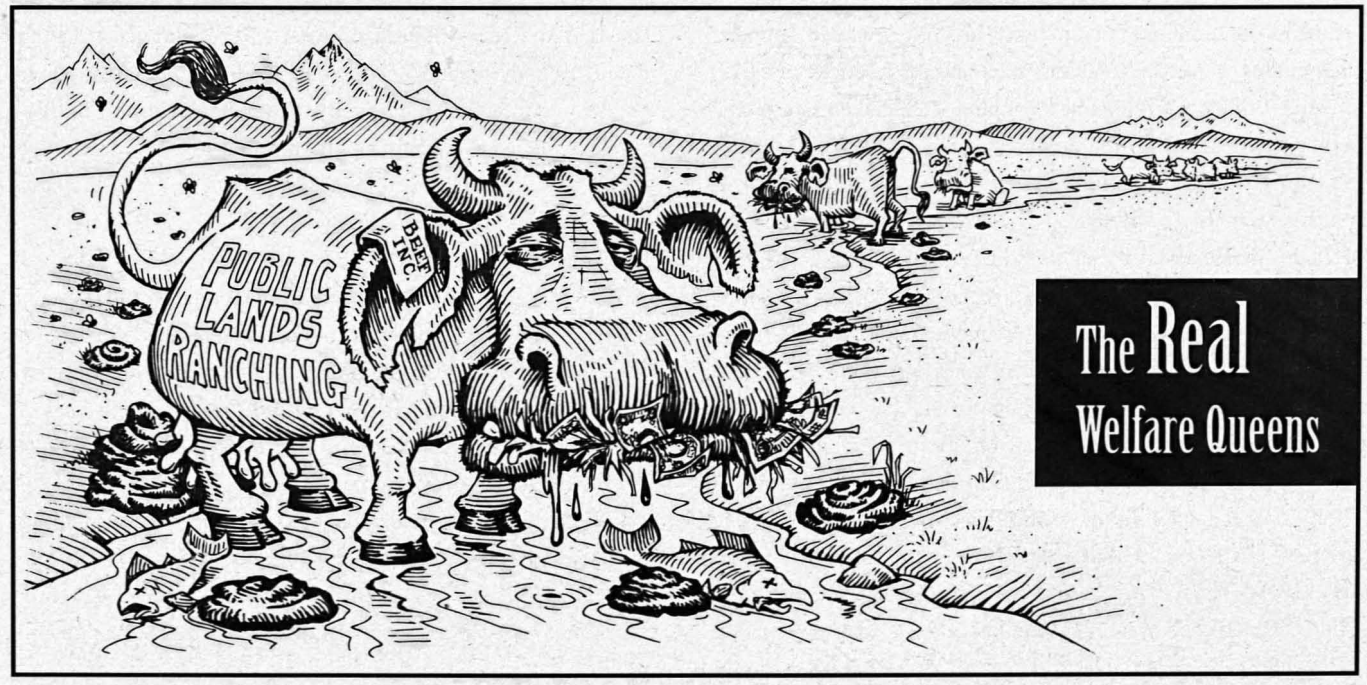
Greater forage production is frequently cited as an indicator of the overall health and vigor of grasslands in "scientific" studies (Holechek et al. 1989). Yet such measurements are more a reflection of economic concerns than biological indicators. Because we permit those with economic interests—whether they are foresters or ranchers—to define the terms used to measure ecosystem "health," we sometimes confuse economic indicators with biological factors.

Just as an increase in timber volume does not reflect a forest ecosystem's health, above-ground forage production may not indicate a healthy grassland any more than increasing wealth should be the sole indicator of the quality of one's life. A young forest regrowing after a clearcut produces more wood per tree annually than an old-growth forest, as a moderately cropped grassland may produce more forage (Jourdonnais and Bedunah 1990), but is this necessarily a good yardstick by which to measure the health of an ecosystem? I think not.

It is true that many grasslands can tolerate grazing pressure; this should not, however, be interpreted to mean they need to be grazed (Belsky 1986, Belsky et al. 1993). Many grassland species invest a tremendous amount of energy toward avoiding herbivory or at least compensating for it. Compensation does not equate to need.

There are many examples of grasslands on isolated buttes, cliffs, and other sites throughout the West that for one reason or another are inaccessible to large hoofed grazing herbivores. Nor should we assume that, prior to widespread domestic grazing, all accessible grasslands were mowed by large herbivores like bison (*Bison bison*) annually or even semi-annually as is common today with livestock utilization. Bison movement and utilization were random and unpredictable.

Much research has demonstrated that coyotes (*Canis latrans*) will successfully rear more pups if their population



dynamics are disrupted by persecution (Nellis and Keith 1976, Pyrah 1984, Windberg and Knowlton 1988). Yet I would never suggest that coyotes *need* to be shot, poisoned, and trapped because they have the ability to respond to high pup mortality. It would be even more presumptuous to infer that humans must manage coyotes to maximize pup production to create healthy coyote populations—but that is the logical equivalent of some livestock advocates' assertions.

Often obscured in the discussion is that most people talk as if grazing were synonymous with domestic livestock. Rangelands are grazed whether livestock are present or not. The difference, of course, is that in an ecosystem without livestock, all of the cropping is accomplished by native species such as prairie dogs (*Cynomys spp.*), ground squirrels (*Spermophilus spp.*), bighorn sheep (*Ovis canadensis*), deer (*Odocoileus spp.*), pronghorn (*Antilocapra americana*), bison (*Bison bison*), and a host of other vertebrate and invertebrate species. Since on many public and private rangelands, 50% or more of the above-ground annual growth is allotted to domestic livestock, a significant amount of the forage base is funneled away from native species into exotic animals. When one considers that this is the status quo on millions of hectares in the West, it becomes clear that livestock production has, and continues to, reduce dramatically the overall native biodiversity of the region.

## A New Vision of the Wild West

Given the appalling condition of public and private western rangelands, where more than 164 million hectares are currently considered to be in unsatisfactory condition (Joyce 1991), the focus of livestock advocates on improving grazing practices is welcome. Nevertheless, addressing rangeland condition via management practices is a tactic used to deflect criticism, as rangeland condition is an area where ranchers can make the most immediate and painless positive changes in their operations. Yet if all the costs associated with livestock production in the arid West were significantly internalized (that is, government subsidies were eliminated), in most instances, western livestock production would be unprofitable.

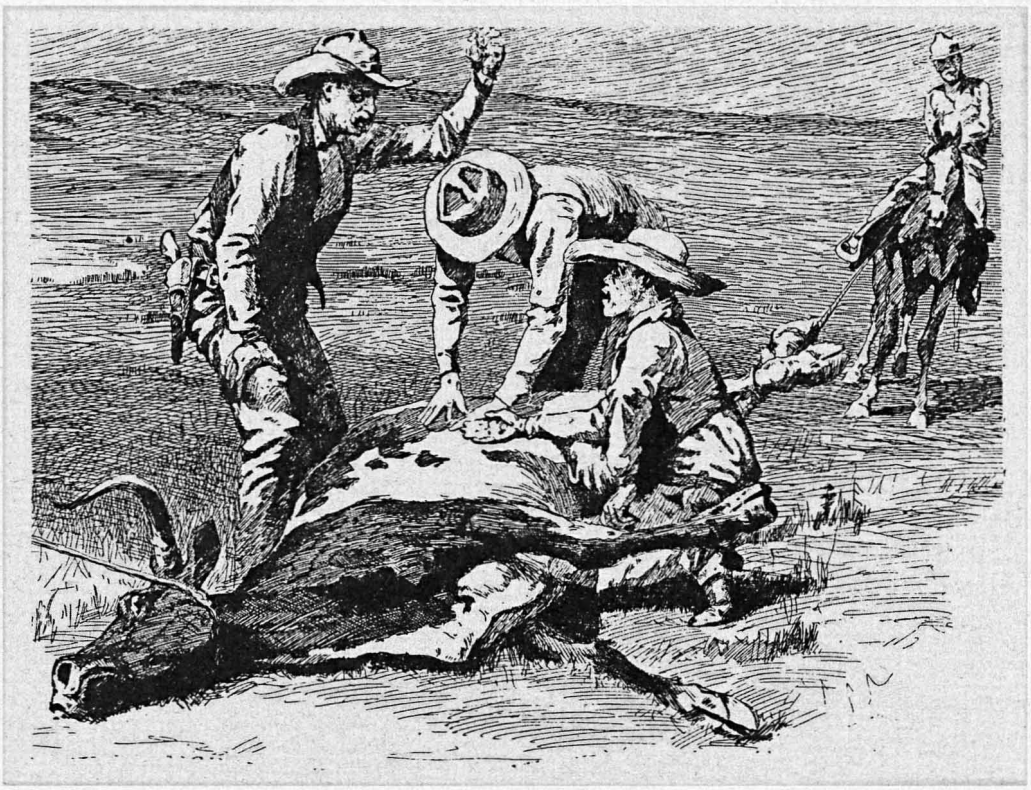
Given its great ecological costs to native ecosystems, and the huge economic costs borne by taxpayers to prop up a dying industry, I cannot join forces with ranchers to protect western livestock production. Not because I don't agree that some management techniques may improve the current situation, but because I question whether we should be producing livestock over much of the West in the first place (Wuerthner 1994). I do not want a domesticated West—where humans manipulate the majority of the landscape and make it a feedlot for domestic animals.

## Does the "Working" Landscape Work for Wildlife?

**Logging tends to reset ecological parameters to earlier stages of forest development and often favors weedy species such as deer that adapt well to disturbance and edges. Grazing also favors species with similar preference for disturbed habitat such as Horned Larks (*Eremophila alpestis*), Cowbirds (*Molothru spp.*), and Lark Sparrows (*Chondestes grammacus*). Many species that require undisturbed grassland ecosystems are rare, or in some cases on the edge of extinction; examples include Montezuma Quail (*Cyrtonyx montezumae*), Columbia Sharptail Grouse (*Tympanuchus phasianellus*), Cassin's Sparrow (*Aimophila cassinii*), and Botteri's Sparrow (*Aimophila botterii*).**

**Is logging simply the removal of surplus wood fiber from the forest ecosystem? No. Even careful and progressive logging—which almost always involves road construction—may have associated negative effects on the land including habitat fragmentation, soil erosion, changes in hydrology, reduction in fuels that would otherwise sustain fires, disruption of nutrient cycling, and aesthetic changes (Wuerthner 1995b).**

**Similarly, even livestock production that maintains rangelands in good to excellent condition has unavoidable consequences for ecosystem function, as well as aesthetic concerns. Livestock production frequently requires dewatering of rivers for irrigated pasture and hay production, fragments habitat, compacts soils, demands predator control, requires fence and water developments, pollutes waterways, causes sedimentation, results in forage competition between native species and exotics, and introduces weeds and disease into native landscapes and species (Fleischner 1994, Wuerthner 1992, Wuerthner 1994). And this is just a portion of known or suspected ecological effects.**



Rather, I dream of a West that is largely given over to native species and governed by natural forces to the greatest extent possible, where much of the landscape is truly self-willed. This is achievable and realistic, but only if marginal economic enterprises are dramatically reduced or eliminated.

While it is unlikely that we will ever again see bison roaming large portions of Tennessee or wolves stalking the Iowa cornfields, such a scenario can be envisioned for much of the West. Rather than remake the West to fit the cow, a wiser course of action would be to let the West do what it does best—produce grizzlies, wolves, elk, bison, trout, scenery, wildlands, wild rivers, and wide open spaces. We can achieve this with some cities and towns sprinkled in here and there, and even a few ranches, logging operations, and farms—but only if we allow the majority of the landscape to function as it once did and could do again.

Most conversations about how grazing proponents and wildlife advocates can cooperate to lessen ecological impacts and maintain "working" landscapes begin with the assumption that livestock production can and will continue on western rangelands. As long as that is the starting point for discussion, the cowboys are going to have to saddle up without me. ❙

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# Wild Forests ARE Working Forests

## Some Thoughts on the Language of Despoilment

by Steve Trombulak

In the mid-1960s, in an ultimately successful campaign to prevent the Bureau of Reclamation from building a dam that would have partially flooded the Grand Canyon, the Sierra Club, under the leadership of David Brower, ran a series of ads in the *New York Times*. One of the ads, conceived by Brower and marketing wizard Jerry Mander, poked fun at the dam proponents' argument that the newly created reservoir would be a boon to power-boating sightseers; it asked "Should We Also Flood the Sistine Chapel So Tourists Can Get Nearer the Ceiling?" Equating the Grand Canyon with a beloved artistic masterpiece provided many people with a frame of reference for the havoc that the Bureau of Reclamation was proposing—a reference powerful enough to make thousands of people who ordinarily wouldn't get involved in a conservation battle become active opponents of the dam. It is a classic example of using language to move the masses. Brower and Mander created a metaphor for environmental destruction that the Bureau could not overcome.

Since that time, it increasingly seems that public issues of all kinds have come to be defined less by their actual details and more by the language that can be used to mobilize public sentiment. Whether this is fair or unfair is beside the point; I say it merely as a statement of fact. Consider the following catch-phrases that have recently come to symbolize complex philosophical perspectives and political agendas: family values, pro-choice, pro-life, corporate welfare, soccer moms.

Interest groups across the sociopolitical spectrum have become very sophisticated in using catch-phrases and metaphorical language to sway public opinion. While usually outgunned in the marketing wars, the conservation community itself has at times used this approach to its own advantage. Arguably, the tide of public opinion against logging old-growth forests can be said to have turned in favor of protection when forest activists began speaking of "ancient forests." The ecological, ethical, and aesthetic values of old growth remained unchanged, but the adoption of a potent catch-phrase helped gain a majority in the court of public opinion. These forests weren't "old" or "over-mature," they were

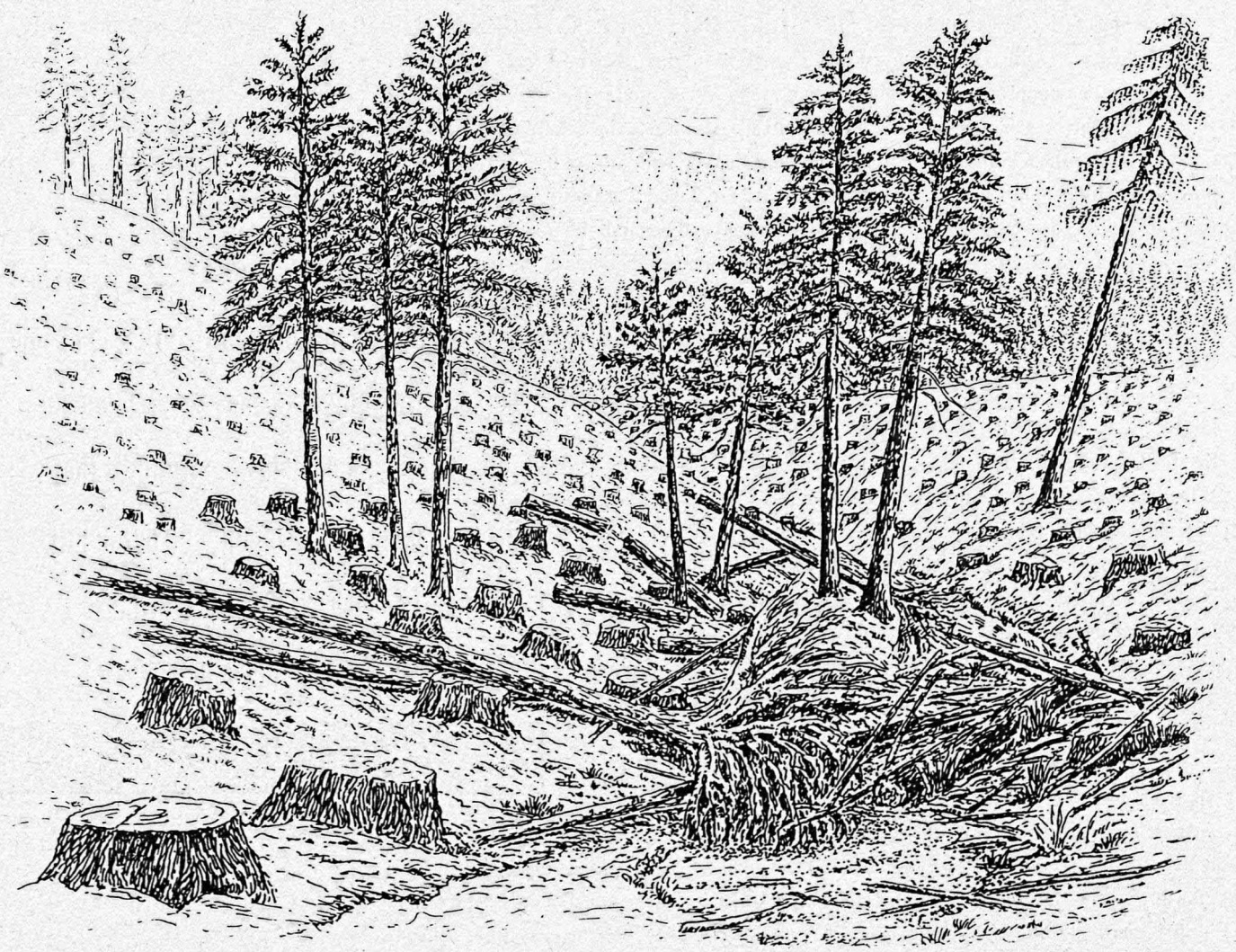
**Our ability to gain meaningful victories on behalf of wild Nature...hinges to a great extent on our ability to develop language that captures the hearts and minds of the public, and our ability to counter the catch-phrases used by those that would rather trash the planet.**

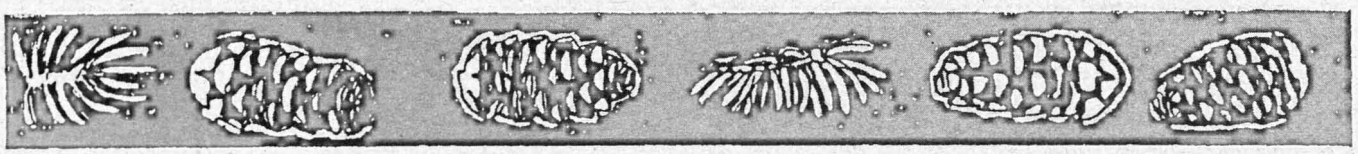
"primeval" or "ancient," which created a new and decidedly positive image in the minds of most people, few of whom had ever seen an old-growth forest.

