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WildEARTH



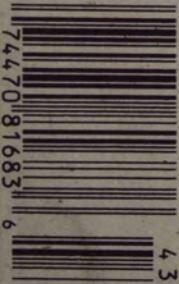
Fall 1996

Religion and Biodiversity



Big Trees
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Wildfire in the post-Yellowstone Era

\$4.95 US



Around the Campfire

When I plunged headfirst into the wilderness conservation movement back in '71 and '72, I dove into the literature of wilderness as well. During my first year as an activist, I read Ed Abbey's *Desert Solitaire*, Aldo Leopold's *A Sand County Almanac*, Rod Nash's *Wilderness and the American Mind*, Paul Sears's *Deserts on the March*, and Paul Shepard's *Ecology: The Subversive Science*.

For the first time in my life, I had encountered genius.

Since then, I've read hundreds of other conservation books and, in several of them, I've also found genius, but those five men at the beginning have continued to share a strong hand on my tiller.

Now Paul Shepard is gone, joining Leopold, Sears, and Abbey around some Pleistocene campfire, sucking marrow out of bones and painting bears on the cave walls.

If Nobel Prizes were given for important things, instead of fluff like economics and physics, Paul Shepard would have collected a pouchful. In his books like *Man in the Landscape*, *The Tender Carnivore and the Sacred Game*, *Thinking Animals*, and *Nature and Madness*, he set forth the most brilliant, provocative, and original thoughts about us and our world I've ever read.

Instead of dying a year or so ago when he could have escaped the pain of cancer, Paul held on and completed two new books—*The Only World We've Got: A Paul Shepard Reader* and *The Others: How Animals Made Us Human*. Because some of his books are out of print, run down to your bookstore and get both of these. The collection from his previous works, *The Only World We've Got*, is a marvelous introduction to the greatest scholar of our time. *The Others* is a fine update and elaboration on his previous work about the deep tie between our minds (and mental health!) and other animals.

Like the other great conservation thinkers, Paul Shepard was also a conservation doer. In the 1950s, the National Park Service was quietly clearcutting the splendid ancient forest of Olympic National Park. A seasonal park ranger blew the whistle and organized opposition to this vile official vandalism of the Park Service's sacred trust. The logging was stopped, and today we still have the awe-inspiring forests of the Hoh and Quinalt valleys. Paul Shepard was the ranger who led the fight.

A few months before he died, Paul sent me a copy of *The Others* hot off the press. In it he wrote to me:

In celebration of our spiritual campout together, in hope that we'll get to one in the backwoods yet.

I never got that backwoods campout, but my spiritual campout with Paul Shepard will go on until the jaguars are cracking my bones.



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We at *Wild Earth* put out one hell of a fine magazine. But, let's face it, we haven't been that good at promoting it. That is changing. Monique Miller joined us this summer as *Wild Earth* executive director with responsibility for administration and promotion. Since I first met Monique six years ago at the Environmental Law Conference, in Eugene, Oregon, where she interviewed me for *Carrying Capacity*, I've grown more and more impressed with her as a manager, journalist, and conservation thinker and activist. With her background as executive director of Carrying Capacity Network, she brings the experience and skills *Wild Earth* needs for us to bring our message to more conservationists. Expect to see Monique around the country representing *Wild Earth*. Introduce yourself; talk to her about the magazine. *Wild Earth* now has the finest team of any conservation publication in the world, in my humble and restrained opinion.

Welcome, Monique. We've needed you!

Happy Trails,

—Dave Foreman

in a slot canyon near the Bear's Ears

Wild Earth Update

by John Davis

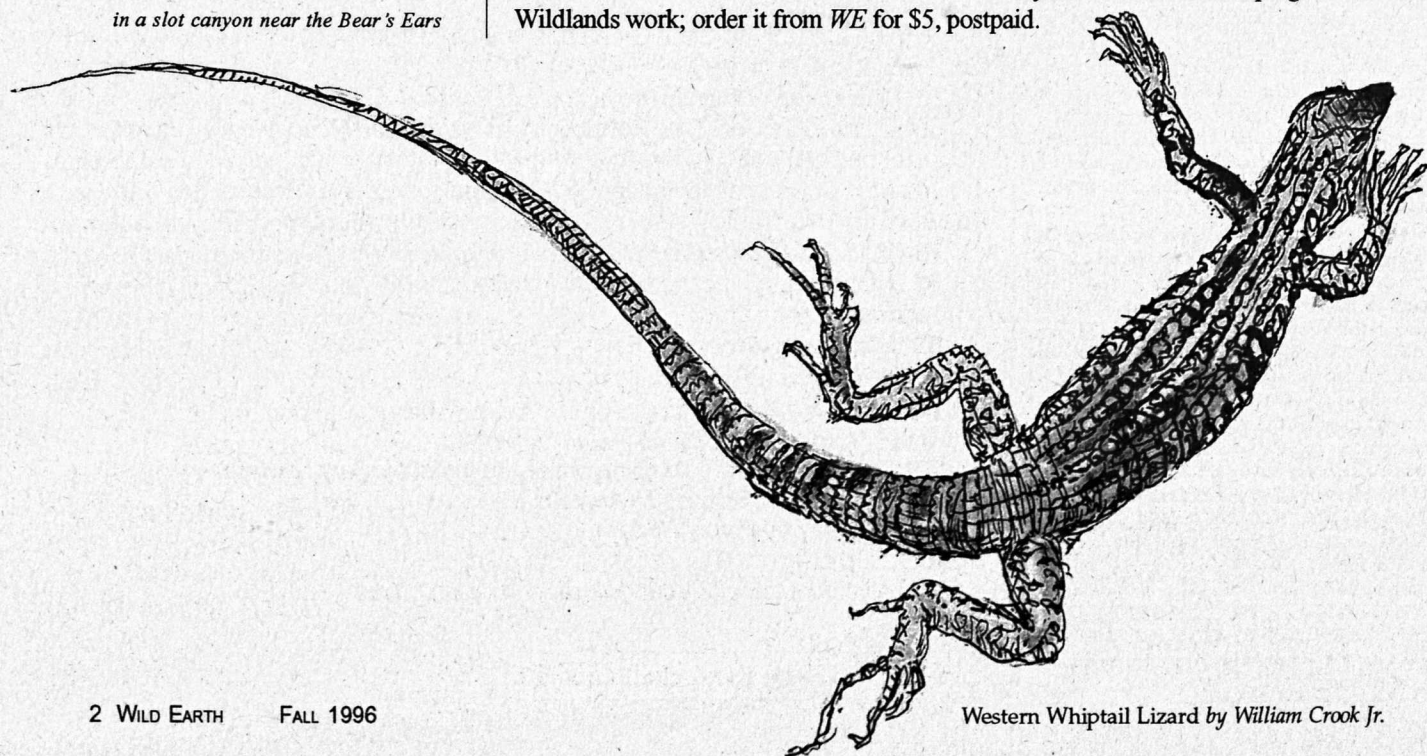
Since its inception, *Wild Earth* has vowed to defend Wilderness both as concept and place. And so, again, unto the breach. In our winter 1996 issue, *WE* will fend off yet another attack on the idea of wilderness. Unfortunately, philosophical assaults on the idea of wilderness are mounting—and coming particularly from several environmental ethicists and historians who ought to be allies, if we may believe their professed motives. Chief antagonist in this “great new wilderness debate” is historian William Cronon, who appears to be inspiring several ivory towers full of “deconstructionists” (the redundancy of their chosen label is apt) to lay siege to such venerable and intuitive concepts and qualities as Nature and natural, wilderness and wild. Arrayed in our pages to turn back the latest academic sortie against wilderness will be such philosophers, biologists, and historians as George Sessions, Don Waller, Sarah Vonhoff, Dave Foreman, and Paul Hirt.

Another likely theme issue in our future will focus on human overpopulation from the perspective of wildlife and wilderness. Most other groups and publications are ignoring this fundamental problem; *WE* will confront it boldly and directly. We'll explore how carrying capacity concerns can (and must!) be incorporated into wildland recovery plans. *Wild Earth's* new executive director, Monique Miller, former executive director of Carrying Capacity Network, will be integral to production of this population theme issue, and will lead efforts to distribute it widely within the conservation community and beyond.

Good News

• Sweet Water Trust early this year awarded Brian Dunkiel (author of the two recent articles in *WE* advocating conservation easements) a grant to further the private lands conservation work he is doing on behalf of *Wild Earth* and The Wildlands Project. We thank Sweet Water for their generosity and for their ongoing efforts to secure protection of wildlands throughout the country.

• “How to Design an Ecological Reserve System,” by Steve Trombulak, the first special paper in an occasional monograph series published by *WE*, is now available. This debut document should be of interest to everyone interested in helping advance Wildlands work; order it from *WE* for \$5, postpaid.



Western Whiptail Lizard by William Crook Jr.

With Monique leading the way, we are commencing some creative ways to attract more support, reasoning that more readers and more donations will translate, eventually anyway, into more acres saved. Money is beyond my ken, though, so I shan't try to report on the rest of the staff's creative pursuits. Rather, I shall (with all due embarrassment) report on my own meager effort to win a little more support for *Wild Earth*:

Now that I am become bleary-eyed, besotted, and beer-bellied from too many years editing too much verbiage, what could be more preposterous than the notion of me running a long-distance race in a dangerous city? Nothing, unless were added to said notion that I would ask for sponsors! Yes, even as our very own Kathleen Fitzgerald ran it in 1992 on behalf of the Adirondacks, I intend to run in the 1996 New York Marathon (though lacking the finesse that Kath showed), with long-time *WE* supporter John Duncan, on behalf of *Wild Earth*. I'm shamelessly asking for help in accomplishing a minor miracle (I don't even know how far a marathon is). If at least three of you will make a \$1 per-mile pledge to *Wild Earth*, I'll promise to run as many of those marathon miles as I can, with **Wild Earth** and our emblematic wolf emblazoned across my chest. —John Davis

Wear wolves of ~~London~~ New York.