We conservationists have also found ourselves struggling against the force of opinion from a public swayed by other catch-phrases, such as "sustainable development" and "multiple-use management." The knife cuts both ways.

As a biologist it pains me to admit that I believe our ability to gain meaningful victories on behalf of wild Nature—such as the establishment of ecological reserves and the closing of ecologically destructive roads—hinges to a great extent on (a) our ability to develop language that captures the hearts and minds of the public, and (b) our ability to counter the catch-phrases used by those that would rather trash the planet and every living thing on it.

A new and troublesome catch-phrase intended to shape the enviropolitical landscape is the phrase "the working forest." I have been to enough forest-policy hearings over the past few years to have a clear idea that anti-conservation and property-rights interest groups like how "the working forest" plays with the public. I also have a sense of how this phrase increasingly will be used to try to isolate conservationists from the great mass of the public, as well as from each other. I have been asked point-blank during hearings, and have heard politicians asked, "Are you for or against the working forest: yes or no?" Imagine the potential moral quandary. If a person admits to being against "the working forest," then he or she can be cast as being against all the decent, hardworking people (read: the people from whom conservation activists must often gain support for wildlands protection) who make their living working in the forest. Presumably,





if you're against "the working forest," you're against paper, log homes, wooden toys, and decorated trees for the winter holidays. You probably even hate mom and apple pie!

If an opinion about working forests were as simple as "yes" or "no," then we wouldn't have to agonize about how to respond. We know that trees need to be harvested to provide products for human use, and we know that the wildlands vision of protected core areas surrounded by buffer zones explicitly assumes that there are areas—both inside and outside the reserve system—where timber harvesting (and other forms of habitat manipulation) may occur. So, yes, we are in favor of "the working forest." But we also know that some of the worst environmental damage on this continent has been and is still being caused by timber companies. So, no, we aren't in favor of "the working forest," which in its current incarnation *works* very poorly for most native wildlife.

The solution to this paradox is to realize that the dilemma is merely linguistic. The problem with the catch-phrase "the working forest" is not that it implies that trees are being cut, but that it indiscriminately combines a broad range of timber-harvesting practices—ranging from operations that use whole-tree harvesters to clear areas the size of townships for an export economy, to operations that use low-impact techniques and selective cutting of trees in areas that have been identified as ecological reserve buffers. The catch-phrase masks a range of abuses and provides a refuge for scoundrels who practice a style of forestry that is not defensible on ecological or economic grounds. It is the abusive practices that we must fight against, not the idea of trees being cut. And most importantly, we need to make the public see that this is what we stand for.

So how can this be done? I don't think it will be easy; public perceptions are often difficult to change. We can gain some leverage, however, by creating a new public dialogue on the question of human uses of forests, a perspective different from—and more nuanced—than just "yes" or "no."

## Change the Language

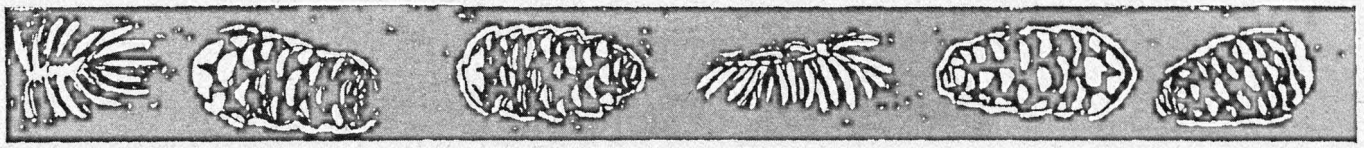
Let's clearly articulate that the idea of a "working forest" is redundant. All forests are "working" whether or not some human being cuts down the trees therein. Forests make a range of contributions to the homeostatic functioning of the biosphere (which, obviously, includes and benefits humans); these facts have been so well documented that we should stand on the tallest soapbox we can find, and shout it so loud and so long that this theme is the basis from which all other discussions begin. Forests—especially unmanaged, uncut, and unharvested forests—provide basic ecosystem services without which life on Earth would be very different, and thoroughly inhospitable to the human race. These services include sequestering atmospheric carbon dioxide, producing atmospheric oxygen, stabilizing soil, controlling flooding, and providing habitat for the countless other creatures we share this planet with. And as my forester friend David Brynn says, "The premier forest product of the 21st century will be high-quality water."

Forests are also "put to work" when they provide non-timber products (e.g., mushrooms, wildflowers, berries), recreational opportunities, and spiritual nourishment for humans. We should not let go unchallenged the notion that a "working forest" is only one where trees are cut by people to make money. Let's call this what it really is: the exploited forest.

## Demand Ecological Definition

Before you express an opinion about whether or not you support a particular proposal to exploit a forest, ask those that use the phrase "working forest" to define what they mean in ecological terms:

- On a landscape scale, how much timber do they propose to cut? Removing a few trees from within a large area has very much less ecological impact than clearcutting, regardless of whether the clearcuts are large or small, dispersed or clustered.
- What is the designated conservation class of other areas within the total landscape? Is the exploited forest in an area designated for tree harvesting within a plan for an ecological reserve system? Are there even ecological reserves currently designated in the area? It becomes easier to support a proposal to exploit a forest if an ecological reserve system is in place, and conservation goals are adequately being met by other lands within the landscape. Perhaps support for forest exploitation needs to be contingent on support for ecological reserves.
- What kinds of timber are being extracted relative to the distribution and abundance of natural community types? Is the exploitation targeting certain species or communities that are rare and underrepresented within the local ecological reserves?
- How will the timber be removed? Whole-tree harvesting is an ecological disaster, as are exploitation practices that do not protect surface water, soil quality, and the health of the trees left



standing. The use of herbicides designed to alter forest composition, extensive road-building, and heavy machinery all increase the ecological damage done in the exploited forest, and should be opposed.

■ What is the effect of the exploitation on the other forest species, and how is that known? The burden of proof in setting timber-harvesting policies needs to be better shared. Do harvesting proponents have sound ecological evidence that supports their management regime? Such data should be available for public critique.

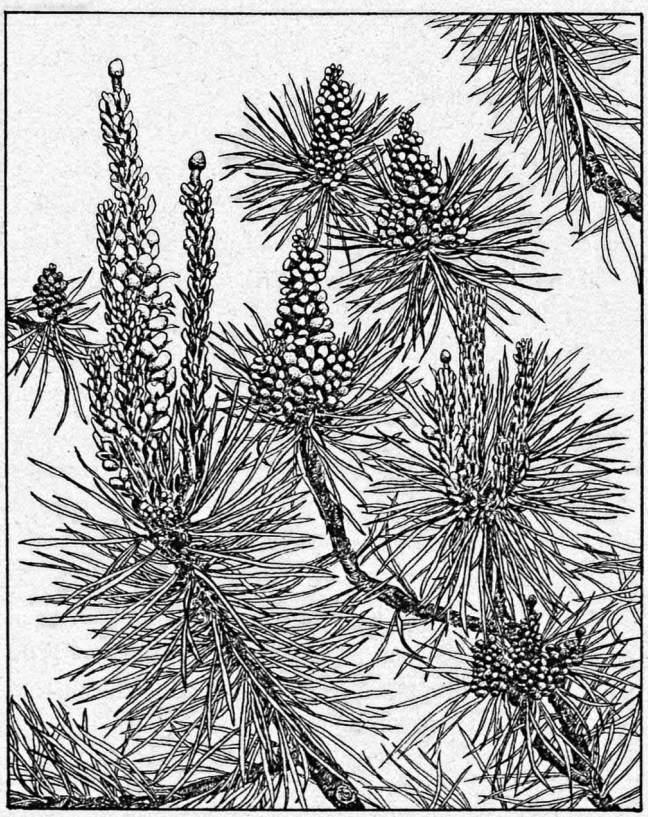
## Demand Economic Definition

Force those that use the phrase "working forest" to define what they mean in economic terms:

■ Will the proposed forest exploitation create jobs for people, or simply keep costly machinery employed? Most conservation activists that I know are actually more supportive of the people who make their living by cutting timber than are the companies that hire them. The recent economic realities of forest exploitation—ranging from the cost to taxpayers of below-cost timber sales and road construction, to the decline in employment from increased mechanization and timber exports—argue for greater scrutiny of timber-harvesting policy, not less.

■ Is the timber being used in a local value-added network or is it being exported for processing elsewhere? The person who cuts the tree is not the only one who makes a living from the exploited forest. The development of a value-added network for timber products keeps money within the community and increases the number of people who can make a living wage from the trees that are cut. Conservation activists should make it clear that we are not anti-people. We are *for* healthy communities, diversified economies, and local involvement. Multinational timber corporations and absentee timber investors can't be allowed to separate us from our neighbors.

■ Is the harvest taking place on public or private lands? Exploiting timber on public land should never be allowed to compete with harvesting on private land. Every tree cut on public land that competes in the marketplace with a tree cut on private land drives prices down and makes it harder for people who depend on timber cutting to make a living.



I AM UNDER NO DELUSIONS THAT CHANGING THE LANGUAGE we use is the sole solution to the conflicts conservation activists face with exploiters of the natural world. People who don't give a damn about anything but money, who will cut trees indiscriminately without regard to ecological consequences, are not going to change their ways simply because they are asked to define their plans or acknowledge exactly who will gain from the cutting. The battle over language is primarily aimed at the great majority of people who straddle the fence in these debates: the people who want healthy natural communities and healthy local economies. Only with these folks on our side will we be able to help our visions of ecological reserve systems become reality. The "working" forest or the "exploited" forest? It's just a matter of perspective—and wording. ❙

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*Steve Trombulak teaches at Middlebury College (Biology Dept., Middlebury, VT 05753) and serves on the Board of Governors of the Society for Conservation Biology. His new book,* The Story of Vermont: A Natural and Cultural History *(co-authored with Chris McGrory Klyza), will be published by the University of New England Press in 1999.*

red pine by David Hunsberger

To rest, go to the woods

Where what is made is made

Without your thought or work.

Sit down: begin the wait

For small trees to grow big,

Feeding on earth and light.

Their good result is song

The winds must bring, that trees

Must wait to sing, and sing

Longer than you can wait.

Soon you must go. The trees,

Your seniors, standing thus

Acknowledged in your eyes,

Stand as your praise and prayer.

*—Wendell Berry, from "The Farm"*

from *The Selected Poems of Wendell Berry* to be published by Counterpoint in November 1998

illustrations by Libby Davidson

THE POLITICS OF Y2Y

PART 2

# Protecting the Wild Heart of North America

*by David Johns*

The anthropologist Margaret Mead said that we should never doubt that a few dedicated people can change the world—indeed, it is the only thing that ever has. If she meant that a dedicated few can start things rolling, she was right. But nothing less than mobilizing many groups and individuals will be necessary if the Yellowstone to Yukon Conservation Initiative (Y2Y) is to succeed in protecting wildlands across the wild heart of North America. In the last issue of *Wild Earth* I discussed the need to organize ourselves; here I focus on the need to organize allies and the public. We can't win alone—to overcome the inertia and myopia that make destruction of the natural world possible we need to forge alliances and mobilize key segments of the public.

## *Working with Allies*

Potential allies include conservation-minded business people, watershed councils, progressive labor organizations, animal lovers, religious groups, media people, civic leaders, and others. These groups carry political weight with decision-makers and with much of the broader public. They directly interact with many people that conservationists could reach only indirectly or at great expense. Incorporating them effectively into our coalition will make for a potent political force; ancient legislators will be worried about offending us instead of the oil corporations and timber companies.

What groups do we contact and when? The answers will be based on an assessment of common interests, how this or that ally fits into a campaign strategy, the length of time needed to build trust, our resources, and so on.

Who should undertake the outreach? Are there conservationists who know people in, or who are part of, the groups we want to cooperate with? We should approach groups with flexibility, but also with a clear idea of what we want from the relationship.

Outreach to allies must always be face-to-face because the desired product is a working relationship generating coordinated action. This can't be accomplished through television ads or magazine articles. Successful alliances require careful thought and planning. Developing good relationships with allies depends on honesty, clarity of goals, and follow-through. Allies *are* allies because they share some—but not all—political goals with us. Those common interests must be clearly understood and articulated because they are the basis for planning coordinated action. Hidden agendas destroy effective cooperation over the long term, so honesty among allies about goals and differences is imperative.

Follow-through means keeping our commitments with allies. We expect the same. Concerted action usually means that we agree to commit certain resources, and undertake or refrain from certain actions, to pursue a common objective. We must be prepared to deliver; if we cannot or will not there must be a good reason for our failure. Trust is usually built slowly, on the basis of common experience of mutual dependability. Effective communication is a big fac-

illustration by Zachary Zdinak

tor in this process; alliances are often undermined not by duplicity but by unmet expectations resulting from poor communication. Political alliances require working with people who have different perspectives; they are about getting things done, not searching for soul mates.

To achieve the maximum benefit from alliances, they must be fully integrated into our campaign strategies. The roles each ally will play in public relations, organizing, fundraising, lobbying, etc. need to be clearly defined. Decision-making responsibilities within the alliance must be delineated; as campaigns must be adaptive, a mechanism for ongoing decision-making is necessary. The degree to which the alliance will be publicly acknowledged also needs to be clearly understood.

As campaigns develop and political circumstances change, the effectiveness of different allies may change. The Y2Y Conservation Initiative is necessarily a long-term strategy, and nurturing alliances should reflect that. Once wildlands are protected they must *stay* protected forever. Without effective ongoing support that protection will wane.

## *Organizing the Public for Action*

To maintain a wild landscape and adjacent healthy human communities requires an active and engaged citizenry, not just an educated one. An educated but passive citizenry is one decision-makers can safely ignore. Thus, outreach is about organizing for advocacy and action.

The public is not a homogenous mass. Some people will be receptive to our message, some neutral, others hostile. We must focus on the first two groups, and isolate the latter. Certain segments of the public carry more weight with decision-makers than others because they play a pivotal economic, political, or public opinion role; the support or acquiescence of these segments can be critical.

Our outreach must recognize that while rural communities are important, most voters and interest groups are found in urban centers—where most of the commodities generated in rural areas are destined. The battle largely will be won or lost here simply because it's where the power is. However, because of the proximity of rural communities to reserves and buffer zones, any intense opposition in rural communities must be overcome. This can only be done by nurturing local conservation support. Over the long term, it will become clear to rural residents that healthy ecosystems are necessary to their communities' economic well-being.

Our task is to deepen and inform the public's stated belief in conservation. People say in overwhelming numbers that they want a healthy world, but that is not always reflected in their choices at the polls or in the marketplace. To deepen the public's conservation beliefs means to encourage a stronger commitment—to make policy toward wildlands a primary concern for them, not one that consistently comes in second or third behind the economy, health care, crime, or other issues. We must demonstrate that protection contributes to our quality of life—not just clean air and water, but a world of variety, interest, joy, solitude, color, and complexity.

To inform their beliefs means educating people about what we must do specifically to protect and restore a healthy world. A poor understanding of what needs to be done allows industry proposals that entail further habitat degradation to appear as reasonable compromise solutions. For instance, the benefits of road closures in restoring connectivity across the landscape are very important; but, because such closures could inconvenience people, we'll need to clearly communicate the science behind these proposals—and build a strong ecological case—to gain support.

We must tell the public what is at stake, and why the solutions we're proposing are needed. Our message must reflect the values we have in common, using themes and symbols that resonate with deeply held beliefs—that is what moves people. Outreach is not just about imparting facts, but situating those facts in a story that makes sense. We are storytelling creatures. If we think of people's values and belief systems as languages, it becomes obvious: you would not normally speak Russian if you were trying to convince an Englishman—you would speak English. We must address the whole person, not just their cortex, not just their heart. That is much more difficult, but there is no way around it. Employing existing stories that challenge business as usual is an effective communications strategy; almost every American, for example, knows about Thoreau and has been inculcated with the concept of America the Beautiful. These values, which have often taken a back seat to acquisitiveness, can be revitalized to make them more of a force in people's decision-making.

In our outreach we must be prepared to confront many formidable obstacles. Most public decision-making is short term—driven by quarterly profit and loss statements or the next election cycle. Too often people fail to understand the dependency of the human economy on the ecological "economy" until problems become critical and the options have been narrowed. We must understand both the privileged position that business holds in the political arena, and the centrality economic concerns hold in people's lives. People are fearful of change, so we must stress that protecting the natural world will not derail the

limited economic security people now have. Indeed, ecologically sound economies provide more economic security.

Effective communication means using the right medium as well as the right language. We must determine where each target audience gets its information. The list is long: magazines, daily newspapers, trade publications, radio, television, presentations to service organizations, word-of-mouth, the pulpit. Some media are more effective than others; we'll need to know which work best, and be more creative than those who can outspend us.

Outreach is not a one-way street. As our movement gains momentum the press will come to us—because we are a player, because we have a vision, because we make news. Being prepared means using these opportunities well.

When people respond to our outreach we need to be ready to incorporate them into activities that further our mission; too often when people are excited and inspired by the conservation movement and they come to us for direction, we aren't ready for them.

We must also anticipate backlash to our message. We will be blamed for threatening jobs and causing economic dislocation (by the very people who order layoffs and move factories and mills out of the region). By preparing an economic analysis of our wildlands proposals and understanding the economic trends in the region, we can make clear to people that what is really at stake is the kind of world we want to live in, not the narrow choices business or others would limit us to. "Jobs versus environment" is a false dichotomy. If we choose jobs over a healthy world, ultimately we will destroy our jobs as well. The real choice is between jobs that are compatible with the natural world, and those that are not.

We will be attacked by property rights advocates when we recommend wilderness or park status, or ask for land-use restrictions. Our opposition would love nothing more than to distract us with a political fight over the value of property rights in the abstract. We must keep our focus—we are concerned with property use as it relates to conservation. Landowners have responsibilities as well as rights.

The more successful we are at defining the issues, the easier our task. Conservation opponents frequently rely on distortions; they seek to sow confusion. Like cold warriors of the near past, they tell the public that choices are limited. The more effort we put into educating the public about what the issues actually are, the less work is required to educate them about solutions—the solutions become fairly obvious.

### *Getting the Right Decisions Made*

Some policymakers will join us because they genuinely understand and care about our goals. Others, however, will support us because of our political strength. Politicians invariably have their eyes on two constituencies: voters, whose support they need to get elected, and members of the elite, whose cooperation they also need to get elected and to rule. These two groups often have quite different interests. The most successful political and economic leaders are quite good at dancing with both, delivering substance to the elite, and pabulum to the people. Achieving our goals means that leaders offering us ineffectual action, unfulfilled promises, or vacuous politeness will be promptly met with consequences.

It is again worth emphasizing the need to speak to decision-makers as one chorus, in support of a clear program with time lines for implementation. We can leave no room for misunderstanding about our goals and the decisions we expect. In the US it is currently fashionable for the worst despoilers and corporate hacks to proclaim their feelings for Nature and commitment to "reasonable" protection. Only clarity about needed action can expose these misleading statements.

The Y2Y Network strategy will need to focus simultaneously on decision-makers at every level—local, provincial or state, federal, and international. (In the final segment of this paper I will review the kinds of decisions made at each level of government.) Because the Y2Y region is geographically large, many campaigns in a common context will be the norm. The challenge will be to integrate them. As Ric Careless* has ably demonstrated, campaigns are of many types: sometimes a vigorous public effort is needed; at other times bringing quiet pressure on a few key folks may work. Overall, Y2Y will be an all-out public effort because only a political climate in which the importance of a healthy landscape is widely recognized will secure its protection.

The tools used to persuade elected decision-makers are many and varied. Direct lobbying, one familiar tool, is often most effective when part of a larger campaign incorporating public education and media. On other occasions lobbying is most effective when done quietly, perhaps through an intermediary personally known by the target. The desire to avoid public confrontation can often motivate decision-makers, as can the desire to take credit for something that is popular and inevitable, even if not personally desired. Whatever the approach, it is important that we are always prepared—with information, with clear objectives,

* Ric Careless. 1997. *To Save the Wild.* Vancouver BC: Raincoast Books.

and with an understanding of the key points of influence. In the US, for example, political parties are weak, and legislators often can be targeted as individuals, based on their legislative committee or subcommittee assignments; in Canada, parties are stronger, and can enforce ideological or voting discipline on their members, making it more important to persuade the leadership.

A public campaign may include lobbying through the activist membership of conservation groups, scientific societies, other constituencies, or through a mobilized citizenry. Such campaigns require an investment of major resources, so planning is crucial. Building momentum to peak at the right time, recognizing and riding trends, cultivating the right conditions—all these are factors critical to success. Making it easy for decision-makers to do the right thing (e.g., to save face even if they've just done a U-turn to support conservation) is key. It is also important to recognize who decision-makers are taking their cues from; often US Senators look to state governors before supporting or opposing legislation, so convincing a governor may be worth significant effort. Both may look to economic players.

Administrative processes are highly varied, and can range from formal agency rulemaking on the US side to the negotiated land-use processes on the Canadian side. Here again, planning, good information, a grasp of the larger political context, using trends, and ongoing assessment are critical.

Litigation is highly specialized and the conservation movement has some of the most competent litigators in the business. Litigation is often a defensive act—we use it when government or industry has broken the law, which they do all too frequently. Using it to prevent biological deterioration, and to achieve other purposes, as part of an overall protection strategy requires careful planning. Of course, litigation is no substitute for creating a political, social, and cultural climate where law-breaking against the natural world becomes the exception rather than the rule. And without grassroots support and public understanding, litigation can contribute to backlash.

Influencing economic decision-makers must also be part of any integrated strategy. Some businesses care about their image, while others don't—they respond only to the bottom line. (Ultimately concerns about image also relate to the bottom line.) The obsession with rates of return to investors has created a frenzied atmosphere in the business world that relegates everything else to secondary or lessor concern, including the long-term health of Nature.

Business people sympathetic to ecological protection face daunting obstacles, including an uneven playing field that subsidizes biological degradation, rewards short-term thinking, and allows real costs to be externalized. Reform of tax codes, requirements that real costs be taken into account, and an end to destructive subsidies are needed to remove these obstacles and will be part of an effective long-term strategy.

Meanwhile, economic regulation, up to and including the global level, is vital to saving wildlands, but by itself is not enough. Direct action is also needed at times. The use of market mechanisms to reward companies that are conscientious and punish those that degrade the natural world can be effective. Conservationists who are concerned that boycotts might threaten employee welfare should heed the advice of Nelson Mandela, who argued that a little temporary pain was tolerable—and necessary—to bring down apartheid. History has shown his advice to be sound. What would the grizzlies and salmon advise us?

With an organized coalition, effective cooperation with allies, and a mobilized public, we can protect our heritage and the wildlands that have nurtured us and the rest of life for four billion years. ❙

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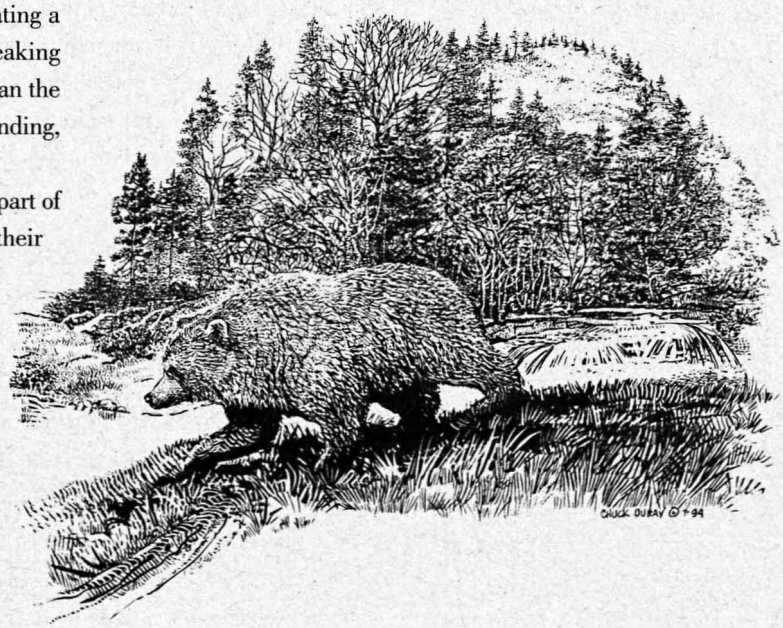
*When not working to further the Y2Y Conservation Initiative, David Johns (POB 725, McMinnville, OR 97128), a founding board member and first executive director of The Wildlands Project, teaches political science.*

*In part 3 of this paper, David Johns will conclude his discussion of Y2Y political strategy by looking at where important governmental decisions affecting the Y2Y region are made.*




grizzly bear by Chuck Ouray

# Staking a Claim for Conservation

*by Jerry V. DeMarco*

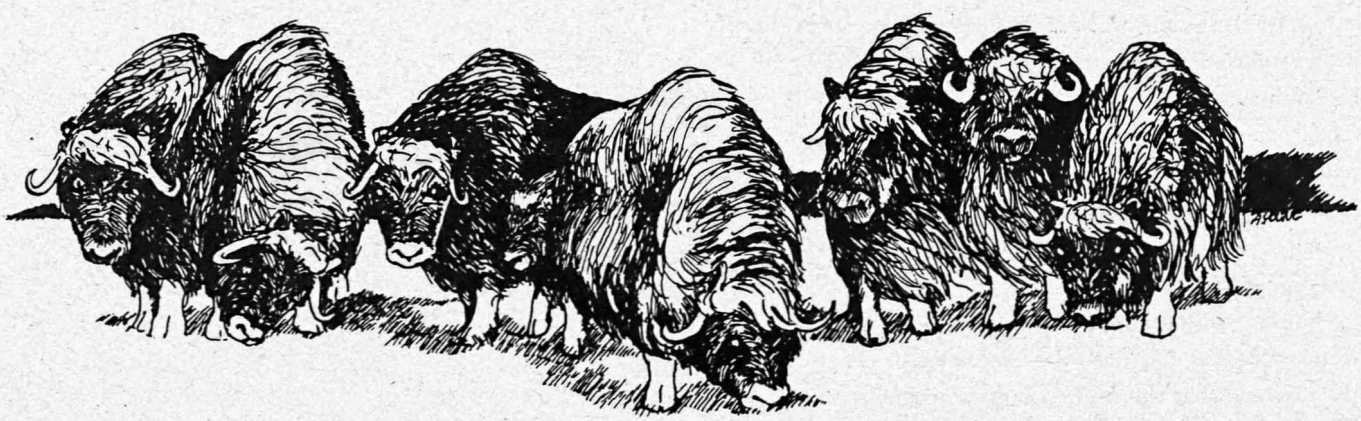
On our first visit to the Northwest Territories (NWT) in 1995, my wife and I were alarmed to see how one industry—mining—dominated existence. Mining claims, marked by teepee-like structures made of sticks and brightly colored ribbons, dot the NWT landscape. Indeed, our in-flight magazine included a striking map of recent diamond mining claims in the Central Arctic. Virtually the entire map was covered with claims all the way from Yellowknife, NWT, to the northern coast. A tiny rectangle on the East Arm of Great Slave Lake was the only major exception. That little corner was withdrawn from staking in 1970 for the purposes of establishing a National Park. Twenty-five years later there is still no park. In contrast, the last few years have transformed the rest of the map into a sea of diamond prospecting sites. Why is it that park establishment is contingent on settling land claims but mine staking is not so hindered?

*By staking these "conservation claims," the groups are attempting not only to protect the small staked areas but also to highlight the ludicrous nature of Canada's archaic free-entry mining laws.*

In fact, BHP Diamonds Inc.'s mega-proposal to construct a road, drain at least five lakes, and build a diamond mine recently received final environmental assessment approval from the federal government. The rush is on. Government and public support for mining is high while renewed interest in improving the NWT's park system is only now beginning. As part of an agreement by World Wildlife Fund Canada to drop its legal challenge to the BHP diamond mine approval, the territorial government has agreed to produce a Protected Areas Strategy for the entire NWT by 1998 and implement it by the year 2000.

In another corner of the NWT, support for the new Tuktut Nogait (Bluenose) National Park was building when federal bureaucrats from the Department of Indian Affairs and Northern Development (DIAND) intervened to allow staking in the very area under consideration for protection. Only after a concerted effort by park supporters did the claim-staking company decide to voluntarily forgo its claims. Why DIAND officials tried to subvert the consensus-building process by encouraging mining in the first instance is a mystery. It is not as if there is a dearth of available land for staking in the North.

Our final lesson resulted from a visit to the Thelon Game (Wildlife) Sanctuary. This remarkable tundra oasis was set aside in 1927 to protect the natural values of the area, including some of the last remnants of the mainland musk ox herd. The old maps we studied were vastly different from today's, for the Sanctuary's boundaries were gerrymandered in the late 1950s to allow



musk oxen by Ann Young

mining exploration. Some areas were added while others were deleted. As we sat on the banks of the Thelon River, we daydreamed about a powerful mechanism to protect and restore Nature that might counterbalance the mining regime's grip on the Earth. Our speculations went something like this:

> *A Conservation Claim Act is passed. Environmentalists race around the North in a mad dash to stake claims. These groups try to demonstrate to investors the conservation viability of an area—that an area possesses such ecological value that society cannot afford to forgo protection, that it would be a waste of resources to permit development. Governments grant subsidies and institute tax write-offs to encourage prospectors to roam the wildlands in search of "formations" of potential ecological value. Limited liability fly-by-night green corporations would parachute in. They convince people that an area is eco-significant and forever lock it up with a conservation claim. If they are wrong, too bad for miners because once the park is established, it is as permanent as an open pit mining scar. And so it would go...*

Of course, it all sounds ludicrous, but is not Canada's present free-entry mining system equally so? It allows nearly anyone to acquire mineral rights in land by simply driving a few stakes in the ground and registering a claim. Perhaps what is needed is a new understanding that forsakes the view that the entire ecological community of the North is a resource waiting to be plundered for the short-term profit of a few.

To our surprise, a year after we started mulling over the notion of "conservation claims," a number of Canadian environmental groups actually carried out conservation staking under existing mining legislation. Representatives of Northwatch and the Wildlands League staked claims in Ontario's Temagami region (recently opened up to mining and old-growth forest cutting by the provincial government), while representatives of the Yukon Wildlands Project and the Canadian Parks and Wilderness Society staked three claims in an area of the Yukon Territory presently threatened by mining activity.