Yes! I want to see wolves in Manhattan... and pledge my support of John's jog through the Big Apple.

Here's my tax-deductible contribution of:

.50/mile (\$13.10)

\$1/mile (\$26.20)

\$2/mile (\$52.40)

\$__ /mile for a total of _____

(Don't tell John that a marathon is 26.2 miles.)

Feel free to round up or down, and send checks to *Wild Earth*, POB 455, Richmond, VT 05477.

The Wildlands Project Update

by Steve Gatewood, executive director

Wildlands Project board president Michael Soule and I recently attended the launch in Vancouver, BC, of a new temperate rainforest conservation coalition—the Canadian Rainforest Network. Activities included a Lighthawk flight, press conference, reception with speakers and a silent auction, and a Canadian/US strategy session to enhance trans-boundary coordination. It was a well organized and useful event that clearly accomplished its objectives, and reinforced for me some issues that must be addressed if the new conservation movement and Wildlands Project are to be successful at protecting biodiversity:

- Clearcutting and road building in old-growth roadless watersheds is a classic “brush fire” situation that requires immediate and constant action at the local level. At the same time, a Wildlands type systems design approach is needed to avoid losing the war while winning the battles.
- Networks need to address all the participating organizations' legitimate needs as well as maintain cohesiveness among them, while directing additional resources to protecting biodiversity. The sum of the parts together **MUST** be more than the sum of the individual parts acting independently, or the coalition shouldn't exist.
- Cultural and political differences between states, provinces, and nations are real and must be addressed, even though species, natural communities and ecological processes may not recognize political boundaries.
- Good science is essential to the process. A well documented technical foundation is the best defense against high paid biostitutes representing the opposition.
- The press and public are hungry for conservation news, but do not really understand some of our technology and concepts—biodiversity, ecological integrity, fire as a “good” process... Shaping messages for lay people will be essential for winning the support of our ambitious agenda.
- All of this takes money. Resource despoilers are well funded and can afford to buy public opinion, political power, information, and ultimately, the resources themselves. Activist and science based groups must substantially elevate their fund-raising capabilities to support this work or risk being buried in a blizzard of misinformation and pseudo-science articulated by public relations spin doctors.

Vancouver is just one of the places visited these last few months. As part of the Patagonia stores tour, Dave Foreman gave talks in Atlanta and Washington DC. We used the trips, and our visit to the San Francisco store, as opportunities to meet with several of the national conservation groups, a few major donors, and foundations who have supported us or we hope will support us in the future. New York, Boston, and Santa Cruz will be scheduled this fall, with Freeport next spring.

I have also been able to meet with some of the pilot region groups. At the board meeting in May, emphasis was placed on pilot regions. The Wildlands Project's role needs to be coordination, science applications, national publicity, assistance with fund-raising, and refinement of products with associated timetables for completion. These pilot projects will be centerpieces of future outreach initiatives that place them in the context of numerous other regional reserve design efforts.

The board has had to make some tough decisions regarding budgeting, outreach, and science. As most of you know, TWP decided from the outset not to be a membership organization, so all of our funds come from foundations and donors. As expenses grew and foundation giving leveled off, adjustments were necessary. The information poster was one effort affected. The board was excited about the informational content and theme, but not the layout and marketing plan. So, facing a \$12,000 cost for final completion, the poster was delayed pending communications consulting for final layout and a distribution plan.

Several other efforts under the broad category of science and GIS likewise needed adjustment. At our November 1995 meeting, the board hired a development coordinator under contract and committed funds to hire an ecologist in spring 1996. The lag time between grant request proposals going out and funds from donors and foundations coming in put the squeeze on salaries and ongoing contracts. The ecologist position was deferred until fall and, based on the rapid development of GIS capability at the local level, our contract for continuous GIS services ended. A pool of money was allocated to address specific science and GIS issues through the fall.

These kinds of decisions are hard for a board to make, but are a necessary part of any active board's role. They cause concern in some quarters, and rightly so. But they are short-term actions that will strengthen, in the board's view, the long-term stability and productivity of the organization. The results are already being realized, with foundation and major donor interest on the rise. An ecologist with GIS skills should be hired by the end of the year, and plans are in the works for a revised poster and communications strategy.

It has been a whirlwind four months since office consolidation and staff changes. We've weathered a budget crisis that forced us to make some difficult adjustments. Our relationship with *Wild Earth* was carefully evaluated and the conclusion was that it needs to be even stronger. Development of a five year strategic plan has been initiated to more clearly chart a course that focuses resources on producing results that advance biodiversity and ecosystem protection through reserve design. New feet are firmly planted on new ground, and we're moving ahead.

The Wildlands Project staff and board is always interested in feedback from all of you out there in the trenches doing local work. Are we responsive to your requests? Do we provide vision and the essential services you need? Through our activities, are things really happening on the ground? And most of all, does what we do result in, or will it result in, motivation and inspiration to accomplish actual wildlands protection? Please let us hear from you. ■



Because It Is My Religion

by Connie Barlow

The greening of traditional religious faith is a hugely important component of the ecoreligious movement. But there are other ways, as well, to infuse ecological concern with a vision of the sacred. There are other ways to fill the perhaps innate drive for religious grounding with memes that can serve the Earth community.



ever-so-secular environmentalists and supporters of wild life and wild lands are being put to shame by the Christian green. The Quakers who publish the liberal interfaith magazine *Earthlight* and the by-the-Book evangelicals who publish *Green Cross* are willing to back their preservationist views with the gutsiest of all reasons: because it is my religion. Each holds that we must end the assault on Earth and the diversity of life because (as the liberals say) the Earth is sacred, or because (as the evangelicals say) we have a responsibility to God's creation.

Consider this statement, which appears in the lead article of the winter 1996 issue of *Green Cross*: "God made it clear to Noah that He cared so much for the creatures He had created, that He wanted each one of them to be saved from impending extinction... Concerns about time or money apparently were not raised by Noah. Neither were questions about the significance or worthiness of each species. Noah did as the Lord commanded him." The author, Calvin DeWitt, then recounts the tragedy of today's human-caused wave of species extinctions, and concludes his essay with an impassioned plea. "The great gallery of the Creator is being trashed. The great treasury of the Creation is being converted to ash. Where are the Noahs?"

DeWitt and other environmentalists motivated by their Christian faith thus push for many of the same legislative and personal actions as you and I do, but their arguments resonate with a special power. "Because it is my religion." Imagine speaking those words to your most conservative legislator! Beyond the litany of anthropocentric functions served by wild life and wild lands, beyond the intricate logical edifices on which species rights and intrinsic value are pressed, lies the ultimate argument for environmental and species protection. And this argument is as American, unpointyheaded, and unprivileged as apple pie.

Because it is my religion.

Can we find the courage to proclaim that? I think we can and must. This essay is an exploration of how we secular enthusiasts of environmental values may not be (and certainly need not be) so secular after all.

A SURPRISE FROM SOCIOBIOLOGY

Not long ago it was intellectually fashionable to declare that religion's time had passed. Religious sentiments—and even more so, religious dogma and institutions—were regarded as drags on human progress. Supernatural belief bound the individual to pre-rational states of consciousness and choked societies with doctrines invented in pre-modern times. Marxists assailed skyward-looking religions for lulling the downtrodden into accepting a wretched existence here on earth. Nietzsche proclaimed, "God is dead." Meanwhile, secular humanists held a mirror to themselves, turning to humankind and human culture as the only aspects of heaven and earth worthy of reverence. We ourselves were the beginning and end of all meaning and value.

Smug disregard of the religious impulse has recently fallen out of fashion, however—even among atheistic intellectuals. Many people now realize that a sense of the sacred need not be based on superstition and supernaturalism. Joseph Campbell, who held that religion was whatever put one "in accord" with the universe, delighted in the mythic metaphors of diverse religious heritages while savaging those who corrupted a metaphor by claiming its material truth. Theologian James Gustafson presents a definition of religion that is as accessible to atheists as theists, and which, moreover, offers possibilities for making peace with the Earth. In Gustafson's view, the religious capacity manifests as "a sense of dependence, of gratitude, obligation, remorse or repentance, and of possibility."

The human religious capacity is also being taken seriously today in part because of the work of biologists with impeccable credentials as scientific materialists. These scientists made the astonishing discovery that the religious impulse (for good or ill) may be too deeply rooted to be rooted out.

Jacques Monod (1919–1976) was a molecular biologist who combined the authority of a Nobel laureate with a passion for philosophy and a gift with words. In his 1971 masterpiece, *Chance and Necessity*, Monod surmised that the capacity for religious experience and the hunger for religious explanation owe to the same force that shaped our opposable thumbs: natural selection.

Evolution of mental capacities that bolstered group cohesion beyond the innate genetic concern for close relatives would have helped members of larger groups cooperate for the good of all. Scientists writing after Monod recognized that, even if loyalty, valor, and the surety of meaning offered by religious belief took a toll on the fitness of warriors who died defending the tribe, such seemingly altruistic acts nevertheless benefited copies of warrior genes carried in the chromosomes of remaining kin. Members of groups made coherent and strong by shared religious conviction thus would have been favored by evolution. "We are the descendants of such men," Monod wrote. "From them we have probably inherited our need for an explanation, the profound disquiet which goads us to search out the meaning of existence. That same disquiet has created all the myths, all the religions, all the philosophies, and science itself."