According to the Wildlands League's Executive Director Tim Gray, "We continue to have a situation where the presence of mining claims and mining leases gives a veto over other land uses. That means no more protected areas, that means it's more difficult to settle native land claims, it means more conflict with other land uses, including forestry and recreational usage." By staking these "conservation claims," the groups are attempting not only to protect the small staked areas but also to highlight the ludicrous nature of Canada's archaic free-entry mining laws. They intend to retain the claims by conducting periodic assessments of the environmental values of the claim areas. Whether or not the claims survive a challenge on the basis that they constitute "nuisance" staking, the groups are using a creative and novel conservation strategy to educate the public that Canada's frontier-based mining laws are inconsistent with the present dire need to expand protection for Canada's remaining wild Nature. ▮

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*Jerry Valen DeMarco is a staff lawyer with the Sierra Legal Defence Fund (106 Front St. East, Suite 300, Toronto, ON, Canada M5A 1E1).*

## To find out more about conservation staking contact:

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fax: 416-979-3155
e-mail: wildland@web.net
website: http://web.idirect.com/~wildland

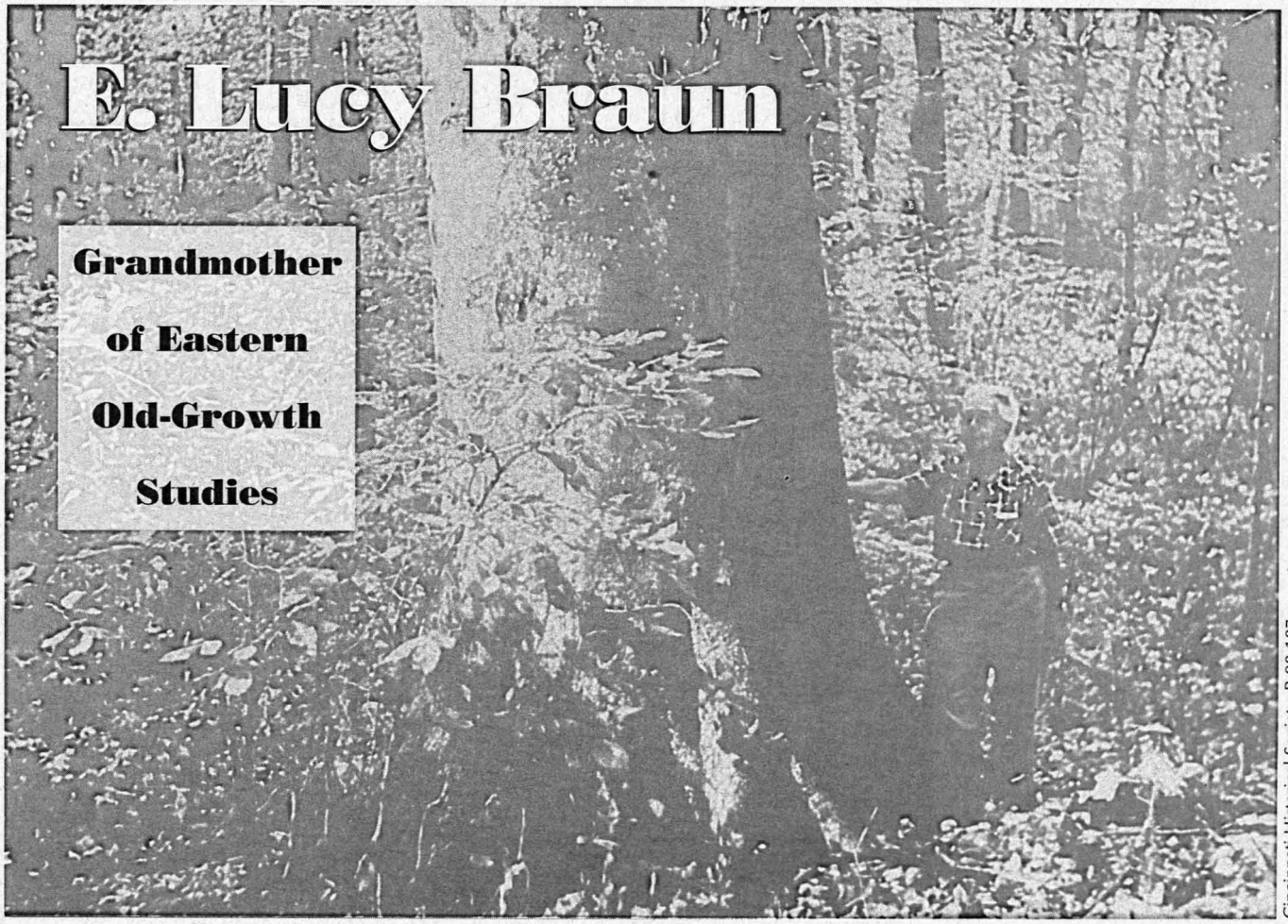
**Canadian Parks and Wilderness Society**
Yukon Chapter
30 Dawson Rd.
Whitehorse, Yukon
Y1A 5T6
CANADA
ph/fax: 403-668-6321
e-mail: peepre@yknet.yk.ca
website: http://www.cpaws.org

## To find out more about mining issues in Canada contact:

**Environmental Mining Council of BC**
1216 Broad St.
Victoria, British Columbia
V8W 2A5
CANADA
ph: 250-384-2686
fax: 250-384-2620
e-mail: emcbc@miningwatch.org
website: http://miningwatch.org

# E. Lucy Braun

## Grandmother of Eastern Old-Growth Studies



Cincinnati Historical Society, B-98-187

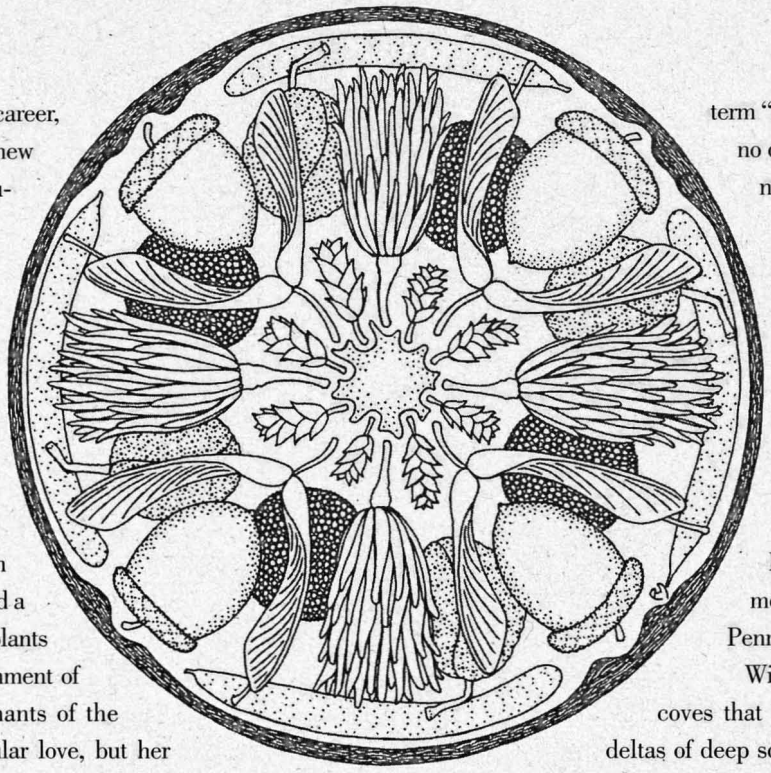
*by Chris Bolgiano*

Once considered an oxymoron, eastern old growth has arrived at scientific legitimacy. Conferences, publications, and most importantly, fieldwork are increasingly devoted to these remnant ecosystems. The East's primeval forests, or ancient forests, or primary forests (the discipline is still, after all, in its infancy, and terminology is not yet standardized) comprise the only measure by which to gauge how we've changed the rest of the landscape. The person who pioneered the study of eastern old-growth forests as well as authored what has become known as the Bible of eastern old-growth studies was a scholarly, imperious woman named Emma Lucy Braun. She preferred to be called Lucy. No one dared do otherwise.

Lucy Braun was one of the most brilliant botanists in American history, ranking with William Bartram, André Michaux, and Asa Gray. She was born in Cincinnati in 1889 to affluent parents who were unusually protective. Her mother instilled in Lucy her own passion for plants, which was manifested in a small herbarium, and both parents regularly took Lucy and her sister Annette walking in the woods to identify wildflowers.

Lucy graduated with a PhD in botany from the University of Cincinnati in 1914, a time when few women ventured into the field (figuratively or literally). She taught at her alma mater for several decades, becoming a professor of plant ecology by 1946, but retired early to pursue her own research and writing.

**Lucy Braun was one of the most brilliant botanists in American history, ranking with William Bartram, André Michaux, and Asa Gray.**



In the course of her long career, Lucy named and described new species, made major contributions to the understanding of plant distribution, and documented a great deal of information about specific plants. Building on her mother's work, she compiled an herbarium of nearly 12,000 specimens, which she donated to the US National Museum in Washington, DC. Lucy also led a movement to conserve wild plants in Ohio through the establishment of parks and preserves. Remnants of the Ohio prairies were a particular love, but her primary interest was the new science of forest ecology.

From the mid-1920s through the '40s, Lucy traveled extensively to find the remaining original deciduous forests of the East. She always took Annette with her. The two sisters lived together, with Lucy as breadwinner and Annette as housekeeper, until Lucy died in 1971. Although Annette was five years older, and had her own PhD in entomology, Lucy completely dominated her. When Annette wanted to show a visitor drawings of a moth, Lucy would say, "Oh, they don't want to see pictures of your old bugs." She was consumed by her own work, and once she reached a conclusion she believed herself infallible. When a prominent botanist came to consult her about his map of vegetation in the US, she refused to see him because she didn't agree with his theories. Her only relaxation was reading mysteries. "All scientists read mysteries," she said.

The Braun sisters traveled by horse and buggy until Lucy bought her own Model T in 1930; the car enabled her to reach remote areas of the Appalachians, where she loved a particular type of forest she named mixed mesophytic. Mesophytic plants live where there is enough but not too much water. She used the term "mixed" to reflect the fact that no one or two tree species dominate the canopy, but six to eight out of a possible two dozen or more are prominent. Lucy drew the range of mixed mesophytic forests from the northern tip of Alabama across eastern Tennessee, Kentucky, and Ohio, encompassing the Cumberland and Allegheny Mountains and Plateau, and most of West Virginia into Pennsylvania.

Within that range it was the coves that Lucy most sought. In those deltas of deep soil near the foot of mountain slopes, formed by millennia of deposition by streams coursing down the hollows, mixed mesophytic forests realize their full potential. Lucy recognized their magnificence: the great size of individual trees and tremendous diversity of species—yellow poplars, beeches, birches, buckeyes, basswoods, maples, magnolias, ashes, hemlocks, oaks, and the prettily named Carolina silverbells. She marveled at the lower canopy and ground cover of a thousand kinds of wildflowers, herbs, forbs, and shrubs. A quarter acre was likely to have 75 species of plants compared to 30 in the average eastern woodland. The finest cove hardwoods she found were in the Smokies.

With Annette beside her in the Ford, Lucy lurched up the roughest mountain roads, stopping to ask people along the way if they knew of old trees. Initial distrust gave way to an assessment that the two city ladies were harmless, and once word to that effect got around, the mountain people helped them. "Oh," said a woman on Big Black Mountain in Kentucky, after first denying that there was a trail to the top, "You're the plant ladies living with the Mullins family. You're the ladies that take pictures of trees. Come along, I'll show you the trail."

illustration by Rob Messick

## FORESTS OF THE CENTRAL APPALACHIANS

### A Project of Virginians for Wilderness

What are the forests of Appalachia really like? What is there beyond the exploitable trees and wildlife? How are these forests related to the climate, geology, and soils? What are the ecological determinants of old growth, rare species, and the many forest types? What is the impact of human activities?

Our Forests of the Central Appalachians Project seeks to answer such questions through extensive site and time-specific inventories using interdisciplinary methods and interpretations. We recognize that a forest is more than the trees by addressing the entire vascular flora, bryophytes, fungi, and as much of the fauna as possible. Particular emphasis is placed on microhabitats, especially relations between biota and mineral substrate, topography, and climate. Although our inventories provide most of our data, we also make use of reliable outside sources such as natural heritage programs and the general scientific literature.

Our immediate objective is to draw the most comprehensive picture to date of the Central Appalachian forests. By making this picture available to the public, informed decisions can be made for the forest's protection. Our long-term goal is the establishment of wildland reserves that require such information.

We have already inventoried and entered into our database more than 80 sites. This data has been used to secure enforcement of the Endangered Species Act and other laws, as well as by the Inspector General of the US Department of Agriculture to investigate three National Forests in the region, with the result that actions have been taken to halt destructive timber sales and other activities.

We invite readers to visit our website where we have posted examples of our inventories, methods, and ecological interpretations. Find us at: http://spies.com/~gus/forests/; Virginians for Wilderness, Route 1, Box 250, Staunton, VA 24401; 540-885-6983.

Where there were no roads, the sisters rode logging trains. Lucy noted that some of the last stands were being cut even as she studied them.

In 1950 her book *Deciduous Forests of Eastern North America*, illustrated by her own excellent photographs, was published and immediately recognized as a classic. She continued to write on many aspects of ecology until her death, and received many honors, but the book is her masterpiece. In the half century since its publication, only one of her beliefs has been seriously challenged: that coves served as unchanging refuges for deciduous species throughout all the glaciations. Recent research suggests these forests to be dynamic, capable of advancing and retreating in response to climate change, and not as static as Lucy believed them to be.

In her book, Lucy characterized nine broadly defined communities of trees, each with a dozen or more different associations of dominant trees and woody shrubs. Included are vignettes from every part of the Great Forest of the East: the rustling beech and sugar maple woodlands that swept from Minnesota to New England; the hemlocks mixed with the towering white pines claimed by English kings for ship masts; the assemblages of river birch, sycamore, cottonwood, and elm that shadowed and cooled the banks of major waterways; the cypress-tupelo swamps along the southeastern coast and the Mississippi River that harbored baldcypress trees more than a thousand years old; the fragrant pine-oak woods that graced dry, shallow soils almost everywhere. The most widespread communities were the grassy woodlands of longleaf pine, with their handful of trees per acre and low understories of up to forty species per square meter. Of these original natural communities, only remnants and regrets remain. ▮

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*Chris Bolgiano, a writer and wilderness advocate from Virginia, is the author of* Mountain Lion: An Unnatural History of Pumas and People. *This article is adapted from her new book* The Appalachian Forest: A Search for Roots and Renewal *(Stackpole Books, 1998).*

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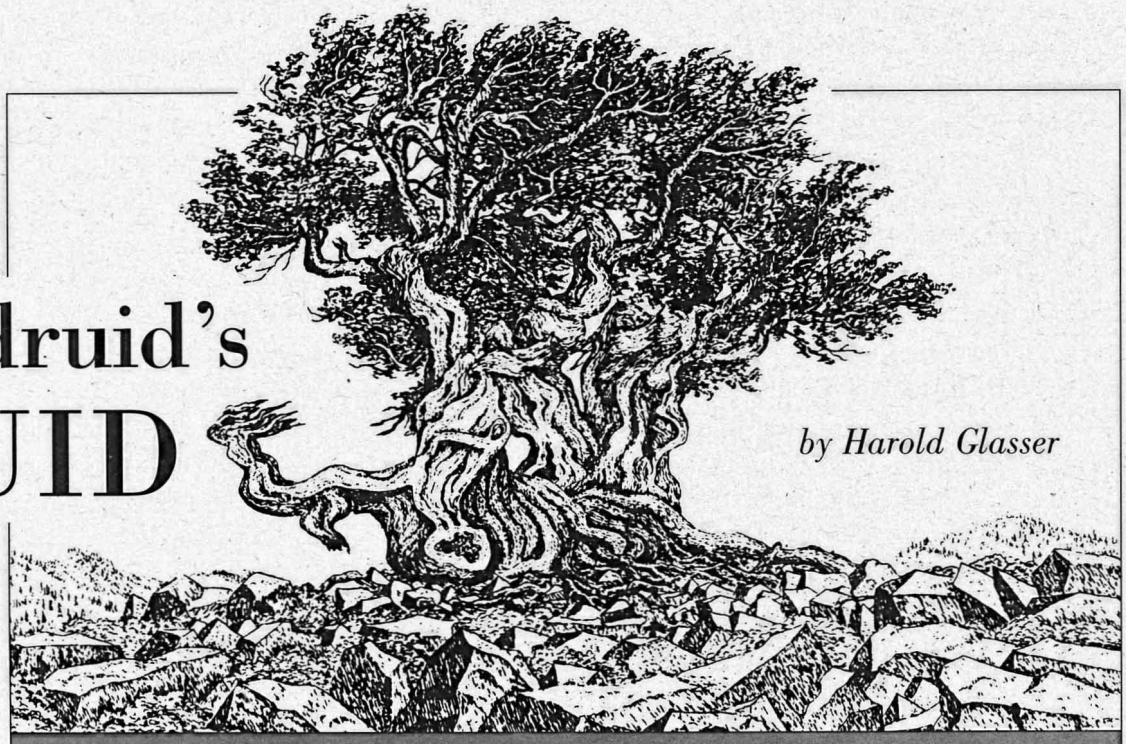
# The Archdruid's DRUID



## A Profile of Daniel B. Luten

*by Harold Glasser*

Dan Luten is one of the unsung heroes of the environmental movement. As an outspoken critic of our growth-directed society and a tireless advocate for wilderness, he has been influencing conservation policy since the early 1960s. Luten blends a scientist's skill of detached observation with a poet's command of language and passion for the unquantifiable, but manifestly observable.* The key to Luten's success is that he is as witty and wily as he is wise. He is a true master of mental monkey wrenching. With a trickster's disarming smile, wry sense of humor, nondogmatism, and probing intellect, his strategy has been to arouse and provoke us to continually rethink our premises about resource issues.