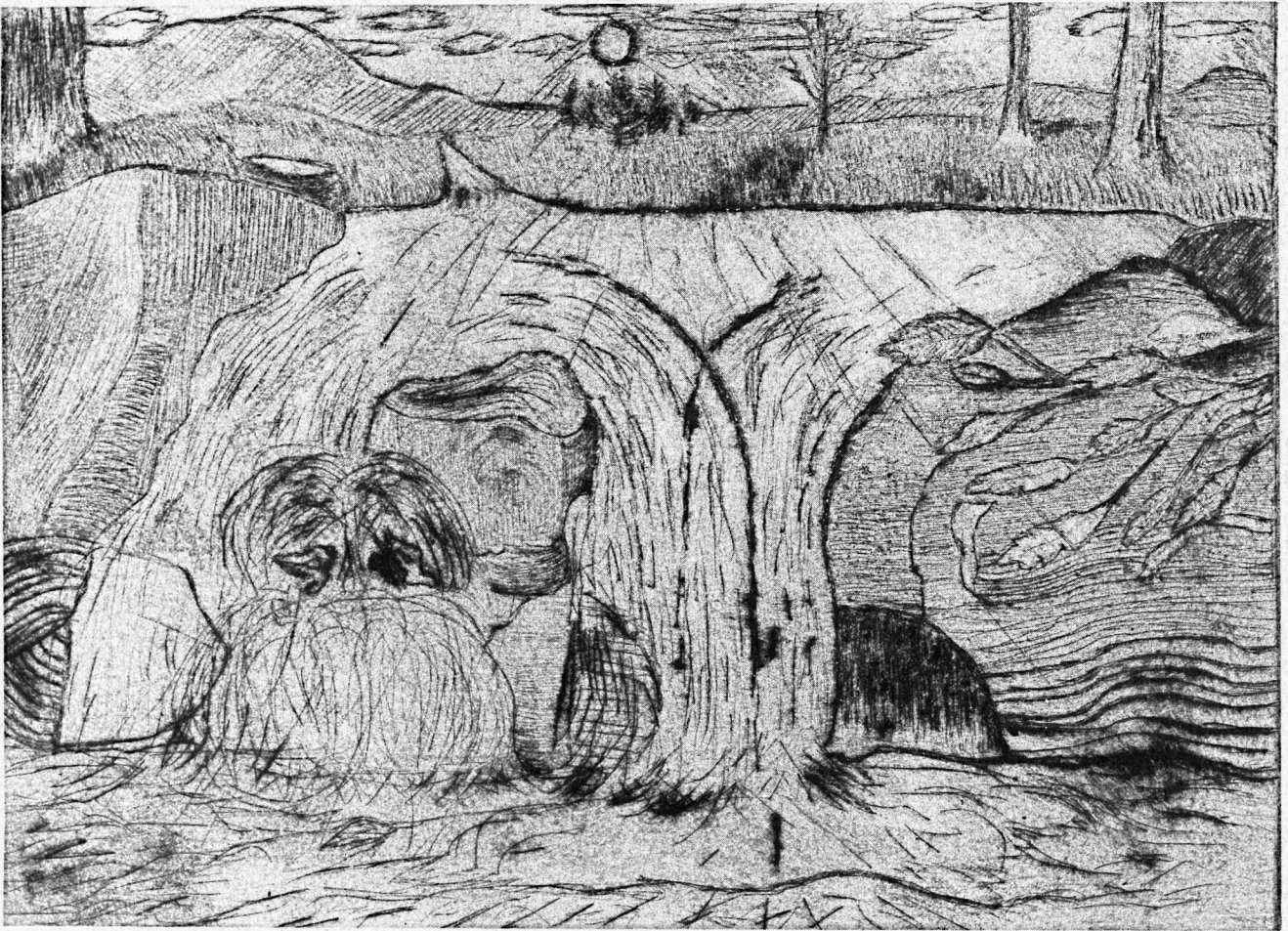
Through the millennia, not only the capacity but the need for a religious framework entered our very DNA. The drive to find or construct a complete explanation by which to orient ourselves and our goals in the universe is thus innate. Its absence, Monod cautioned, "begets a profound ache within."

Edward O. Wilson took up where Jacques Monod left off. In 1975, with a massive tome titled *Sociobiology*, Wilson founded a new branch of science. Sociobiology draws from the fields of evolutionary biology and population biology to explore the evolutionary roots of all sorts of social behavior in animals—from mating

rituals and dominance hierarchies expressed in many species to the very few forms of behavior and emotion that seem to have no analog outside our own kind. Sociobiology thus looks at social behavior from an adaptationist standpoint. How, for example, does an instinct to whistle an alarm call help a prairie dog propagate its genes? How might deception—even self-deception—enhance the evolutionary fitness of an ape?

A few years after publishing *Sociobiology*, Wilson left prairie dogs and chimpanzees behind, narrowing his focus to the human species. In so doing, he widened his scope to include matters of philosophy and religion. The resultant book, *On Human Nature*, was not a work of science, Wilson demurred. It was more a "speculative essay"—a speculative essay that earned its author a Pulitzer Prize. Nevertheless, the science and argumentation Wilson presented on the sociobiology of religion were formidable, going well beyond the groping ideas that his fellow biologist, Jacques Monod, had pioneered.

The predisposition to religious faith is "the most complex and powerful force in the human mind," Wilson concluded. It is likely "an ineradicable part of human nature." Wilson went on to make a daring proposal: Rather than allowing the innate religious capacity to fill with old superstitions and fears, why not fill it with an exaltation of the natural world illuminated by science? Science offers humankind the grandeur of what Wilson called "the evolutionary epic." (Note the extension into poetry, meaning, and subjectivity implied by the word 'epic'.) The evolutionary epic is the creation story for our time. My story and your story are not just part of the triumphant march of humankind. They are part of the even grander story of the evolutionary stream of life, of planet Earth, and of the universe. Moreover, the grandeur of that story stands firm, even when faith in ourselves and our kind begins to flag.



By taking the evolutionary epic into our hearts, we would be inclined, Wilson hopes, to dedicate a good portion of our religious zeal into reverence for the vast diversity of life produced by nearly four billion years of struggle and symbiosis on Earth. By way of the evolutionary epic, we can redesign our prescriptions for spiritual allurements and atonement. And we can revisit the questions of ultimate meaning and value.

All this is possible because the capacity for religious experience and explanation is just that—a capacity. Genes do not tell us how the world came into being. Genes do not determine what we revere, or even worship. These crucial details are, rather, the workings of the cultural counterpart of genes: memes.

The term ‘meme’ is the brainchild of evolutionary biologist Richard Dawkins. He invented it to signify the

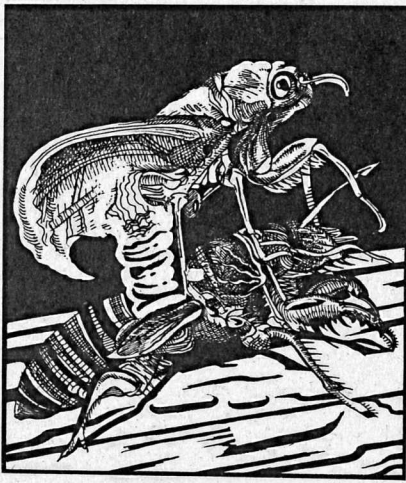
route by which cultural evolution tracks that of biological evolution. Examples of memes are “tunes, ideas, catch-phrases, clothes, fashions, ways of making pots or of building arches,” explains Dawkins. “Just as genes propagate themselves in the gene pool by leaping from body to body via sperms or eggs, so memes propagate themselves in the meme pool by leaping from brain to brain.” The term is an artful invention, owing to its sound resemblance to gene (meme rhymes with cream) and its etymological connection to words like ‘mimetic’ and the French word *même* (meaning, same). The meme of meme is now wildly successful. Writers who normally have no truck with evolutionary biology or any other science now find it indispensable.

Memes are what give substance to our inchoate capacities for religiousness. Whether they enter our brains by

thoughtful or thoughtless invitation or by indoctrination, particular memes are usually what we judge when we speak of religion in friendly or unfriendly ways.

Overall, even if the mythopoeic drive and other vestiges of the religious are innate, it seems to be a cultural choice whether these are expressed through memes that will impair or enhance our bond with other species and the Earth itself. Both nature-phobic and nature-philic religious memes are evident in the world today. We do have a choice. Moreover, the choice may be genetically slanted in favor of what, in today’s vernacular, would be called “green.”

Here E.O. Wilson is again the pioneer. He has suggested that a desire to associate with, even to love, living things is not just a cultural choice. In his 1984 book, *Biophilia*, Wilson claimed that “to affiliate with life is a



deep and complicated process in mental development. To an extent still undervalued in philosophy and religion, our existence depends on this propensity, our spirit is woven from it, hope rises on its currents." Wilson's "biophilia hypothesis" may be highly speculative, possibly unconfirmable; but the idea that love of living things may be genetically imprinted in human nature has been a smashing success. The terminology has caught on, the hypothesis is talked about, and the beginnings of a research program in biophilia are evident.

Biologist Jared Diamond, no less a proponent of biodiversity protection than E.O. Wilson, has his doubts about the reality of biophilia. His long association with tribal people in New Guinea, whom he has come to know during his birding expeditions to remote forests, makes him question the rosy view of biophilia. New Guineans are extremely knowledgeable about the biological landscape; hunting and gathering are ways of life. But their treatment of animals can be ghastly. He gives several examples, among them: extracting bones for nose ornaments from the wings of live bats; keeping snared animals fresh by transporting them alive, but preventing escape by breaking their legs.

Why would Jared Diamond offer as evidence against Wilson's hypothesis the apparent absence of biophilia in just one small tribe in New Guinea? What about the love of living things evident in the goldfish ponds of Japanese gardens, in the myriad backyard

bird feeders of suburban America, in the altogether new concept of "animal rights"? The answer is that hunter-gatherer cultures are where we must look to assess whether any psychological trait has a genetic basis. The field of evolutionary psychology (a subset of sociobiology in which humans are the focus) builds its hypotheses on the notion that our psyches were honed by the hundreds of thousands of years our lineage spent in the Stone Age. Our brains have had little time to adjust to modern exigencies. If love of living things finds its fullest expression in cultures where the unpleasantness, hardships, and outright dangers of the natural world have been removed from everyday life, perhaps biophilia is a cultural emergent.

Unlike biophilia, religious sentiments do seem to be common to all cultures. The mythopoeic drive, a sense of the sacred, and other manifestations of the religious are thus even more likely than biophilia to have a strong genetic component. Of course, likelihood is not certitude. Even if a human capacity is found to be universal, there is still a danger in granting it a genetic basis. Just because all hunter-gatherer cultures know how to flint, for example, this does not mean that flint flaking is an inborn capacity. Cultural inheritance from a single moment of innovation during the evolution of genus *Homo*, multiple discovery, or even borrowing—not chromosomes—probably keeps this particular skill going. How, then, could we possibly know that the mythopoeic drive, but not flint flaking, has jumped to the genes?

Maybe it doesn't matter.

Consider: we know in other facets of evolution that certain magnificent traits were probably not deliberately evolved. That is, they are exaptations, not adaptations. Exaptations are serendipitous by-products of selective forces that were sculpting something else. Insect wings, for example, may have started as sails evolved to help their bearers glide across the surface of a

pond. Only later were they co-opted for powered flight. The vertebrate jaw likely began as a paired gill arch, exapted into service for clamping the mouth shut when a gulp of water was forced out through the gills. The respiratory function remained even when the structure was exapted again to aid in food-getting (simple teeth) and then again to aid in food-processing (teeth that could rip) and finally even more sophisticated food processing (teeth that could grind). Similarly, owing to natural selection—perhaps a form of natural selection called sexual selection (involving the often whimsical preferences of the opposite sex)—we seem to have evolved brains with the capacity not just to think useful thoughts but to ruminate about all sorts of strange things. Surely intelligence, in general, was selected for. A by-product of intelligence is that we begin to wonder about the meaning of it all. And if there is no meaning, we need to invent it—else we risk falling prey to what Monod called the "profound ache within."

Whether an adaptation, exaptation, or cultural inclination—whether expressed through memes that are reasonable responses to an only partially known reality or just fantasy—the religious urge is rising like the phoenix today. The upsurge in spiritual (and outright magical) tendencies in the former Soviet Union, the attraction of fundamentalist doctrines in the Middle East, and the trend in my own generation in America to head back to church or into a coven is empirical evidence that the religious capacity must be taken seriously. More to the point, it offers an opportunity not to be missed.

VARIETIES OF ECORELIGIOUS EXPERIENCE

In 1990, thirty-two prominent scientists, led by Carl Sagan, put their signatures to a document titled "An Open Letter to the Religious Community." Freeman Dyson, Stephen Jay Gould, Motoo Kimura, Lynn Margulis, Peter Raven, Stephen Schneider, and

Conversation with an Earth Ecstatic

Connie Barlow talks with Diane Ackerman

CB: In your latest book, *The Rarest of the Rare*, a religious sensibility comes through in your encounters with endangered species, in a kind of communion with nature. Would you, in fact, describe yourself as religious?

DA: I've always felt an ecological spiritualism, and this powers everything that I write. When I was growing up, I was simply curious about all religions, all peoples—everything. As a teenager, I read about the lives of saints and explored oriental religions. These days I may read a book by a Jewish mystic, or by a Buddhist, or by other religious folk, as well as books by novelists and poets and nonfiction writers. I don't feel satisfied by any organized religion that I've encountered. Yet I'm probably the most religious person I've met. I'm deeply religious. It's just that I don't require a governing god in my sense of the sacred.

CB: One of my mentors, the evolutionary biologist Julian Huxley, wrote a book called *Religion Without Revelation*. The religion he was promoting was essentially a celebration of the evolutionary epic. What struck me was that even though Julian was an atheist, he wanted to claim the word *religion*. He didn't want it to become the exclusive property of theists. But when I interview scientists today, I find I have to be careful about using that term.

DA: I don't have any problem at all with religious language because I cherish the origins of religious terms. *Holy* we can trace all the way back to the Indo-European. It meant the healthy interrelatedness of all living things. From this we get our word *whole*. As a result, I have no trouble using a word like *holy* to describe a place in the wilderness where I might feel an intimate relationship with the cosmos.

CB: You use plenty of other such words, too. I recall *benediction*, *sacred*, even *prayer*—all these words come out in your essays. But the most striking religious term is the one you invented. Here it is in your chapter on the gravely endangered Short-tailed Albatross: "I go in part to stand witness. Life forms such as these need to be beheld and celebrated. That is my privilege as an earth ecstatic, but it is also my duty as a member of the species responsible for their destruction." *Earth ecstatic*: that's a fabulous identity to take on.

DA: It's a personal religion that fulfills me in countless ways. My creed is simple. I believe in the sanctity of life and the perfectibility of people.

Victor Weisskopf were among the signatories. The manifesto briefly recounted the story of escalating human impact on the environment. "We are close to committing—many would argue we are already committing—what in religious language is sometimes called 'crimes against creation'." Problems of such magnitude "must be recognized as having a religious as well as a scientific dimension... Efforts to safeguard and cherish the environment need to be infused with a vision of the sacred." The thirty-two scientists thus appealed to the world religious community "to commit, in word and deed, and as boldly as is required, to preserve the environment of the Earth."

The appeal was answered by several hundred religious leaders of all major faiths and from around the world. Thus arose a coalition, the Joint Appeal by Religion and Science for the Environment, coheaded by Carl Sagan and James Parks Morton, Dean of the Cathedral of St. John the Divine in New York City. In 1991 the group declared that "the cause of environmental integrity and justice must occupy a position of utmost priority for people of faith." The coalition has since produced a number of aids for religious networking and for environmental education. The Joint Appeal, in turn, spurred the founding of a new organization: the National Religious Partnership for the Environment. This partnership includes national-level groups representing Catholics, Protestants, Jews, and even Evangelicals in the United States. It encourages each of the faiths to build an ecological component into their traditions, and then makes these products available to priests, rabbis, ministers, and other religious leaders.

In most quarters of Judaism, Christianity, and Islam it is still heresy to consider trees and frogs and the Earth itself as divine or as manifestations of divinity. Paganism and pantheism and all forms of nature worship are still scorned. Yet it is perfectly acceptable to regard the natural world—the creation (usually now the evolved creation)—as a sacred work of divinity. And we can then acknowledge our own negligence in failing to serve as good stewards of God's green Earth. The newly formed Evangelical Environmental Network, for example, came together as "a fellowship of Christians who know that the time has come for human creatures to honor the Creator and care for His good and glorious and beautiful creation." *Green Cross* (mentioned earlier) is the house organ of this group.

The greening of traditional religious faith is a hugely important component of the ecoreligious movement. But there are other ways, as well, to infuse ecological concern with a vision of the sacred. There are other ways to fill the perhaps innate drive for religious grounding with memes that can serve the Earth community.

The ecoreligious revolution is unfolding along five distinct—but not mutually exclusive—paths. These five may be called the way of reform (just discussed), the way of the ancients, the way of transcendence, the way of immersion, and the way of science.

Those who warm to the idea of worshipping Earth directly, rather than through a posited creator, can follow *the way of the ancients*. This path encompasses the nature religions of primary peoples everywhere and the revival of various forms of Earth goddess worship. Thus the attraction of Native American and Aboriginal Australian rites of passage and views of the sacred. Those who suffer "the accident of being born to a culture that separates nature and home," as Richard Nelson describes the modern pathos, need not relinquish their own

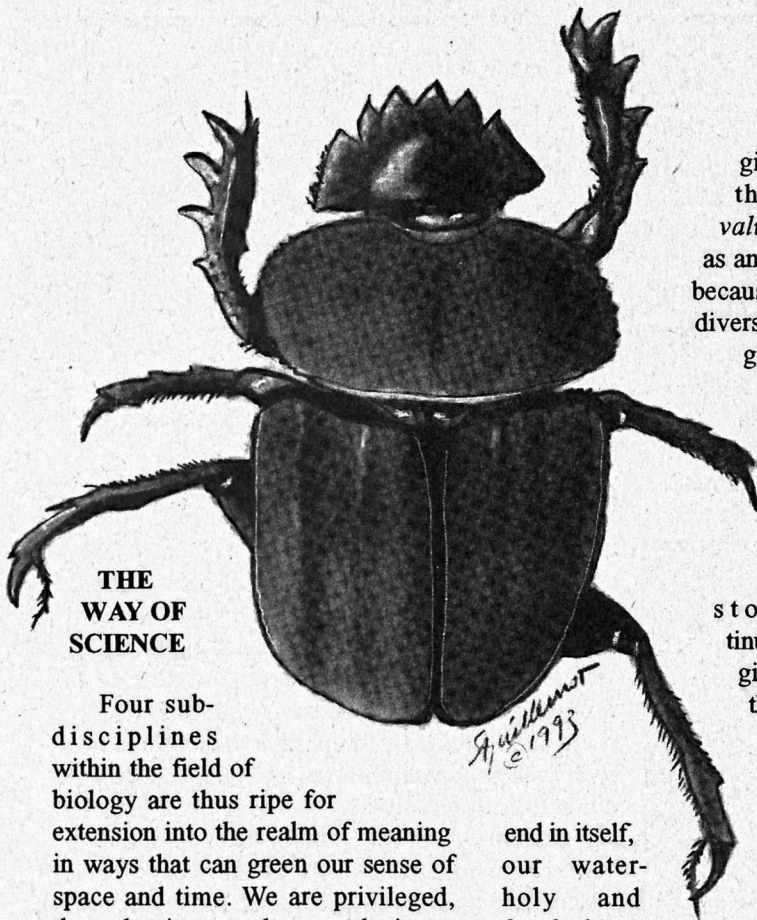
cultural heritage, however. By digging deeper into the past, we may find ancestral roots more to our liking. For those of European descent, Celtic rituals for marking the quarters and cross quarters of the calendar are becoming popular. For those looking to add a feminine aspect to the face of the divine, one can call up the goddess worshipped by Old World agriculturists long before the herders entered into covenant with Yahweh. For the descendants of the African diaspora, the practice of Yoruba is an option. Most important, beyond today's fashion for a back-to-the-genes sort of spiritual authenticity, Gary Snyder reminds us, "we are all indigenous to the planet."