As a past president of Friends of the Earth, and a treasured advisor to Dave Brower and other conservation leaders, Luten has sought to raise the level of debate by challenging conventional wisdom. As Brower put it, "Dan enjoys being pleasantly outrageous." For almost forty years, Luten has exhorted us to reexamine our assumptions regarding progress and the benefits of continued growth, both economic and population. He has questioned the notion of endlessly increasing agricultural production, the propriety of building new dams, the virtue of limitless immigration, and the prudence of the North American Water and Power Alliance. Arguing that the "highway of growth is the road to disaster" (1988: 110), Luten pointed to the foolishness of expanding the supply of energy and water to meet whatever preposterous levels of demand forecasters projected.

* Much of Luten's work has been gathered in a collection of essays edited by his former student, Thomas Vale (1986). The collection includes sections on population, food and agriculture, energy, water, wild Nature, conservation, and the future. The book is, unfortunately, out of print, but is probably available through your local library.

Western juniper by Claus Sievert

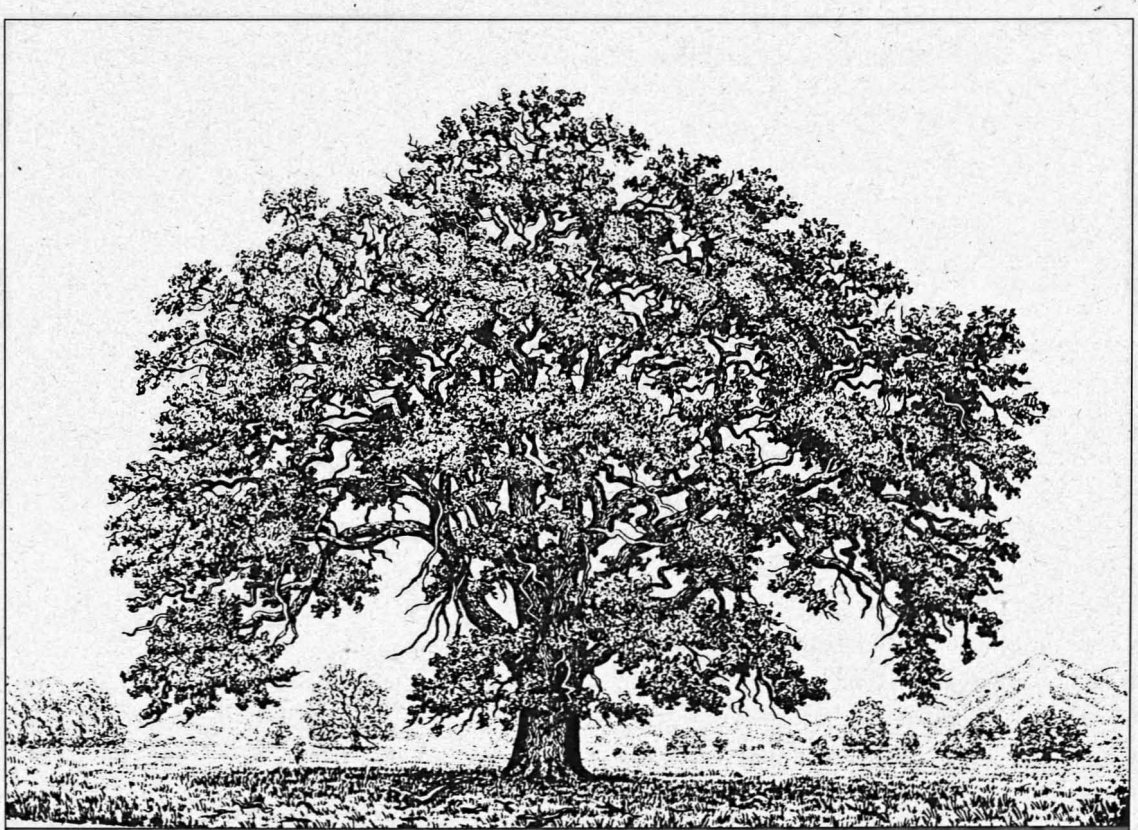
Luten asks us to reconsider what we mean by the term "resource" and how we decide on the conventions that govern its use. More than fifteen years before E.O. Wilson introduced the "biophilia hypothesis" (1984), Luten commented on the human genetic proclivity for wildness and raised the issue of its importance, both for the soul and for the long-range welfare of humanity. In the latter context, Luten was referring to society's need for a "reference device"—an "immutable Polaris"—that by force of being relatively free from human domination, could serve as a guide and unbiased indicator for judging the efficacy of human decisions. The concept of wildness as a reference device is Luten's twentieth-century equivalent to Thoreau's "In wildness is the preservation of the world." He explains how the concept gives context and meaning to Leopold's "land ethic" (Vale 1986: 210):

> *[A]ny bit of life on this earth, especially if in its natural, undomesticated, wild condition, may have something to say to mankind that is of importance to the fulfillment of the purposes of humanity.*

Luten also calls for introducing aesthetic criteria, such as beauty, into our frameworks for making resource decisions. Drawing from Thoreau and Loren Eiseley, Luten argues "moving water is more to be admired than used...the primary purpose of water is to beautify the earth" (Vale 1986: 92). This sentence might be recast to state that admiration should be viewed as a valid use—a use that should frequently supersede, and remain free from, more direct utilitarian or economic concerns.

In another essay, Luten calls the very notion of "use value" into question when he asks, "Are some things more to be admired than used?" (Vale 1986: 140). Luten argues that species have a right to *their* habitat. In a statement made before the Berkeley City Council over the fate of Aquatic Park in 1962, Luten stated (Vale 1986: 164):

> *Aquatic Park is an essential base for some of the wildlife of this region. It is not improper even to say that it belongs to them, and that to take it from them is no less than common thievery.*



**Inspired by his work as a natural resource specialist in postwar Japan, Luten became, perhaps, the first person to mine the connection between human population growth and environmental degradation.**

valley oak by Claus Sievert

This leads us to a discussion of conflicts between direct use and aesthetic appreciation—reminiscent of the clash between Muir and Pinchot—and an evaluation of what typically does (although not what should) happen in such instances. In 1967, Luten wrote with great prescience (1986: 141):

> *In such dilemmas, we usually speak of compromise. The compromises are never true ones, for beauty does all the compromising. Splitting the difference between utility and beauty again and again will leave nature next to nothing; half of a half of a half of a half is a 16th.*
>
> *Suppose someone were to counter a suggestion to compromise on the Colorado dams by saying, "Certainly. Two dams block the river today, Hoover and Glen Canyon. You may keep the Hoover, if you will remove the Glen Canyon Dam and let Glen Canyon begin its return to the world of beauty."*
>
> *"Ridiculous!" is the only possible reaction. And for so long as such a statement is ridiculous, the cause of the American landscape is a losing battle, to be fought from barricade to barricade, but always backward.*

In these and other challenges to conventional wisdom, Luten appears more interested in stimulating discussion and debate than offering definitive solutions. Throughout, he emphasizes that resource policies appropriate for an empty land and a poor people are not suitable for a full land and a rich people.

In his 90 years, Luten has worn many hats—amateur naturalist, research chemist, natural resource specialist, academic geographer, and conservation activist—and been witness to unprecedented changes. For instance, in Luten's own lifetime the human population has roughly trebled (from under 2 billion in 1908 to just about 6 billion today). As a point of reference, at the time of Christ, the world's population was probably a little under 300 million. It took nearly 1,650 years for the population to double, but then only another 200 years to double again and reach approximately 1.2 billion in 1850. By 1950, just 100 years later, the population doubled once again.* Luten stresses that the rapid global population growth of the twentieth century (one percent per annum) represents but a blink in the history of human evolution; it is both very recent and clearly unsustainable over the long term.

Inspired by his work as a natural resource specialist in postwar Japan, Luten became, perhaps, the first person to mine the connection between human population growth and environmental degradation. He made population growth and its impacts on wilderness a conservation issue in 1961 when he asked the provocative rhetorical question (Vale 1986: 17):

> *Does a wilderness program, a wilderness policy, without a population policy make sense? Or is it only a sop to the outdoorsman?*

Luten elaborated on this thesis in a 1963 article for the *Sierra Club Bulletin* titled "How Dense Can People Be?" which sparked considerable controversy, from enthusiastic endorsement to statements of protest in the form of resignations from the Club. While his work on resource issues is wide-ranging and his influence on the conservation movement extends well beyond population issues, Luten himself contends that all resource problems are ultimately population problems (1991: 328).

The impact of population growth on resource use should not be underestimated, but the role of worldviews in shaping policy and practice must also be carefully considered. Luten repeatedly draws on the contrivance of categorizing people into "optimists" and "pessimists" (cornucopians and cassandrans) to characterize two schools of thought regarding resource use and the future (Vale 1986: 320):

> *The optimists see it as bright, the pessimists see it as bleak. In fact, both seek the same future—one of progress, whether or not of growth. The optimists hope their forecasts are self-fulfilling. The pessimists hope their forecasts are self-defeating.*

Another core distinction is that pessimists embrace the idea that we live in a world of physical limits, while optimists believe that science and technology allow humanity to transcend limits. Optimists insist that we need not be concerned about population growth because with each new birth comes a mind and a pair of hands to solve whatever problems lurk on the horizon; pessimists fear that we might reach a day when two hands are not enough to feed every mind and satisfy its cravings.

Presaging the current trends in the environmental movement—dominated by social justice, political correctness, and urban concerns—Luten deliberates over the possibility of the environmental movement being truly proactive in a world where the optimists dominate (1986: 241-242).

* For a summary table of various estimates of global population over time, see Cohen (1995: 400-401).

*Can [the environmental movement] spread itself over parks and wilderness, [over] wildlife and endangered species, [over] outdoor recreation, over rivers and dams, over energy from nuclear power, through pipelines and oil spills to coal stripping, over environmental contamination, and still act on population growth, steady-state economics, urban blight, and social reform, while defending itself against charges of elitism? Can it ever take the offensive on battle terrain of its own choosing?*

*Is it doomed by the nature of the game always to fight the battles forced on it and to fight only with troops that arise as if from dragons teeth sown by an adversary?*

Luten, however, is an unabashed pessimist. Believing in the fundamental intelligence and foresight of humans, he argues (Vale 1986: 152):

*[A] society convinced by the pessimistic forecast will modify its course to avoid such a fate, and a society convinced of the other will probably expand until there is nothing to spare.*

As an example of what the future might hold if the pessimists prevail, Luten, in a 1976 essay on the bicentennial landscape, speculates hopefully on the fate of conservation (Vale 1986: 271):

*Among its coming successes, I envision, for example, establishment of a national buffalo migrating corridor 200 miles wide from Montana to Texas, wolves in the Adirondacks, cougars in Tennessee, and defenders of such developments everywhere. I see already the Friends of the Sea Otter as a totemic group; [similar groups will be formed by] the defenders of the elk, green turtles, peregrine falcons, and, of course, wolves. There will be many more. Perhaps, even, these will have legal standing.*

It is interesting to note that these comments predated The Wildlands Project by fifteen years.

One of Luten's favorite quips from Thoreau is: "There are a thousand hacking at the branches of evil to one who is striking at the root...." (1854/1992: 72). Perhaps no words better typify his own contribution. Certainly no quote is more appropriate for characterizing his sagacity and eloquence. Luten is one of Thoreau's one-in-a-thousand, or more likely, given the present era, one of the one-in-a-million. (Despite the rosy proclamations of Julian Simon and other cornucopians, growth in sapience does not appear to scale with growth in population.)

Luten's response to the "arrogance of humans" has been to advocate for a more humane way of interacting with Nature that frees and shields the natural world from the caprice of the marketplace. He has taught us to be skeptical about assumptions (those of others and our own unexamined ones), to be wary of self-fulfilling forecasts, and to be more sophisticated in our use of numbers, models, and information. His work deserves a much wider following—we still have much to learn from him. Let his motto and example be a guide for all of us as we work on behalf of Nature and ourselves, moving into the new millennia. ❙

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*Harold Glasser (1555 Pacific Ave., San Francisco, CA 94109) is the author of many articles on environmental policy and philosophy. He has been developing an ethically based, multicriteria alternative to benefit-cost analysis that, amongst other things, enables humans to privilege the interests of nonhumans above their own nonvital needs. He is currently in the midst of revising and editing a ten-volume collection of Arne Naess' selected works, which will be published by Kluwer in late 1999 or early 2000.*

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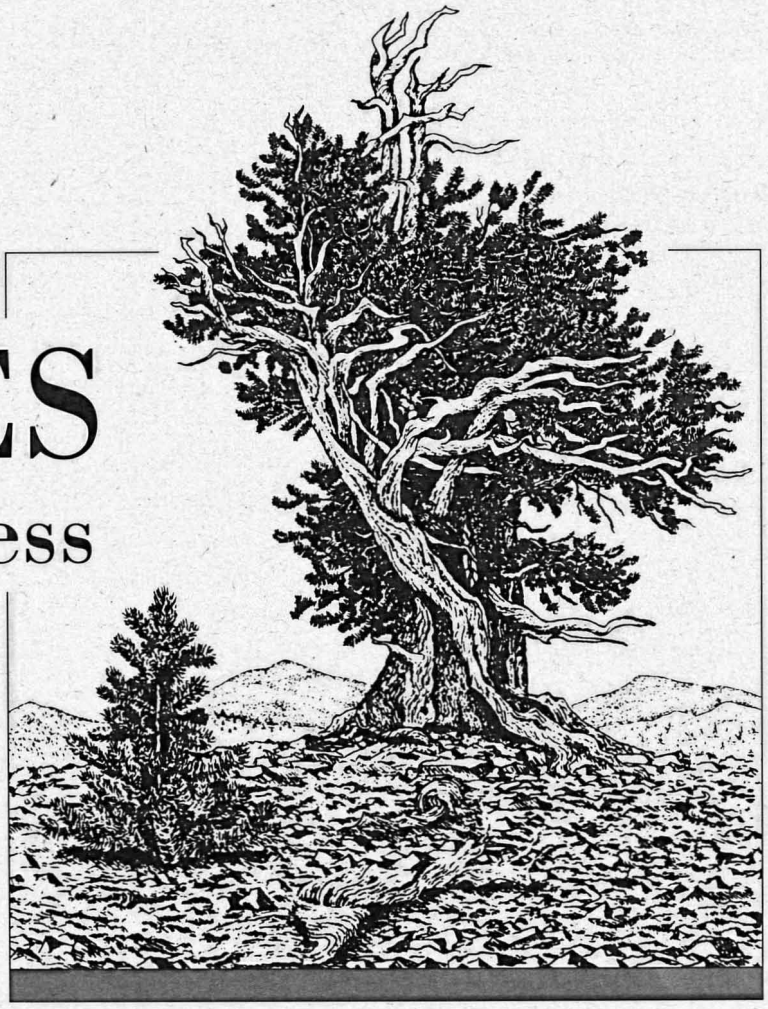

# ENGINES in the Wilderness

*by Daniel Luten*

A few years ago Erle Stanley Gardner, more famous for his writing in other fields, undertook a defense of off-highway motorized vehicles in an article published in *Sports Afield* (September 1962). The following excerpts may give his sense:

> *Perhaps the person who owns property on the lake would like to sleep late on a Sunday morning, but he now recognizes the fact that the noise made by outboard motors is something he has to live with.*

And, later:

> *...Under the guise of preventing "attrition" to trails, an attempt is being made to use legislation to preserve "solitude." Preserving solitude is one thing. Preserving liberties is another....I claim that anyone who wants to drive a scooter, an airplane, a helicopter or a Jeep into the vast desert wastes which still remain public property...is entitled to do so and to use any means of transportation that he wishes.*

An acquaintance, on being shown the second excerpt, said that he certainly agreed with it. Knowing that, while he was no wilderness type, he was an avid trout fisherman, pheasant hunter, and horseman, I conceded the point and said I'd go even a bit further. "What I like to do on the public lands," I said, "is to walk along trout streams and throw rocks at trout. I prefer company, of course, and if I can find a trout fisherman I like to work up a stream ahead of him, showing him good pools and, by tossing rocks where trout might be, showing him where to cast. I have had, quite commonly in fact, objections raised to my conduct, but I have pointed out to such a fisherman that it's a free country and if he wants to preserve his solitude, maybe he should climb

*This essay was originally published in* Landscape, *1966, 15(3): 25-27, and is reprinted by permission.*

bristlecone pine by Claus Sievert

a mountain. Liberties are just as important as solitude, or more so, and it is important to my sense of liberty to throw rocks into trout pools on publicly owned lands where and when I see fit.

"At other seasons, especially in November, I like to walk along the field edges in the Valley to watch the pheasants fly up. I can't always tell where they are, but when I see some pointers in a field I go over and start working along with them and am really pretty good at this. I usually manage to find the pheasants before the dogs can stir them up. Once, when I made the point about the preservation of my liberties, I got a load of birdshot in my backside, and the other gent said he was sorry but he had to preserve *his* liberties."

My friend, when I got done, left in a hurry, saying he had to inquire about extra tickets because he meant to ride his horse in to the opera that night, it being a public place.

I have a lot of other liberties to defend and other people do, too. A year ago up in Glacier Park, it took me half an hour to get a coveted picture of St. Mary's Lake from a notable point. Mostly this was because of other people who were having pictures taken to prove they had been there.

I'm such a nut on stereo hi-fi I've got one in my camper and, when we camp, I try to get near the underprivileged who haven't any radios at all and I give them all 50 watts.

Then there's the question of garlic.

And whether I can throw a beer can farther out in the lake than the next man.

Next, let me quote from a San Francisco sports columnist:

> *...I had motored up the Putah Creek arm of the lake where a few other fishermen were slowly trolling among the weather[ed] tree trunk snags. The lake was calm. Sounds traveled easily so we could hear the "plunk" of an angler's lure as it splashed the water, the purring of slow outboards and when a flight of ducks sailed overhead, we could hear the whistle of their wings....Then the roar of a speedboat shattered the quiet and suddenly a boat with a water skier behind—in a skin-diving suit, mind you—charged into the trollers. The speedboat veered sharply to send the water skier flashing sideways....My fishing partner muttered, "I hope he breaks his damfool neck!" [B. Boyd, 1964]*

Again, the same writer says:

> *...The bright colors of fall, mountain-maple yellow and poison-oak red, were splashed in wild profusion on the green, and in the distance the tops of powder-blue mountain peaks dissolved into the hazy sky. It was very quiet. Completely still....Then from down the ridge I heard the noise, like a power saw or a lawnmower. Soon I saw the hunter on his trail bike as he skidded and swerved uphill, revving the engine until it roared. He came to a halt beneath the rock I rested on and asked, "Any bucks up there?" "Not any more," I answered....with that, [he] took out a portable walkie-talkie set and started yakking with a friend...."Nope, Sam, there's no bucks up thisaway. Let's head back to camp." [B. Boyd, 1963]*

This is not new on this continent. Leo Marx, in his recent book, *The Machine in the Garden* [1964], takes his theme really from *Hawthorne's American Notebook:*

> *...a thriving field of Indian corn, now in its most perfect growth, and tasselled out, occupies nearly half of the hollow: and it is like the lap of bounteous nature....But, hark, there is the long shriek, harsh, above all other harshness, of the locomotive.*

And Thoreau pondered the railroad, then newly built, which still thunders by Walden Pond.

Professor Marx in his book has followed, in our literature, the invasion of the machine and the rather tantalizing images we have had of wilderness, the pastoral scene, technology, and the city. But another thread weaves through the parables and citations above.

This is the matter of competing uses of a resource. We are wont to speak of "multiple use," and have specified it in our legislation. The concept of multiple use was an experiment, noble in purpose. It came from a vision, not particularly foresighted, that what was once an enormously rich country was becoming markedly, perhaps disastrously, less rich. Today, the most conspicuous change is from a country which was once empty to one which is now perilously full. This stems less from increase in numbers than from increase in mobility, in affluence, in *uncommitted* time. (I despise the word "leisure" for the company it keeps, but its root *licere,* to be permitted, is appropriate.)

Now, we do have multiple uses of natural resources which are not competing, but fewer of them than we used to have. While the chipping for pulp of mill slabs seems hardly a competitive use of wood substance, logging and watershed perhaps got along better together a generation ago than today. And when you look at our large water developments, manifestations of the competing, difficultly compatible uses of the resource insistent-

ly intrude: flood control, irrigation, power, mass recreation. Quite apart from who wants the water level low, variable, high, or constant, note the intrusion of forebays, afterbays, and other ingenious devices designed to reconcile competing demands for the same water. We are also finding that the use of air for breathing and as a vehicle for effluents can be competing, and not entirely compatible.

How should such competitions, such incompatibilities be resolved? By letting "normal evolution" take its course? Would we have any forests today in that case, or is the conservation movement a part of normal evolution? Rather, "normal evolution" is simply a refuge of ignorance. A separate factor is clearly involved. It was enunciated at the fifth Northwest Wilderness Conference (Portland, 1964) during [a] discussion by William Burch, of the Pacific Northwest Forest Experiment Station. It is very simple: *Convention* is a most important factor in the use of landscape.

The ignoring of conventions, sometimes strong and current, at other times failing, was the common pattern in my initial examples. It is easy to argue for, but also against, conventions. It depends on who is ignoring them: whether it's students at the University of California in Berkeley, or you who drive an automobile but are the grandson of a man who only drove a wagon. People love to distinguish between progress and revolution, between tradition and reaction, but I think if you seek patterns of consistency in such attitudes, you had better start off with a far more durable lantern than Diogenes possessed.

TURNING NEXT TO CONSERVATION, ITS DEFINITION AS "wise use" is a good definition. It leaves the door open: What is the part of wisdom? Who amongst us is the wisest? Where is the oracle? Is today's wisdom tomorrow's folly? And yet, we do find ourselves able to agree in large measure that some actions, some policies, are wise; others are foolish; and still others are debatable today but probably will be clarified tomorrow.

Which is the wiser, the conventional or the unconventional use of the landscape, especially the wild landscape? I am going to argue in this instance for the importance of the conventional use. Please do not expect me to do so in other matters.

Parenthetically, let me note that my discussion will not encompass all of the currently cited uses and exploitations of wildlands: ecological sanctuary, scenic spectacle, wilderness experience, mass recreation. And so I hope to keep clear of any involvement in the issue of "wilderness sentimentality" or of its complementary ill, "mass sentimentality"—the programmed, regimented, lossful consumption of leisure, that portion of the American life no longer demanded for gainful production.

To support the argument for convention, I want to introduce what seems a most important polarity in human nature: at the one end wanderlust, at the other homesickness. Their symbols are opportunity and security. We could dredge up many examples in other species as well. Consider the seasonal migration of birds. The waning of the great arctic ice sheets and the continental seasonality, especially of North America, spelled opportunity, and a host of bird species responded to it by migration and by confining their breeding cycle to this opportunity. Retreat to the tropics in winter was a retreat to security. I would hazard that the most successful of bird species, measured by numbers, not by durability, are those which migrate. In quite another pattern but still dealing with birds, Ernest Thompson Seton speaks of the "mad moon" in late fall when the ruffed grouse travel and disperse erratically.

Each of the two attributes of wanderlust and homesickness has such a potential for survival that it is hard to escape the proposition that they should be separate genetic qualities, peaks in a bimodal curve of distribution of attributes, rather than the extreme manifestations of a single genetic quality. While among early men, those who clung to the group, who stayed at home, were essential to the stability and succession of generations, it was the rarer ones who wandered away, discovering new opportunities, who sired new tribes and founded new cultures. No one living today has an ancestry of undeviatingly settled people going all the way back to those earliest human dwellers on the shores of East Africa. The waves of human migration have swept back and forth over all of the old world and much of the new. But each of us has many more ancestors who settled for security than who wandered for opportunity. In consequence, there has been a genetic development of both attributes.

Those who stayed home did so for a variety of reasons: They were strong and mature and could dominate the community; they were timid; they were provident; they could get along with the group; they saw the wisdom of elder counsel. Those who left or were thrown out included the weak, but also the young, the bold, the ingenious, the improvident and a host of other nonconforming sorts. And just as each of us suffers from or glories in some degree of weakness and strength, of timidity and boldness, or improvidence and providence, so each of us also has inborn, in varying degrees, but always *both* wanderlust and homesickness. And our environment will be adequate only if it provides opportunity for expression for both of these attributes.

Neither is easily fulfilled in this century of revolution. Some of us who seek, in homesickness, the site of our childhood can only say, "I grew up somewhere under this freeway."

For wanderlust, some of us may seem to find opportunities in the mind, in the exploration of the margins of science and literature, many of us by reading of adventure, others in the city. But this trait is really geographic; its eternal companion is solitude and its essence is insecurity. I have said opportunity before, let me now call it insecurity.

I bring in security and insecurity because I want to turn to the matter of security symbols. In this geographical context, the first security symbol coming to my mind, perhaps curiously, is the motel. I cannot escape the feeling that in the days when we were relatively immobile, the distinctions between the city slicker and the country hick were much sharper than today. Going to the city posed substantial problems of conduct in hotels. Can you trust these people with your bags, thievery is rife; how about tipping, and table manners? Our ribald literature is thick with these stories, now becoming obsolete. The motel, to my way of thinking, was the answer. It has now, of course, become much more than that and quite different, but this was its start.

There were similar problems in the country. Any city dude knows that one end of a horse bites and the other kicks. The real problems, though, are how much do they cost, where are they, how do you go about hiring a packer? And the upshot is that the only secure way to approach God's great out-of-doors is in the custody of that all-pervading security symbol, the gasoline engine.

Tourism today has as its chief problem to maintain the illusion of wanderlust while guaranteeing security. But our acute secretary, after reading a deluxe world tour prospectus, said, "It almost convinces you that you could go around the world and see nothing new."

After all of this preparation, I come to my primary conclusion quite abruptly: The wise use of our wildlands is to manage them to satisfy the human need for wanderlust. The conventional use of wildlands has come to us from experts in wanderlust and is sparse in security symbols. These conventions should be honored and, in particular, the profligate introduction of security symbols into wildlands should be discouraged because this, more than anything else, destroys the essential qualities of such places.

Robert Marshall, of southern California, put it beautifully in a statement of opposition to ski development of the San Gorgonio wilderness when, in speaking of a Boy Scout troup heading up the mountain into the wilderness, he asked, "If there is a ski development at the top of the mountain, what will they be going away from?"

This is a flexible criterion. It speaks of convention and of security symbols. But convention varies with time and place. Every man has limits to his wanderlust. No one, to my knowledge, has asked to be sent to the moon to carve his own life out of *that* wilderness. Few have wanted to go unsupported to Antarctica. And few, barefoot and naked, have gone into the mosquito-ridden barrenlands of Canada. (Read, again, Seton's chapter in *The Arctic Prairies* [1923] on mosquito censusing.)

Conventions regarding equipment vary with circumstances. Thus I see no conflict in assenting to air drops on Mount McKinley while deploring them in the Sierra Nevada. I can oppose the use of land rovers, or tote goats, or what you will in the Golden Trout Wilderness of California's Kern Plateau while assenting to them in many extensive arid regions of the United States. (Let me reserve for another time the issue of the damage they may wreak if driven at random across the fragile desert landscape.) I can condone the use of motorboats on Lake Tahoe while deploring them on Lake Yellowstone and condemning them in the Boundary Waters Canoe Area.

One concluding, perhaps appendicular, matter deserves to be brought up. This is the problem of communication. I don't know what to suggest, because I think I see both too little and too much. Let me give some examples of the problem and drop it there:

If I ask one man where to seek a job, I can end up in any American city or town with about equal chances of its being in any size range, because American city size follows the harmonic rule reasonably well. But if I wait until two men tell me to go to the same town, I will never end up in Poplar, Montana, and if I wait for a third confirmation, I can only end up in Los Angeles.

In spite of my wanderlust, I can, in fact, do very little that I know *nothing* about; I can only go to the places I am told of and in the manner familiar to me. If I ask the man on Atlantic City's beach why he chooses to vacation there, his only answer is "But where else is there?" If *Sunset* magazine tells me Death Valley is wonderful at Thanksgiving, I, thousands of me, will swamp its sewage system.

How can I ever find my way to those empty Forest Service campsites? No one I know has ever been there. Everyone I know has been to the crowded ones. Everyone can tell me where to find full camps; no one where the empty camps are. I am not sure it is desirable to overcome this problem, because I like to come on the unknown, unoccupied camps by accident, but if it is to be overcome it must be through communication other than word-of-mouth.

Why do the motorized vehicle advocates push into the wilderness? Because the wilderness enthusiasts have bragged of its beauties and of their wilderness exploits. But they have failed to communicate the conventions. That is why I walk up trout streams, rock in hand, but, as I age, farther and farther ahead of the agile fishermen and their flies. ▮

# Book Reviews

*Reviewed in this issue*



## Beyond the Rangeland Conflict: Toward a West That Works

*by Dan Dagget with portraits by Jay Dusard; Gibbs Smith (POB 667, Layton, UT 84041) in cooperation with the Grand Canyon Trust; 1995; $19.95 paperback; 104 pp., color and black-and-white photographs.*

This volume succeeds admirably as art, but largely fails as science and as a guide to public policy. The book is wrought with hidden problems—its "main objective" is to chronicle stories of ranchers who have been successful stewards of land. The basic theme is: a few committed people have had the courage to go "beyond the rangeland conflict" between environmentalists and ranchers, to work toward constructive solutions, rather than toward proving oneself right. Key to this constructive approach, we are told, is replacing *issues with the land* as a focus for dialogue (why the two are mutually exclusive remains unclear), and letting go of attachment to predispositions and assumptions. When we are courageous enough to transcend political camps and see rangelands in a new light, then we can pave the way (excuse the metaphor) for truly sustainable rural communities in the West.

I find both positive and negative points in the book. Unfortunately (because I would love to believe its upbeat assertions lock, stock, and barrel), the negative significantly outnumber the positive.

First, the strong points. Dagget clearly acknowledges at the outset that the status quo of range management has been a failure. For those of us concerned with wildlife, this is an inescapable conclusion, but one not addressed so honestly in many range ecology books. Second—and most important—the book offers an instructive perspective on the value of collaboration, of working *for* instead of *against* something. The point is well taken that too often range management (or, by extension, any other form of land management) degenerates into partisan mudslinging—good for building egos, horrible for creating solutions to real problems. The book's case studies provide a rudimentary process roadmap to a place, as the title suggests, beyond the conflict. So, given these positive contributions, what are my objections? Essentially, they are three:

**1) Bias.** Although Dagget poses as an impartial party, his bias toward utilitarian use of land, and in favor of the workers who use it, is evident on almost every page. While the ostensible message is that both ranchers and conservationists must dispense with partisanship to meet in compromise, virtually every example of recalcitrance involves conservationists. Perhaps this can be explained as the fervor of the recently converted—Dagget was a Sierra Club wilderness activist for many years before "the light went on." He insists early on that he portrays neither villains nor heroes— "just people"—then goes on to paint heroic pictures of ranchers for the next ten chapters; the only environmentalists that receive similar treatment are those who agree with his party line.

He repeatedly parrots a habitual misstatement by ranchers—that federal land is *theirs.* (One example: They were concerned about "the movement to declare some of their land wilderness." Whatever happened to multiple use?) Dagget's utilitarian bias also is evident when he says that "getting to know a piece of open country means literally getting a feel for it on horseback, preferably as a matter of work rather than idle observation."

*A longer version of this review originally appeared in the* Journal of Wildlife Management, *1997 61(2) :582-584.*

What about getting to know land while walking? Thoreau has been replaced by Roy Rogers. And natural history study? Sorry, naturalists—that's mere idle observation—not the stuff of which insight is born. Dagget employs a selective use of scientific commentary, utilizing a few quotes, but generally concluding that science cannot provide a path, because both sides of the debate cite "best science." In many cases, it's what's left out that tells a tale of bias. The failure of livestock removal to heal arid lands (often true) is scorned repeatedly. What is never mentioned, though, is that simple removal of livestock *does* have rapid, beneficial effects in riparian areas (see Fleischner 1994).

**2) Inaccuracy.** *Beyond the Rangeland Conflict* contains numerous errors in matters of science, land management policy, and even geography. Some are minor—Crested Butte and Gunnison, Colorado are not on the Colorado Plateau, for example—while others are more revealing. In one case, a photo caption touts a saguaro cactus that is "returning" to a Sonoran Desert ranch because of dramatic improvement in management during the past two decades. If true, this would be the fastest growing saguaro on record. Common understanding of saguaro growth rates would estimate the age of the featured cactus at roughly three-quarters of a century. In other words, this cactus didn't return due to wise management; it was simply lucky enough to escape the dozer blade in the first place. Such basic natural history errors undermine the reader's confidence.

Several times in the text, when applauding the desire of progressive ranchers to restore natural fire regimes, Dagget accuses federal Wilderness designation of obstructing enlightened fire management. This is blatantly wrong; the basic objective of wilderness fire management is "to restore fire to its natural role in the ecosystem..." (Hendee et al. 1990). Thus, Dagget's inaccurate information creates a false impression that subverts the work of wilderness fire ecologists seeking to gain *support* for natural fire.