Several widespread religions that are not "of the Book" don't require a lot of (if any) reform in order to embody an ecospiritual component. Buddhism and Taoism are commonly cited as examples. For these religions, divinity already is in everything; we just don't notice it. Meditational practice inspired by these and other Eastern religions is, however, sometimes viewed as narcissistic by action-oriented environmentalists, especially if the all-consuming goal is higher states of consciousness for oneself. Nevertheless, the *way of transcendence* has a long tradition in which success in communing with "the One" is then followed by a return to everyday life, with a new-found compassion for and urge to assist "the Many." Thich Nhat Hanh is a leader on this path. This Buddhist monk has been an inspiration to many in the ecospiritual movement, including Joanna Macy (who, with Australian John Seed, originated an ecological ritual for consciousness-raising called the Council of All Beings).

The *way of immersion* works through direct—even mystical—contact with nature. This form of ecospirituality is available to one and all, whether we have an immense wilderness at our doorstep, a treasured tree in an urban park, or just a chance, for a moment, to float with the clouds through a win-

dow. Something deep within us is brought into communion with the mountain, the tree, the cloud. Walt Whitman, Henry David Thoreau, John Muir, William Wordsworth were exemplars of this faith not long ago. Today Annie Dillard, Diane Ackerman, Barry Lopez, and Richard Nelson are among the growing family of storytellers and bards who offer us their own experiences. Their tales reach into our souls. We learn from these teachers how we mortals, too, might become spiritual beings, if only for a moment, by fully entering into the miracles routine in the world of nature. We can do it on foot or vicariously through *Desert Notes* or *The Moon by Whale Light*. The prophets of the way of immersion can urge us on, but each of us is deliciously on our own, as this is a doctrineless path.

Finally, there is the *way of science*. This path draws primarily from evolutionary biology, conservation biology, ecology, and geophysiology (global ecology). The more we learn about Earth and life processes, the more we are in awe, and the deeper the urge to revere the evolutionary forces that give time a direction and the ecological forces that sustain our planetary home. *Evolutionary biology* delivers an extraordinary gift: a myth of creation and continuity appropriate for our time. This is the grand sweep of the evolutionary epic that E.O. Wilson extols. Meanwhile, *conservation biology* introduces us to our farthest-flung kin, promoting knowledge and valuing of biodiversity throughout the world. We relish life in all its multifarious forms. *Ecology*, in turn, has a presence in the bioregional movement. Deep reverence is accorded the particular watersheds, nutrient cycles, and biological communities that are the lifeblood of particular human communities. Lastly, *geophysiology*, including Gaia theory, has reworked the biosphere into the most ancient and powerful of all living forms—something so much greater than the human that it can evoke a religious response.



THE WAY OF SCIENCE

Four sub-disciplines within the field of biology are thus ripe for extension into the realm of meaning in ways that can green our sense of space and time. We are privileged, through science, to know and witness the immense and fecund journey of life on Earth. Time thus becomes history, and history sacred story. We are privileged, through science, to augment folk wisdom of ecosystems and to begin to learn the physiology of the whole Earth, Gaia. Space thus becomes a cherished place: our bioregional and planetary home.

If a greening of perspective takes place at a very deep level within us, if we have "got religion," so to speak, then a whole new pathway opens for our environmental activism. However we may wish to marshal support for wild life and wild lands by speaking the language of human benefits and species rights, we can conclude our pleas with the simple refrain, "Because it is my religion." We can let our legislators know this. We can let our public lands administrators know this. We can let our neighbors know this. We can let one another know this.

We can thus begin to speak of the evolutionary value of lineages as an end in itself, because the evolutionary epic is our creation story. We can be-

gin to speak of the diversity value of species as an end in itself, because for us biodiversity is today's glorious manifestation of our sacred story and the only way to ensure that the story will continue. We can begin to speak of the bioregional value of intact ecosystems as an end in itself, because our watersheds are and must therefore be kept whole. We can begin to speak of the gaian value of vast landscapes—of a coastal rim of life-supporting wetlands, of climate controlling forests—because for us Earth is our cherished home and we its indigenous peoples.

We can begin to work together to create the language through which these deepest convictions can be expressed, so that we too can be counted among the religious, so that our views too will be accorded respect and deference. Diane Ackerman—a poet, essayist, and naturalist who views herself as "deeply religious"—has invented a lovely term for her self-description. "I am an earth ecstatic," she witnesses in her latest literary book on endangered species, *The Rarest of the Rare*.

Earth ecstatic. I am becoming rather fond of that term. I think I will join you, Diane! And on issues concerning the Earth Community, we can stand together with people of all faiths whose religious convictions support a vision of humans in healthy and respectful relationship with the natural world. Count me, then, as part of the

Earth ecstatic denomination of what I hope will become the fastest-growing religious movement in America: the religious green. After all the deft (and essential) talk about ecosystem services and the medicine-chest value of species has played itself out, we can rise and witness with these simple words: Because it is my religion. I

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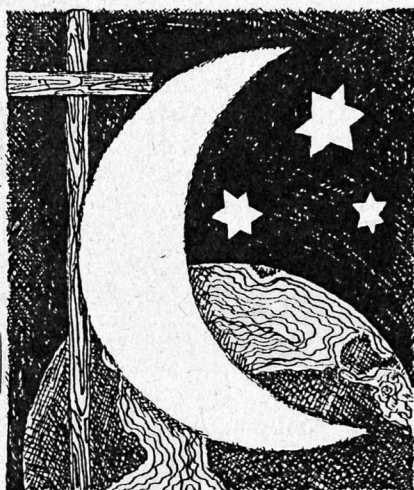
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Religion and the Conservation of Biodiversity

Traditional Faiths Provide a Way

by Max Oelschlaeger



CONSERVATIONISTS TEND TO BLAME Judeo-Christian religions for the degradation of habitat and the extinction of species. Count me among the majority who believed this. Things are beginning to change, though. The charge that Jews and Christians singlehandedly caused the environmental crisis has been discredited. More important, there is a new responsiveness across almost every American faith tradition to ecological issues.

Contrary to the perception that religion is the cause of environmental crisis, I believe that a caring concern for the earth by people of faith is not only possible, but essential to the resolution of environmental crisis generally, and to helping advance The Wildlands Project specifically.

Consider this argument. There are no lasting and comprehensive solutions for the systemic causes of

ecocrisis, at least not in democratic society, apart from religion and religious narrative. The simple truth is that religion has irreplaceable functions in the larger society. One role is helping people begin to change the daily practices that have adverse ecological effects. A second purpose is to change the lay of the political landscape, primarily through the election of leaders who are *genuinely* rather than rhetorically responsive to ecocrisis. And a third is to motivate people to become actively engaged in the conservation of biodiversity.

Consider also the four institutions that shape social and natural ecology: the state, the corporation, the university, and the church. Clearly, the state is necessarily involved in any solution to ecocrisis. God bless the Endangered Species Act. Yet the state is incapable of dealing with ecocrisis at its roots, since government deals more with symptoms than causes. To look to the corporation to initiate response to ecocrisis, even under the banner of corporate social responsibility, is naive. And faith in our universities to promote solutions for environmental crisis is difficult to maintain. The research university less and less leads society in new directions and more and more reflects society's established characteristics.

Which leaves us with a single alternative: the church. Not that the church is perfect; no institution is. But religion can help Americans begin to appreciate the earth as something more than a resource to fuel manufacture and as an environmental sink for pollution. Plainly stated, the church can be the organizational vehicle for cultural innovation. Religious discourse offers the most accessible alternative to the language of utilitarian individualism, which holds the state, the corporation, and the university in its sway. True citizenship ultimately involves individuals bound together in collective purpose, something beyond economic greed where I get mine and you get yours and we are all better off for it. The church is a necessary part of the politics of community, for it can sustain a dialogue that could avert an anthropogenic mass extinction, and move people to act locally, as well.

Of course, Americans have many different faiths. How then can we conceivably come together in setting an agenda for the creation of an ecologically sustainable society? Doesn't the sheer diversity of belief, the more than 1200 identifiable denominations and more than 400,000 congregations in the USA, make such an idea ridiculous? Obviously, this is a complicated issue (and I've written a 300 page book on it, *Caring for Creation*, 1994, Yale University Press); but the answer, in short compass, is that virtually without exception every single faith tradition in North America, from the conservative right to the prophetic left, either can find or has found its way to an ecological ethic, if not an ecotheology. Thus, in a wide variety of ways that are consistent with theological diversity, Americans can achieve solidarity on a public agenda, even if we do not agree on every single environmental issue.

What Judeo-Christianity offers, above all else, is a story of meaningful purpose and goodness that remains free of the grasp of state capitalism and utilitarian individualism. The potency of such a story to change things, amid the buzzing confusion of secular society, is too easily underestimated.

Recent events help illustrate the points above. In late 1995 the Christian Environmental Council (CEC) passed a resolution at their national conference urging Congress to resist any action that would weaken, hamper, reduce or end the protection, recovery and preservation of God's creatures, including their habitats. Citing biblical teachings from Genesis on the human responsibility to serve and to keep God's creation, and from the Psalms and Matthew on God's concern for all creatures, the resolution also appealed to Congress to support the Endangered Species Act.

In early 1996, the Evangelical Environmental Network (EEN), led by Cal DeWitt (an ecologist at the University of Wisconsin), carried the message to the offices of the United States Congress. The message delivered can be interpreted in various ways, but the outcome is unequivocal in meaning. The Republican members of the 104th Congress were elected with the overwhelming support of the religious right. Shortly after the initiatives of the CEC and EEN, Newt Gingrich

confessed that the anti-environmental initiatives of the 104th Congress were dramatically out of step with what Americans wanted, stating that the environmental movement in its values was basically right and in goals was exactly right (Knight-Ridder 25 April 1996). This position is totally at odds with the one staked out when Republicans took power in 1994, vowing then to repeal the Clean Air, Clean Water, and the Endangered Species Acts.