A favorite theme in the book is that the profiled ranchers are creatively using cattle to mimic the natural role of bison (or even Pleistocene megafauna) in grassland ecosystems. There are several problems with this proposal. First, bison had a much more limited distribution than cattle currently do (Fleischner 1994) even if one grants Dagget that "the process of redrawing the map of bison distribution across the West" he alludes to turns out to be accurate. Second, all the talk of grazer-grassland coevolution is essentially irrelevant on the vast majority of Western grazing lands; most "rangelands" are *not* grasslands, but forests, deserts, chaparral, and a variety of other ecosystem types. Third, even if we disregard the above two items, comparative behavioral studies show huge differences in habitat selection, feeding behavior, and impact between cattle and bison (Van Vuren 1982). Finally, ecological communities do not evolve as discrete units—natural selection works at the population level.

**3) Vagueness.** With maddening consistency, Dagget refuses to clearly state what his *criteria* of successful stewardship are; instead, we keep reading platitudes like "health" and "vitality" of ecosystems—terms that are open to opposite interpretations. Ultimately, this vagueness is the book's greatest undoing. On the very first page he states: "I tell you this not because I've read it in a book or a government report but because I've seen it." But he never does tell us *what* he has seen, that we might judge for ourselves. Thus, we are left to read between the lines and guess what he thinks makes a healthy ecosystem. Based on frequency of mention, I would guess that he equates "greener and thicker grass" (any grass!) with ecosystem health. If so, this is a remarkably shallow definition, one that deserves close scrutiny.

Dagget gives brief acknowledgment that "a large proportion of the ranchers included in this book use HRM or some part of it." He accurately states that HRM—the system of Holistic Resource Management developed by Allan Savory—is controversial. If he was clearer about what HRM *is*, and which of the methods he portrays derive from it, the book would more usefully, openly advance the dialogue on this system. As it stands, the book seems to grant a vague endorsement of HRM without coming out and saying so. Important questions that might help resolve doubts about HRM are never asked: How is success gauged? Does HRM necessarily succeed for the *reasons* its practitioners believe, or just because it demands more attentive involvement than traditional approaches? Virtually all experimental tests have refuted various claims of HRM—is this, as Dagget might imply, the fault of the scientific process, or is something awry in the theory of HRM? Dagget's vague homage to HRM furthers this confusion instead of helping to resolve it.

The book's subtitle is "Toward a West That Works," the implication being that these are models for a new society. But even if we accepted all the book's contentions regarding ecological sustainability, it begs the question of grazing economics, even as it makes a grand conclusion: that the people it pro-

files teach us that "we can choose to have rural communities in the West with sustainable economies," based at least in part on grazing. But what makes an economy sustainable? Do a handful of ranches, dispersed across thousands of miles, create *communities*? What do we make of the fact that most of the described ranch operations are underwritten by inherited wealth or external funding? These questions should not deter us, but they should be asked. Dagget remains vague, avoiding these thorny issues.

We all would like to see ranching become more ecologically sustainable. *Beyond the Rangeland Conflict* disappoints and frustrates me because, after all, the sort of collaborative caretaking it promotes is, at the very least, a step in the right direction. The ranchers we encounter *are* to be commended, and we need more like them. Nevertheless, the author's sweeping generalizations and offhand put-downs of contrary ideas render his assertions suspect. If we are to fashion a new approach to ranching, I hope we may find a foundation that is sturdier and less swaggering than this. ❙

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*Reviewed by conservation biologist* **THOMAS L. FLEISCHNER**, *who teaches in the Environmental Studies Program at Prescott College (220 Grove Ave., Prescott, AZ 86301).*

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Van Vuren, D. 1982. Comparative ecology of bison and cattle in the Henry Mountains, Utah. In L. Nelson, J.M. Peek, and P.D. Dalke, editors. Proceedings of the wildlife-livestock relationships symposium. Forest, Wildlife, and Range Experiment Station, University of Idaho, Moscow, Idaho. pp. 449-457.


## Prairie Night:
### Black-footed Ferrets and the Recovery of Endangered Species

*by Brian Miller, Richard P. Reading, and Steve Forrest; Smithsonian Institution Press (POB 960, Herdon, VA 20172); 1996; $34.95; 254 pp.*

*Prairie Night: Black-footed Ferrets and the Recovery of Endangered Species* is, and will probably continue to be for some time, the most complete treatise on the black-footed ferret. Based on this fact alone the book warrants shelf space. But *Prairie Night* is much more than a species fact sheet. It's an odyssey through the trials and tribulations of government-driven endangered species recovery programs.

The first 63 pages, elucidating the ecology and life history of the ferret, are the most pleasurable to read. The authors admirably succeed in their prefaced goal of being "semi-scientific and semipopular" (although I still don't know what a "chiaroscuro" prairie is). They deftly explain the reasons for the moody mating behavior of female ferrets (testing male fitness), why there are no subspecies (the burrow climate is uniform from Canada to Mexico), and why ferrets cache prey instead of storing fat (fat retards their specialized hunting habits). These numerous bits of fact and theory, perhaps considered trivia by some, eventually add up to meaty substance. The unwritten conclusion is that the ferret is irreplaceable.

The second part of the book, which discusses the ferret's (hopeful) recovery from the brink of extinction, is more laborious to read; however, it may be the more valuable component. The authors unwaveringly chronicle the failings and shortcomings of the government-driven recovery effort. Certain agencies come out looking especially inept and arrogant. I won't give away the story, but most of the authors' indignation is aimed at bureaucrats in the state in which the last wild ferrets were found. In spite of the lengthy criticism, one senses that the authors are still withholding their best punches; I suspect that one could get an even more enlightening recount of ferret recovery by sharing a beer with the authors. The exasperating story of government inefficiency and interminable intergovernment squabbling is enough to make conservationists throw up their hands in frustration and say "to hell with the whole formal recovery process; there must be a better way to restore the Great Plains ecosystem." (Are you listening, Ted Turner?)

Obviously, one can find places to nit-pick in any work as ambitious as *Prairie Night*. The authors' frequent comparison of ferrets to other similar species sometimes misleads readers; for example, the section on ferret gestation is titled "Delayed Implantation" although black-footed ferrets do not actually utilize the mechanism. The authors also sometimes get careless.

black-footed ferret by Evan Cantor

They state that prior to European settlement prairie dogs created ideal habitat for "hundreds of millions of bison, elk, and pronghorn antelope." Tens of millions, yes—hundreds of millions, unlikely. These are trifling matters, however; I have substantive concerns about only two areas of content.

First, the authors espouse the use of financial incentives in recovery. While economic incentives can provide short-term benefits, studies have shown that they rarely result in long-term fundamental change in ethics, values, and behavior. Second, the authors gloss over anthropogenic disruptions to the grassland ecosystem outside of the deleterious impacts to prairie dogs. For instance, the authors note that sources of ferret mortality include domestic dogs, cats, great horned owls, and coyotes (among others) but do not elaborate that the first two are exotic to the biome, that great horned owls were likely historically limited to the larger riparian zones, and that coyotes were likely historically much less abundant in the wolf-dominated plains. It seems reasonable to question whether the protection of extant prairie dogs is by itself enough to restore the ferret, or whether more visionary efforts are needed. Still, *Prairie Night* is highly recommended—it is an excellent overview of black-footed ferret ecology and a useful outside review of a government administered recovery program. ❙

*Reviewed by* **DAN LICHT** *(5030 Lundblade Dr., Eureka, CA 95503), author of* Ecology and Economics of the Great Plains *(University of Nebraska Press, 1997), who works as an endangered species biologist for the federal government.*

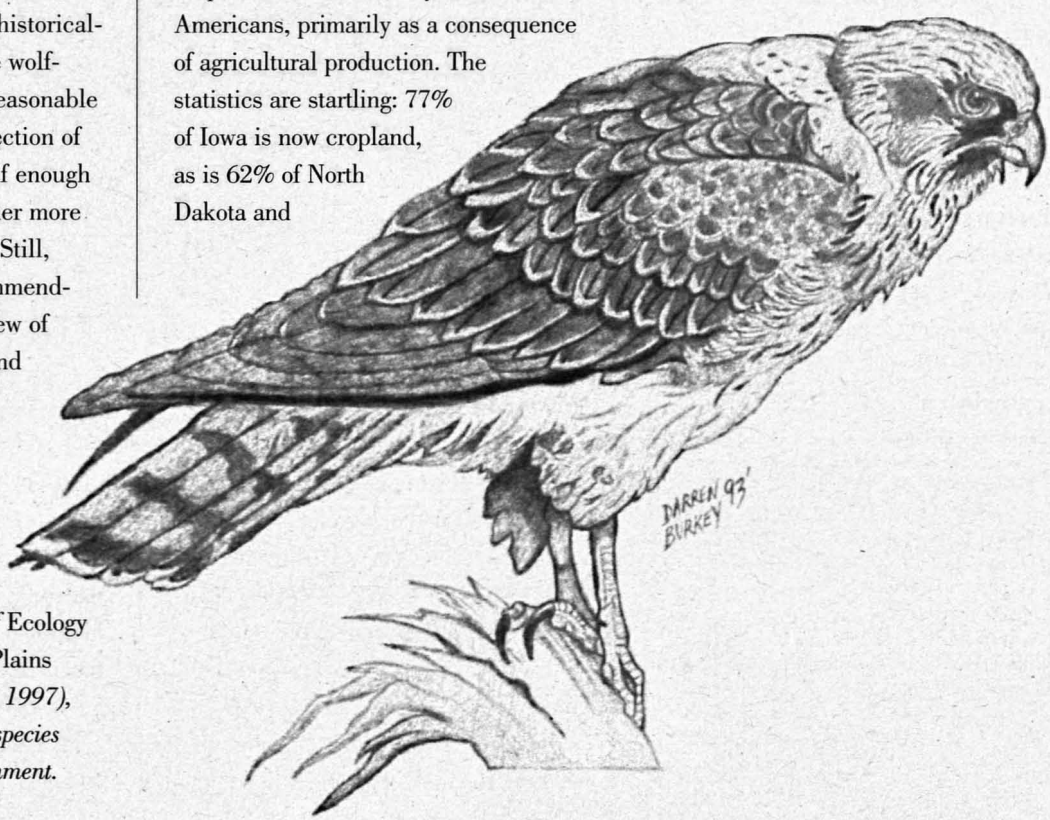
## Ecology and Economics of the Great Plains

*by Daniel S. Licht; University of Nebraska Press (312 N. 14th St., Lincoln, NE 68588); 1997; 225 pp.*

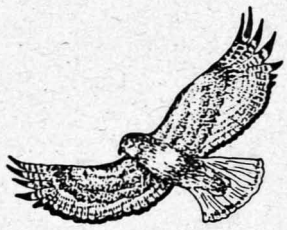
*Ecology and Economics of the Great Plains* is a comprehensive and compelling overview of one of North America's most interesting and yet unappreciated ecosystems. The author begins with a description of the region's geography, climate, and settlement; he then delves into the region's ecological underpinnings, providing an excellent review of Great Plains ecology and a clear explanation of how human exploitation has led to a degraded natural system.

Licht describes the vibrant landscape that once supported North America's greatest concentration of large mammals, and documents the alteration of the region's natural landscape since settlement by Euro-Americans, primarily as a consequence of agricultural production. The statistics are startling: 77% of Iowa is now cropland, as is 62% of North Dakota and 59% of Kansas. In total, Licht informs us, 43% of the plains—once the largest major landscape region in the country—is now cultivated. The negative ecological effects are greater than this percentage may imply since the conversion of native prairie to cropland has fragmented nearly 100 percent of the natural landscape. (Anyone who thinks housing subdivisions are the major threat to biodiversity should stop and consider that agriculture affects far more of the United States than any other land use.) Licht shows how this fragmentation and land use conversion has led to biological impoverishment of the plains, including the near elimination of an entire ecosystem—the tallgrass prairie.

Ironically, for all the impoverishment the natural landscape of the region has suffered, the human community has not prospered either. Indeed, the region's small towns are dying, and its rural economies survive




Prairie Falcon by Darren Burkey



on government subsidies and support. Licht's discussion of agricultural policy—its contribution both to the destruction of the grassland ecosystem and America's farming community—is one of the most insightful I've ever read. His critique of the popular Conservation Reserve Program from an economic and ecological perspective is exceptional; Licht concludes that the program accomplishes little for wildlife and is extremely expensive to taxpayers. In short, the Euro-American settlement of the Great Plains has created an ecological, social, and economic disaster.

Still, *Ecology and Economics of the Great Plains* doesn't leave the reader feeling hopeless. The author makes a compelling case for landscape-scale restoration, arguing that our best hope for rebuilding healthy human communities in the region requires the restoration of healthy natural communities—including the return of extirpated carnivores. Licht's proposals could be implemented today without significant legal or funding changes, and would vastly improve the chances for biodiversity preservation and rewilding of this magnificent landscape. This book is highly recommended for anyone interested in the Great Plains and its natural communities or the topic of ecological restoration. ❙

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**GEORGE WUERTHNER** *(POB 1526, Livingston, Montana 59047) has written more than twenty books, plus numerous essays and articles on wildlands, wildlife, and land use.*

## Wild to the Last:
### Environmental Conflict in the Clearwater Country

*by Charles Pezeshki; Washington State University Press (POB 645910, Pullman, WA 99164); 1998; $22.95; 274 pp.*

*Oh Creator, if they destroy this place, if they build their roads, chop down these sacred trees, kill the bull trout in the water, drive the elk and bear to the high country, burn the fisher and pine marten out of their groves, crush my precious wildflowers in the ruts of their trucks and bulldozers, please, oh please do not forgive them. Damn them. Damn them all to hell.*

These words, from *Wild to the Last,* refresh me, give me strength. Enough professional objectivity and neutral tones. This book does not try to hide the rage the writer feels. It doesn't couch the biodiversity crisis in scientific jargon. It refuses to pander to politeness in the hope that a pleasing bureaucratese will alter public policy. How could careful words alone succeed when some of our public lands' fiercest foes—Chenoweth, Craig, and Kempthorne—hail from Idaho and represent the Clearwater in Congress?

Pezeshki has a PhD in engineering. Despite that background, his book is a hotheaded activist's firsthand account of the resource wars in central Idaho. He founded the Clearwater Biodiversity Project to save a place he loves. Who can blame him? Pezeshki wrote *Wild to the Last* to make good on a bar-room bluff, but he's thrown his big heart into the mix. He wears well, and he swears well.

Most compelling are the profiles of little folks in these resource wars. Folks like pigtailed Leroy Lee, former "hippie road dog," as he calls himself, now an independent timber cruiser in Clearwater country. Leroy found—and testified about his find before Congress—that "ghost trees" plumping the numbers on accountants' ledgers proved invisible on the ground. Folks like piano teacher and salmon advocate Reed Burkholder, who called for dam removal on the Snake River years before "breaching" made the pages of the *New York Times.* Many Inland Northwest eco-heroes people these pages. All are being dispossessed, their hearts' homes torn to bits.

Moral matters call for more than cold statistics to convey the enormity of silted streams and slumping sidehills, gutshot elk and homeless Goshawks, timber-dependent towns whose citizens have been duped by corporations that routinely cut and run. Raw numbers don't suffice. Timber subsidies may outrage fiscal conservatives. Mass extinctions may set off scientific alarms. But *Wild to the Last* factors in the human element, puts faces on the players.

Gary Snyder and Barry Lopez have urged us to save our favorite haunts by imparting bioregional wisdom through tales. Not for ourselves alone, not just so we'll have unspoiled spots to romp, but for the integrity of ecosystems we need to practice the narrative craft. That means committing species' names and geographies to memory, keeping journals, sharing the past to forestall future shock. Pezeshki tells memorable stories. They "sacralize" the Clearwater, make us want to go and see it for ourselves, get outraged at the agencies and industries unraveling its seams.

Several stories have stuck with me. One tells of a mountain goat that grows belligerent—territorial or habituated to human presence—and attacks some campers who shoot it in the face. Bloody

Red-tailed Hawk by Libby Davidson

but undaunted, the goat keeps on coming. Another relates the tale of timber sale protester Erik Ryberg, handcuffed and locked in the back seat of a Forest Service truck, who found a way to piss on the radio when his captors refused to let him out to go. (The site of protests for seven years, the Cove-Mallard timber sales will cleave the heart of Clearwater country between the Gospel Hump Wilderness and Frank Church/River of No Return Wilderness on the Salmon River breaks.)

Perhaps Pezeshki comes off as too misanthropic. Witless frat boys party on the Salmon River and litter it with cans. Protesters come from far away to Cove-Mallard not because they love the land, but because it's a cool thing to do. Pezeshki's characterization of such people often drips with scorn. The "wise-use" leaders like to call enviros "human haters," and it's unwise to fuel that fire. A good copy editor also would improve the book.

Are we too late to save the Clearwater? On the contrary, it is one of the last best places, a unique mix of Cascades and Rocky Mountain microclimates and coniferous forests. Some of its creeks and rivers—the Snake, Salmon, Selway, Lochsa, Crooked, and forks of the Clearwater—still run clean. Gray wolves now roam the region. Is the Forest Service planning timber sales? You bet. It's a complicated mess. Team an undereducated populace, rocky and unstable soils, run-amok federal agencies, and the most reactionary congressional delegation in the lower 48, and you get a picture of the sorts of forces besetting the Clearwater country. ❙

*Reviewed by* **PAUL LINDHOLDT** *(English Department, EWU MS-25, Cheney, WA 99004) who teaches at Eastern Washington University.*

# *Other Recommended Titles*

## The Trees in My Forest

*by Bernd Heinrich; Harper Collins (10 E. 53rd St., New York, NY 10022); 1997; 245 pp.; $24 hardcover*

Biologist and author Bernd Heinrich, whose books include *Ravens in Winter* and *Bumblebee Economics*, is one of a gifted few scientists able to write credibly for both scientific and lay audiences. In *The Trees in My Forest*, he returns to the woods surrounding his Maine cabin—the scene of several of his earlier books—to feast his insatiable curiosity on assorted arboreal puzzlers: What factors affect tree size and shape? Why do some tree species fare well in an ice storm, while others are badly damaged? How do trees have sex, and why might it be more fulfilling on a windy day? These and other provocative topics are addressed in this lovely and instructive exploration into natural history and forest ecology.

—TOM BUTLER

## Another Country: Journeying Toward the Cherokee Mountains

*by Christopher Camuto; Henry Holt and Company (115 West 18th St., New York, NY 10011); 1997; 331 pp.; $25 hardcover*

Christopher Camuto's *Another Country* is a humble walk through ecological and mythological history in the southern Appalachians. On foot and by canoe he seeks out the remnants of wildness, pursuing his sense of place in these mountains and unwinding an evolution tainted by modern development and American frontier strongholds. He tracks the restoration of the red wolf, a symbol of the ecosystem's wildness and health, and defers to Cherokee culture and beliefs to interpret the landscape. With what he refers to as the Zen Buddhist beginner's mind, Camuto gratefully explores bits of the past in the place he calls home. This is a beautiful and informative read.

—STEPHANIE LOGIN

## Intimate Nature: The Bond Between Women and Animals

*edited by Linda Hogan, Deena Metzger and Brenda Peterson; Fawcett Columbine, The Ballantine Publishing Group (New York, NY); 455 pp.; $27*

Diane Ackerman, Jane Goodall, Birute Galdikas, Cynthia Moss, and Terry Tempest Williams are only a few of the seventy talented women from all over the globe whose writings are gathered together this unique and powerful collection. The authors celebrate women's long-standing connection to nonhuman creatures, and sound a loud alarm about the plight of wildlife worldwide. The contributors are scientists, researchers, activists, and writers who have lived with, raised, witnessed the births of, spoken with, and mourned for animals; you will be moved by each and every story.

—KATHLEEN H. FITZGERALD

## The Great Bear Rainforest: Canada's Forgotten Coast

*by Ian and Karen McAllister with Cameron Young; Harbour Publishing (POB 219, Madeira Park, BC VON 2HO); 145 pp.*

After reading the McAllisters' account of *The Great Bear Rainforest*, you will not easily forget it. Eight million acres in size, the globally significant Great Bear Rainforest hosts an amazing variety of species including grizzly bears, elephant seals, pine martens, bald eagles, and wolves. The McAllisters lead us into this spectacular landscape of towering old growth and diverse natural communities through their breathtaking photographs, intimate journal writing, and informative text. The authors succeed in overwhelming us with the beauty of the land and horrifying us with the threats facing it. If this book does not hurl a reader into action on behalf of the Great Bear Rainforest, I am not sure what will.

—KHF

# Nature Lover's Library

**Recently Published Books That May Be of Interest to Conservationists**

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*Prairie Conservation: Preserving North America's Most Endangered Ecosystem* edited by Fred B. Samson and Fritz L. Knopf. 1996. Island Press, Washington, DC. 339 pp. $28.

*Silenced Rivers: The Ecology and Politics of Large Dams* by Patrick McCully. 1996. Zed Books, London. 350 pp. $25.

*Poles Apart: Parallel Visions of the Arctic and Antarctic* by Galen Rowell. 1997. University of California Press, Berkeley. 184 pp. $24.95.

*Endangered Mexico: An Environment on the Edge* by Joel Simon. 1997. Sierra Club Books, San Francisco. 275 pp. $16.

*Eagle's Plume: The Struggle to Preserve the Life & Haunts of America's Bald Eagle* by Bruce E. Beans. 1997. University of Nebraska Press, Lincoln. 318 pp. $17.95.

*A Field Guide to the Familiar: Learning to Observe the Natural World* by Gale Lawrence. 1998 (1984). University Press of New England, Hanover. 274 pp. $16.95.

*The Nature of Vermont: Introduction and Guide to a New England Environment* by Charles W. Johnson. 1998 (1980). University Press of New England, Hanover. 354 pp. $17.95.

*A Classification of North American Biotic Communities* by David E. Brown, Frank Reichenbacher, and Susan E. Franson. 1998. University of Utah Press, Salt Lake City. 141 pp. $19.95.

*Texas Land Ethics* by Pete A.Y. Gunter and Max Oelschlaeger. 1997. University of Texas Press, Austin. 156 pp. $18.95.

*By the Light of the Glow-Worm Lamp: Three Centuries of Reflections on Nature* edited by Alberto Manguel. 1998. Plenum Press, New York. 373 pp. $19.95.

*Biodiversity and Conservation* by Michael J. Jeffries. 1997. Routledge, London. 208 pp. $17.99.

*Environmental Biology* by Allan M. Jones. 1997. Routledge, London. 196 pp. $17.99.

*Ecosystems* by Gordon Dickinson and Kevin Murphy. 1998. Routledge, London. 190 pp. $18.99.

*Essentials of Conservation Biology, 2nd Edition* by Richard B. Primack. 1998. Sinauer: Sunderland, MA. 608 pp. $49.95.

# Announcements

## Words of Wilderness Mentors

*Building a Successful Wilderness Campaign: Lessons from the 1998 Wilderness Mentoring Conference,* published by the Southern Utah Wilderness Alliance and Alaska Wilderness League, is now available. This 48-page booklet synthesizes the experiences of many veteran campaigners on campaign organizing, coalition building, types of campaigns, lobbying, and media work. The book is available free of charge from SUWA, 1471 South 1100 East, Salt Lake City, UT 84105; 801-486-3161; suwa@suwa.org.

## Let There Be Wolves

Restoring the Wolf, a forum on wolf biology, recovery, management, and activism, will be held November 11–15, 1998 at the Doubletree Airport Hotel in Seattle, Washington. The conference will include scientific presentations, posters, panel discussions, and activist workshops. For more information, contact Nina Fascione, Defenders of Wildlife, 1101 14th St. NW, Suite 1400, Washington, DC 20005; 202-789-2844 ext. 227; nfascione@defenders.org.

## Frog Songs

Smithsonian Folkways Recordings has reissued *Sounds of North American Frogs: The Biological Significance of Voice in Frogs.* Pioneering herpetologist Charles M. Bogart recorded the frog sounds between 1954 and 1957. Originally released in 1958, this album showcasing 57 species of frogs and toads is "considered a classic by specialists." In a time when frog and toad populations are in rapid decline, this recording reminds us of the remarkable diversity and beautiful music we are in danger of losing. Mail order the record, which includes 40 pages of liner notes, at 800-410-9815 or http://www.si.edu/folkways.

## Tax Shifting

Two publications discussing the possibilities for green tax reform are now available. Friends of the Earth's 59-page report, *Citizens' Guide to Environmental Tax Shifting,* provides information about how the tax system can be harnessed to benefit both the economy and the environment. Call Friends of the Earth at 202-783-7400 to receive the report.

*Tax Shift: How to Help the Economy, Improve the Environment, and Get the Tax Man off Our Backs,* by Alan Thein Durning and Yoram Bauman, offers a novel way to fix our tangled tax system. Order this latest report from Northwest Environment Watch (115 pp.; $9.95) at 1402 Third Ave., Suite 1127, Seattle, WA 98101; 206-447-1880; 888-643-9820; new@northwestwatch.org; www.northwestwatch.org.

## Exploring Parks & Protected Areas

The George Wright Society is calling for papers for their 10th Conference on Research and Resource Management in Parks and on Public Lands. Abstracts on any topic related to research, resource management, and public education in parks and protected areas, from any field in natural or cultural resources, are welcomed. Abstracts must be postmarked no later than October 15, 1998; e-mail submissions are preferred. Submissions or questions may be directed to The George Wright Society, POB 65, Hancock, MI 49930; 906-487-9722; gws@mail.portup.com.

## Population Conference

A Population, Consumption, and Sustainability Conference will be held at the Science Museum of Minnesota on November 20–21, 1998. Sponsored by SMM, the Lee and Rose Warner Nature Center, and World Population Balance, the conference will feature nationally recognized expert Anne Ehrlich, and panel and free-form discussions. Attendance costs $30 for one day; $50 for both. Call Tessa Bridal at 651-221-4560 for information and registration materials.


## *Caribouddhism*

A new collection of poems
by Gary Lawless
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by Art Goodtimes • $3

*First Sight of Land*
by Gary Lawless • $7.50

*Sitka Spring*
by Gary Lawless • $5

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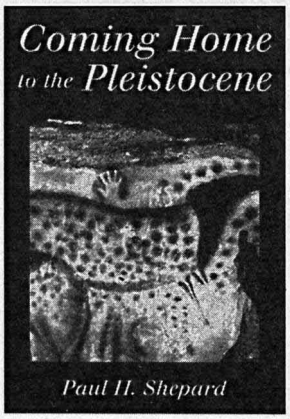


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**We list here only the major articles of each issue, by partial title or subject. For a more complete listing, request a comprehensive Back Issues List (see form on last page).**

# 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 are 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 Adirondack Proposal, National Roadless Area Map, Preliminary Wildlands Proposals for Southern Appalachians & Northern Rockies, 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

**14 Summer 1994** • Bil Alverson's Habitat Island of Dr. Moreau, Bob Leverett's Eastern Old Growth Definitional Dilemma, Wolke against Butchering the Big Wild, FWS Experiments on Endangered Species, Serpentine Biodiversity, Andy Kerr promotes Hemp to Save the Forests, Mapping the Terrain of Hope, A Walk Down Camp Branch by Wendell Berry, Carrying Capacity and the Death of a Culture by William Catton Jr., Industrial Culture vs. Trout

**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 are 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 Adirondacks, 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 are 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 two of NPS Prescribed Fires in the Post-Yellowstone Era

**27 Fall 1997** • SOLD OUT (but photocopies of articles are 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

**Additional *Wild Earth* Publications**

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**Species Spotlight**

# Red Fox

## *Vulpes vulpes*

ONE OF THE FEW WILD CREATURES that has benefited from human manipulation of the landscape is the red fox. The deforestation of most of eastern North America created the openings that foxes prefer; the species range expansion was also accelerated by the importation of European red foxes in the 17th and 18th centuries. (Although the American red fox was once considered a separate species, *Vulpes fulva*, both the new and old world red foxes are now classified as *Vulpes vulpes*.) The European settlers' desire for open pasture and cropland, fuel, and building materials, as well as for the traditional fox chase, encouraged this species—initially restricted to Canada and most of New England—to spread throughout much of North America.

Despite its preference for rolling farmland mixed with wooded areas, marshes, and streams—usually edge habitats near sparsely settled areas—the red fox may be difficult to observe. Often described as cunning, shy, and sagacious, red foxes are also primarily nocturnal. A fox abroad at dawn or dusk (or on dark days) may be identified as *Vulpes vulpes* by its indicative white-tipped tail. Curious yet wary, foxes are believed to be capable of learning from experience like other canids.

Omnivorous, the red fox feeds on whatever is available—summertime offers berries, corn, apples, grapes, acorns, and grasses; in winter, meadow voles are a key food resource. Mice, rabbits, woodchucks, squirrels, birds, carrion, and small reptiles and invertebrates are also consumed. In autumn, fox families disperse from their den; a young fox might travel 5–15 miles to establish a new territory. By January, red foxes are paired up and their tracks intertwine in the snow, a sign of the approaching breeding season. Although capable of digging a new den, the male and female usually choose a pre-owned burrow (often a woodchuck's) and enlarge and modify it. Adult foxes sleep in the open, curled into a ball, but retreat to the den to rear their young, who are born between March and May. The vixen has an average of 5 pups in her one litter; the pups venture outside after about a month, and once a dominance hierarchy is established, they play with each other and with various toys, including bones, skins, feathers, and leftover food.

For years, unregulated trapping and bounty payments took a heavy toll on foxes. Today, the red fox population, perhaps 3–4 million, is probably expanding. The extirpation of large carnivores across most of the continental US has altered natural ecosystem function; one consequence of this absence of top carnivores is an increase in the abundance of mesopredators, such as foxes, opossums, and raccoons. This "demographic release," and the edge habitats created by conversion of land for agriculture, have likely allowed *Vulpes vulpes* to increase its numbers and range, potentially causing a cascade of ecological effects disruptive to some native wildlife, including small mammals and songbirds.

—JENNIFER ESSER

*"Out of the Den" (pencil) by Massachusetts artist James Opalenik (658 Ryan Rd., Florence, MA 01062).*

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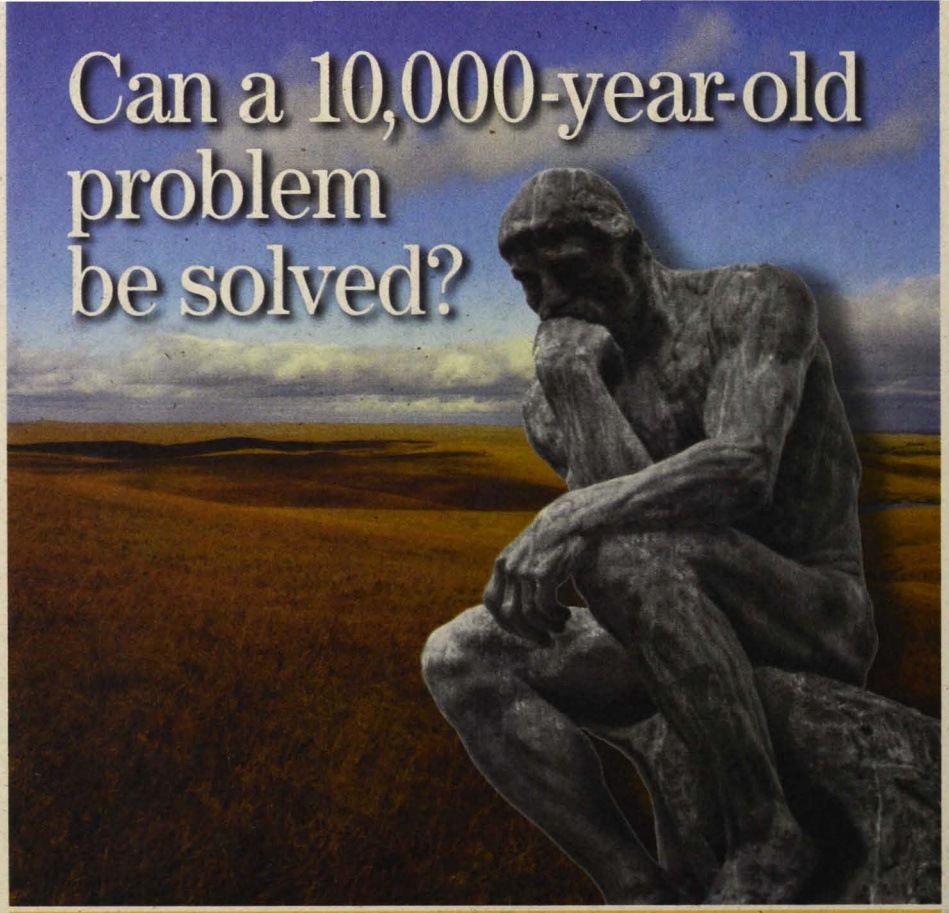

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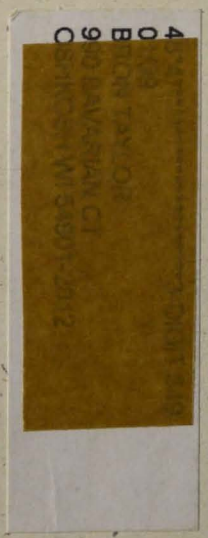

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