Not to be outdone, the Clinton administration has jumped on the religious bandwagon. Secretary of Interior Babbitt delivered a speech entitled *Leading America Closer to the Promise of God's Covenant* in April before the Associated Church Press 1996 Convention (Mesa, Arizona). Babbitt vigorously attacked those members of the 104th Congress who were "armed with an agenda that was both hostile to God's creation and determined to dismantle the very legal tools—especially the Endangered Species Act—that allow us to restore it" (from the text of Babbitt's speech).

What is the upshot for those involved in The Wildlands Project? Long a "card carrying" deep ecologist, with religious sensibilities more akin to John Muir's pantheism than Calvin's theism, I'm finding new allies in the religious community in my conservation work. The time is ripe for wildlands proponents to engage religious leaders and the religiously faithful in dialogue. I believe that we should avoid the blatant "politicking" that is characteristic of our elected leaders in Washington, DC. Better to establish rapport with the religiously faithful and bring them into The Wildlands Project to work toward restoring and protecting the creation. ■

Max Oelschlaeger is a philosophy professor at the University of North Texas (Dept. of Philosophy & Religion Studies, POB 13526, Denton, TX 76203-6526). His books include The Idea of Wilderness (1991, Yale University Press), The Wilderness Condition (1992, Island Press), and Caring for Creation.

The Evangelical Environmental Network may be contacted at 10 E. Lancaster Ave, Wynnewood, PA 19096.

I believe that a caring concern for the earth by people of faith is not only possible, but essential to the resolution of environmental crisis...

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Your Fall 1995 "Around The Campfire" deeply saddened me. It appears that Dave hasn't been paying very close attention to the distribution of wealth in America. He states that if we wish to see protected wilderness areas remain protected, "we may need to pay for it." As if we don't pay already. Over half our income taxes continue to support the Pentagon—no shortage of cash there. The federal budget deficit could be totally wiped out if we merely returned corporate tax rates and military spending to 1977 levels. In 1995, corporate welfare totaled \$167.2 billion! And Dave claims that we live in "a new world of limits." Dave: America is as wealthy as ever, but the corporations have most of it locked up. There's plenty of cash to not only keep protected lands wild but to institute The Wildlands Project's wildest vision! All that's required is that we build a strong and radical national citizens' movement which demands that corporations and the wealthy pay their fair share, and corporations that balk have their operating charters revoked. Dave's love of user pay is dangerous. Does he honestly favor the privatization of our libraries? I'm no whining liberal Dave—I'm simply a radical conservationist who's been paying close enough attention to have noticed where all the money goes! For information on the rapidly growing corporate charter revocation campaign, send \$4 to Charter Ink., POB 806, Cambridge, MA 02140. ■
—Paul Cienfuegos, POB 982, Bellingham, WA 98227

Your editorial in the fall 1995 *Wild Earth* compels me to respond to several points. I hope you are able to share these comments with others.

As a long-time habitat preservation activist and National Parks activist, I have always been disturbed by the trend of some wilderness lovers to abandon National Parks. By doing so, it leaves a visitorship interested only in (and therefore inadvertently promoting) the very thing to which we object... increased development resulting in habitat loss.

In general, I heartily agree with the concept of "user pays." Like many others, I have always "put my money, and my *time*, where my mouth is" on these issues.

I have purchased a Golden Eagle pass every year, and would happily pay \$100 annually. I also do volunteer work in NPs and contribute to various NP advocacy groups. I have always felt there should be a nominal fee to cover Wilderness permits. The fee should at least cover the paperwork, but not be so high that people would go into Wilderness without the required permit as this causes other problems at the cost to nature and Wilderness rangers.

All of this said, I want to suggest that you carefully consider issues associated with raising fees for National Parks, separate from the Golden Eagle, -Access and -Age program. I agree that at least a small increase in the daily fee is appropriate, but only if the fees go to the Parks and not to the gen-

eral treasury. I agree the Golden Age discount is unwarranted and should be eliminated. As I believe you agree by its non-mention, leave the Golden Access program as-is. Please note my words of caution are absolutely not related to "liberal values" or being "PC" (I don't qualify for either).

Rather, we must understand that the entrance fees and costs associated with visiting National Parks do in some part determine who visits those parks. I personally know naturalists, environmental professionals, teachers and other concerned people who cannot, on their meager salaries, justify visiting NPs with high entrance fees and \$14/night camping fees, when they can stay on other public lands for free. Yet, these people (who would fall under your label of "voluntary poor") are among the very "type" we should want to have visiting NPs because of their background and concern. I am in a position to witness first hand the problems in National Parks caused by people who want more and more conveniences and ensured "safety," "fine dining" experiences, wine tasting events, cooking classes, and so forth...and who are willing to spend any amount necessary to do this within the boundaries of certain NPs.

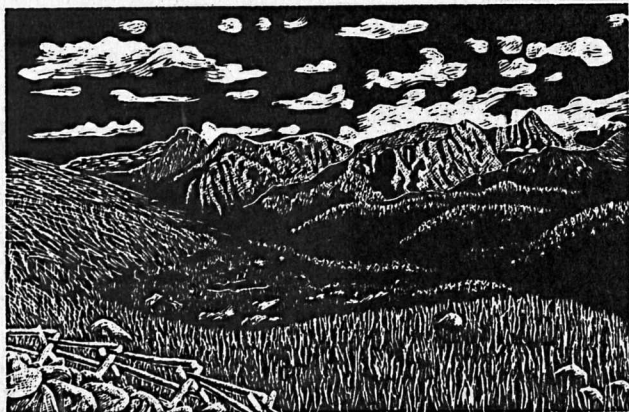
These resort style activities bring people into the NPs who would not otherwise visit, and put undue pressure on both infrastructure and natural values. So again, please give this issue the careful attention it deserves

Erratum

Thoughtful readers may have wondered at Bill McKibben's discussion of nature writers working "more through accretion than dialect" in his summer 1996 Viewpoint, "Text, Civility, Conservation, and Community." An unfortunate typing error altered his passage, which should have read:

Inside this world, however, even people whose temperaments and emphases are poles apart work more through accretion than dialectic, examining texts for what they can agree with, not what they can argue over.

WE regrets the error.



and not over-simplify it with divisiveness (e.g., *liberals vs. libertarians*).

I also see the destruction caused by the masses of people who visit NPs without any knowledge of or interest in nature from other than a recreation viewpoint. Regardless of economic class, these are the people who litter, feed wildlife, trample vegetation, erode riparian habitat and generally degrade the Parks. Much of this destruction, with the exception of littering, is done out of ignorance. This topic warrants its own separate discussion, but let me try to summarize: *Budget cuts that reduce naturalist (interpretive) programs in NPs result in beautiful resorts with great views.* Period. Without naturalist programs, the only "attractions" are the private concessions which generally do not provide interpretive programs, but cater to resort seekers. Without naturalist programs, children and adults have few ways to learn about the areas they are visiting. When I was a child, my parents relied heavily on "campfire programs" and "ranger walks" for part of our education about the natural values of the areas we were visiting. Children love these programs, and take their en-

thusiasm and knowledge back to their parents...and more importantly, to other children. So when you hear that "the crown jewel parks will not be closed," check further as to how much the interpretive budgets for those parks have been reduced. The effect is basically the same, in terms of destruction of wildlands. In fact, I'd go as far as to say I would rather have National Park gates locked (*not sold*), than leave them open without Interpretation.

Like you, I am in support of day use reservations for the NPs suffering from hordes of day-use visitors who drive their private vehicles instead of walking or using public transportation, and who only spend a few hours in the Park; again, without giving anything back except their litter.

I agree with a national sales tax on backpacking and river running equipment; also, on car camping and RV equipment, birding supplies, etc. I also believe all of these companies and outfitters are morally obligated to include information with their products about practical protection ethics & methods, since they are pushing products that take people into Na-

tional Parks and wildlands. I also heartily agree with not compensating people who build in the path of natural events.

However, I balked at your analogy of motorcycle helmets and fail to see the connection with wilderness preservation. Laws that *keep me safe from myself* (as opposed to safe from others) make me extremely nervous. This society is very hypocritical about such topics. If we were consistent on the "not wanting to pay for others' foolishness" theory, we would make it illegal to drive, smoke, drink alcohol, get fat, fall in love and a plethora of other activities that are simply part of being a society; and which should not be illegal. I'm a woman who often hikes solo, which many people consider "foolish" and "dangerous" (my view of "dangerous" is to not go hiking). I worry that people will get carried away with this concept and make it illegal for women, or perhaps anyone, to hike alone (don't laugh...it's come up).

From a purely environmentalist, resource preservation viewpoint, I vehemently disagree with your concept of "discounts for the truly poor, but not for the 'voluntary poor.'" Again, a topic worthy of full discussion in another forum. But for now, I'll say this: America should honor the group of Americans who forego large salaries to do work that is critically important (teachers, naturalists, activists) but for which the pay is dismal or even non-existent. People who choose to live simply, while doing this critical work, should not be

discriminated against. Your viewpoint, if played out, says that people must buy into the corporate trap of jobs that destroy the environment as well as the human spirit, for salaries that cover an obscenely increasing cost of living.

I advocate scholarships and sponsorships, not hand-outs, for people without financial resources (regardless of the reason) *conditional* on making a contribution. That is, an approach that values time given as much as money given. Because of budget cuts, the National Park Service will increasingly rely on volunteers to do critical work such as interpretation, exotic plant eradication, native plant revegetation, fee collection and so forth.

Lastly, there are many organizations working with and on behalf of National Parks, including the individual Park advocacy groups (usually a natural history association), small grassroots groups, and factions within the larger environmental organizations. They include many hard working activists who have been grappling with complicated National Parks issues for years, and who "know the ropes." I hope you will expand your communication with some of them as you continue to develop and share your ideas for National Parks.

Remember that when we help a National Park, we are helping the entire bioregion. Thank you. |

—Georgia Stigall, a.k.a. Native Species for Habitat, POB 2152, Sunnyvale, CA 94087-0152

A REALITY CHECK FOR TWP

Trombulak, Noss, and Stritholt (*WE*, winter 1995/96) suggest that those of us who find naiveté in the realpolitik of The Wildlands Project should look to the tearing down of the Berlin Wall or the peaceful (thus far) transition to democracy in South Africa for examples of how unexpected change is when it comes. For me these show exactly the opposite of what the authors intend. In both cases there were massive and compelling reasons for change—reasons that impacted on the lives of all the people concerned in direct and tangible ways. Lots of people—with lots to win or lose.

Can we make the case that the general vision and the specifics of The Wildlands Project are as directly important to a sufficient portion of this country's populace? I don't think so. Our population is overwhelmingly urban and happily consumerist. Whether there is a place for grizzlies and Florida panthers (and for the outdoor recreationists whose visions predominate in TWP) is, for most people, an abstract question. What direct impact would the implementation of The Wildlands Project have for these people? Almost none. Trombulak, Noss, and Stritholt say they "will go so far as to say there is no such thing as political reality." I'd respond by recalling Sam Rayburn's comment to Lyndon Johnson about the whiz kid advisers he'd just inherited from JFK: "None of them ever had to run for dogcatcher."

Another famous House Speaker said that "all politics is local." For The Wildlands Project to achieve even a measure of political possibility will require its acceptance and integration in the context of local struggles. We can never win on a larger stage what we can't win in our own homes and neighborhoods. Grand schemes—whether damming watersheds, marching into Russia, or creating thousand-year-Reichs—usually have unfortunate side effects (along with a tendency to crash and burn). To mislead a younger generation of environmental activists with the notion that they can so easily change the direction of this society is to almost insure their rapid disillusionment when the going gets tough—and the fight for biodiversity is going to get a whole lot tougher before it gets any easier. ■

—Jim Walters, 2511 Hwy 1 SW, Iowa City, IA 52240

AUTHORS' REJOINER

Jim Walters raises important points about the strategies that The Wildlands Project must use if it is to be successful. It should be obvious to anyone who has been involved in any conservation movement that our ultimate success will hinge on being repeatedly and consistently successful at the local and regional levels, and linking those successes into a continental-scale, integrated strategy. Like we said in our article, "such a conservation strategy will be most successfully implemented if done over a pe-

riod of time as a series of coordinated projects."

He is also correct that conservation will only occur if the majority of people believe it is necessary. Education is key. However, the level of interest among urban consumers for environmental protection is greater than perhaps Walters suggests. Support for the Endangered Species Act among US citizens is extremely high, as is support for strengthening the Clean Air Act, Clean Water Act, and bans against some of the most egregious land-use practices, such as clearcutting. In New England, support for increased efforts at conservation is greater than 70%. We agree that the Berlin Wall fell because a majority of people felt that they wanted the Wall to come down, and were tired of having an elite minority impose their will on others through use of force, both militarily and economically. We disagree that this is fundamentally different from the situation with environmental protection in the US today. The vast majority of the public is in favor of environmental protection and has no problem with increasing the amount of public land devoted to conservation as long as it contributes to an increase in the quality of life for humans. Study after study has shown a close and positive link between environmental and economic health. What is threatened are particular economic sectors and groups that advocate unrestrained population growth.

Our point that "there is no such thing as political reality" was made not to deny

that political conditions, opinions, and trends affect the course of events, but rather to contrast what we mean when we say something is opposed by "political reality" or by "scientific reality." Quoting Rayburn and O'Neill about the importance of politics is silly. They built their entire careers around smooth-talking, arguing, cajoling, persuading, and brow-beating their colleagues into seeing things their way. For them, political "reality" was whatever they wanted or whatever the dominant mood of the Congress was at the time. But even these master manipulators would never have dared dream of putting it up to a vote whether to repeal the laws of gravity, thermodynamics, or conservation of matter. These realities are not matters of opinion or political philosophy, and to use the word "reality" to describe the latter gives a false impression. Maybe it will disillusion some of the current generation of environmental activists to suggest that the direction of society can be easily changed (though we don't believe we said that); but how much worse is it to tell them that although we know what the problems are we dare not try to solve them because "powerful forces" and "political reality" will prevent it. Maybe those who are expecting the quick victory will drop by the wayside, but others, despite knowing the odds are against them, will be in it for the long haul because they know what is at stake. ■

—Steve Trombulak, Reed Noss, Jim Stritholt

Big Tree Updates

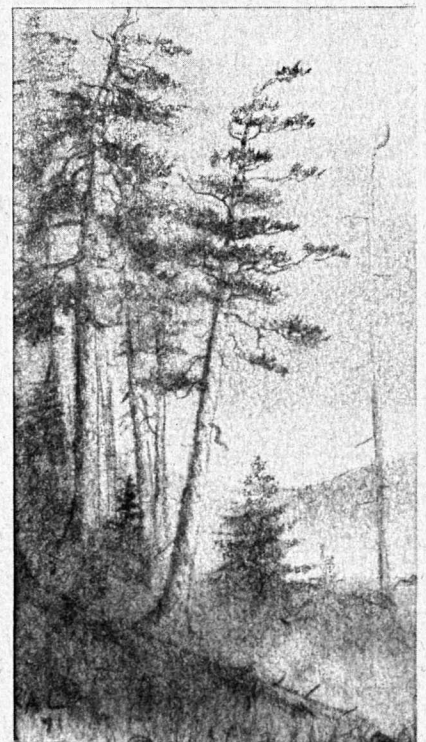
by Robert Leverett

Editors note: With this latest big tree update, Wild Earth is pleased to make regular and official its Eastern old-growth reports. Thanks largely to the energetic proselytizing and diligent research of Wild Earth advisor Robert Leverett and Wild Earth associate editor Mary Byrd Davis, old-growth forests in the Eastern US are now the beneficiaries of a conservation campaign. Canadians, too, have been documenting and defending their remnants of Eastern old growth. (Contact Canadian Parks and Wilderness Society, 401 Richmond St. West, Suite 380, Toronto, Ontario, Canada M5V 3A8; Ancient Forest Exploration and Research, RR #4, Powassan, Ontario, Canada P0H1Z0; Margaree Environmental Association, Box 55, Mabou, Nova Scotia, Canada B0E 1X0). With the publication of Old Growth in the East: A Survey (by Mary Byrd Davis, foreword by Robert T. Leverett; Wild Earth, 1993), Eastern Old-Growth Forests: Prospects for Rediscovery and Recovery (edited by Mary Byrd Davis, introduction by Robert T. Leverett; Island Press, 1995), as well as the creation of an Eastern Old-Growth Clearinghouse (c/o Mary Byrd Davis, POB 131, Georgetown, KY 40324) and the increase of Eastern old-growth coverage in Wild Earth, active collaboration should grow between forest friends throughout eastern North America, rallying to save what's left of the big trees and to make room for more.—JD

LIKE BIG TREES. I enjoy hunting them for sport, but I have a more important mission: to understand the physical growth and age limits of Eastern species over their ranges. I share this interest with my friend Will Blozan. In addition to our field time, Will and I research historical records. Here we encounter problems. Sources that should be reliable are not. The so-called National Big Tree Register maintained by American Forests is an example. We have become wary of other people's tree measurements, at least so far as heights and spreads are concerned. So we must develop our own database. Now for some numbers added to that database, first to the Great Smoky Mountains, Mecca for all Eastern old-growth forests.

Great Smoky Mountain Big Trees

On 2 May 1996 the Western North Carolina Alliance honored Will Blozan at the site of a great Eastern White Pine in the Cataloochee District of the Smokies. Will, myself, and others had confirmed the tree's dimensions in August of 1995. With a modest girth of 11.7 feet, the great pine proved to be an amazing 207 feet in height. Its age is probably over 300 years. Will cored a nearby tree which proved to be over 300. We believed the great pine to be the tallest confirmed tree in the eastern United States. On our return to Cataloochee this past April, we found that Hurricane Opal and heavy spring snows had dealt our champion a harsh blow. Thirty-six feet had been sheered off the tree's crown. The pine is now 171 feet tall. A nearby White Pine is now the reigning champion of "accurately confirmed heights" in the Park. The sister tree measures 175 feet high. Based on what Will Blozan has been finding, it is a matter of time before he finds another White Pine or Tuliptree that exceeds this figure. However, the going is not always easy. Will has been unable to locate tall Tuliptrees measured by Robert Van Pelt, an expert big tree hunter from Washington, who measured heights up to 185 feet. We have no reason to doubt Van Pelt's measurements. He is an expert and definitely knows what he is doing. We just haven't been able to locate the trees he measured.



So, with the truncation of the champion White Pine, where is the tallest tree in the East? We have no way of knowing the answer with certainty, but the tallest "confirmed" pine in the East is probably a great tree in the Cullasaja Gorge of Nantahala National Forest of western North Carolina. Its height, as accurately measured by Will Blozan and Michael Davie, employees of the Great Smoky Mountains National Park, is 195.8 feet. A tree close by is 183. American Forests lists a White Pine in Michigan as 202 feet tall. I doubt the measurement, due to dubious numbers for other Michigan trees.

The problem with height measurements for tall White Pines is that most of the old-growth White Pines exhibit some lean. Many lean dramatically from weathering past storms and from being continually flexed by wind. The high points of the crowns of these pines are seldom directly over their bases, yet simple methods based on the principle of similar triangles to compute tree heights build in this assumption. One such method is prescribed by American Forests. Calculations that treat the crown as being squarely over the base can be in error by tens of feet on a tall tree. Both Will and I can cite examples of absurd heights being quoted for trees, the errors traceable to the unfulfilled assumption.

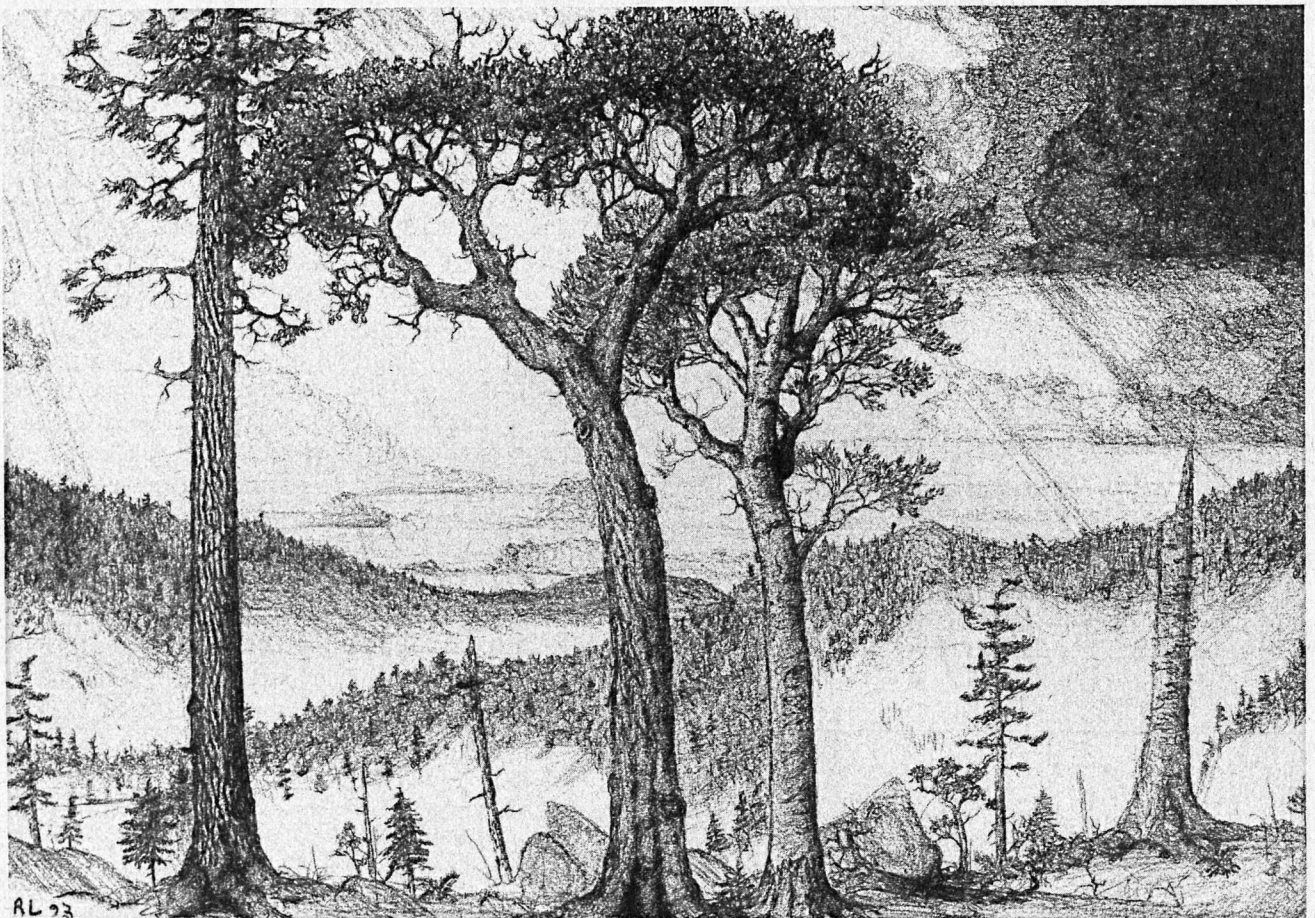
It has long been recognized that many tree species reach record or near record proportions in the Smoky Mountains. The Smokies are the place to go to see the physical culmination of *Tsuga canadensis*, the Eastern Hemlock. Tsugas

have been measured to just under 20 feet in circumference and heights have now been confirmed to over 160 feet. These numbers push the all time recorded limits for the species. Will Blozan has confirmed many hemlocks in the 140 to 155 foot height class. The ecological value of all this is that the physical limits of the hemlock appear to be achieved in the optimum growing conditions of the Great Smoky Mountains. As of now, I would state the size limits as 160-165 feet in height and 18-20 feet in girth. The age limit of the species appears to be between 500 and 600 years, although one tree in Pennsylvania is listed as having reached 988 years. Forest ecologists like Charles Cogbill are skeptical of this last figure. Interestingly, the girths of the extremely tall hemlocks we've been measuring vary from 8 to 18 feet. That's quite a range. Girth and height are not highly correlated in mature trees; nor are size and age.

It is fascinating that we can still see trees of an Eastern species that may equal the most impressive ever recorded. The sad part of it all is that these great trees may not be around many more years. In all probability, the hemlock woolly adelgid will kill them. Thus, the hemlocks of Great Smoky Mountains National Park are national treasures that need to be documented much more thoroughly while they still live. I hope we can launch a campaign, perhaps through *Wild Earth*, to raise funds to help in the documentation of our old-growth hemlock stands throughout the East.

I will close the update on the Smoky Mountain big trees with a sample of recent Will Blozan discoveries.

| Species | Girth | Height | Comments |
|-------------------|---------|---------|--|
| American Sycamore | 9' 6" | 151.4' | A second-growth sycamore (wow!) |
| Eastern Hemlock | 13' 9" | 162.2' | Third tallest hemlock known; in the Cataloochee District |
| Eastern Hemlock | 11'+ | 160' | Confirmation with laser by Bob Leverett; another Cataloochee tree |
| Eastern Hemlock | | 156' | Forge Creek Drainage near Cades Cove |
| Eastern Hemlock | 11' 9" | 151' | Forge Creek |
| Eastern Hemlock | 14' 11" | 151' | Largest in overall volume according to Will; almost no taper for 1st 100 feet; tree is on Forge Creek. |
| Eastern Hemlock | 15' 7" | 125' | Single trunked hemlocks over 15 feet in girth are scattered throughout the Smokies. |
| Red Spruce | 7' 5" | 147' | Tallest accurately measured spruce. There are assuredly taller ones. |
| Red Spruce | 9' 6" | 144.7' | The tallest Red Spruce are in mixed hemlock-spruce stands. |
| Red Spruce | 10' 2" | 139' 4" | |
| Black Locust | 13' 3" | 129.9' | Largest measured Black Locust in Park |
| Tuliptree | 11.7' | 173.1' | Tallest confirmed Tuliptree in Park |
| Tuliptree | 14.4' | 166' | Same area as previous tree |
| Tuliptree | 24' 2" | 150' | Largest sound Tuliptree found in Park |
| Serviceberry | 6' 3" | 102' | Yes, it's true! |
| Yellow Buckeye | 13' 1" | 137' | North Carolina champion |
| White Oak | 10' 8" | 147' 6" | Being pushed to grow tall by competition with nearby Tuliptrees |
| Red Oak | 17' 6" | 144.2' | Crown spread of over 107 feet |
| White Pine | 11' 3" | 171.8' | Meigs Creek - one of the great ones. |



In addition to the aforementioned sample of trees, Will made some extraordinary Tuliptree discoveries last winter. He located several Tuliptrees in the 18-21' circumference range. Will's 173 foot Tuliptree listed above surpasses the one he and I measured two years before, which is a hair under 170 feet. Tuliptrees have weak crowns and fight a constant battle with Nature. Many Tuliptrees in the Smoky Mountains likely make it into the 160-180 foot range, only to be pruned back into the 140-160 foot range. Whether or not Tuliptrees reach 200 feet in the Smokies remains to be determined. It is, I'm convinced, genetically possible for the Tuliptree to reach such heights. The day we find one, it will be celebration and champagne aplenty.

Linville Gorge Old Growth

On April 28, Will Blozan, Mike Perlman, Rob Messick, Norma Ivy, and I spent the day thrashing around in rhododendron on the sides of western North Carolina's Linville Gorge. Some of the pines jut through the "rhodo jungle" and soar to remarkable heights. The pines predate the rhododendron growth. A great tree below an intimidating rock cliff reaches a remarkable 168 feet in height and 11' 7" in girth. Its huge bark plates reveal an age that likely exceeds 300 years. A scattering of pines in this class can likely be found elsewhere in the gorge, but the roughness of the terrain makes confirmation a very slow process. A hemlock in the vicinity of the great pine, just beneath the intimidating cliff, makes 140 feet. I now believe this to be near the limit for the Linville hemlocks.

Linville Gorge is a veritable botanical paradise, but our knowledge of its ecology is limited. Research performed in pursuit of masters theses and doctoral dissertations may be floating around; any leads from readers would be appreciated. Scientists possess limited understanding of the old growth on the sides of the gorge which will be greatly affected by the adelgid. We need help in documenting the Linville Gorge old growth.

Cook Forest Old Growth

Pennsylvania's Cook Forest State Park includes a virgin remnant straight out of the pages of history. I have seen 1500 acres quoted as the acreage of forest in near-virgin condition within the park boundary. However, based on Anthony Cook's knowledge, the actual acreage may be closer to 2500. This has to be confirmed.

Anthony Cook, Mike Perlman and I did confirm that Cook Forest (not Heart's Content) is home to the tallest living things in Pennsylvania. In a visit to Cook Forest in May and using laser technology, I confirmed a big White Pine to 171.1 feet in height. The tree's girth is approximately 9.5 feet. A pine in a different area of Cook reaches 168.9 feet. A half dozen other pines in what is called the cathedral area were confirmed to be between 160 and 165 feet. The Forest Service (or somebody) had previously listed a 160 foot White Pine in Heart's Content as Pennsylvania's tallest pine. The listing shows up on some area maps that include both the Allegheny National Forest and Cook Forest State Park.

Fourth Ancient Eastern Forest Conference

The fourth Eastern old growth conference will be held at Clarion University, Clarion, PA, 5-8 June 1997. Field trips to Cook Forest, Tionesta, and elsewhere will allow many to see prime old-growth forest. Like previous events, the conference incorporates three separate agendas: science, management & restoration, and values. Professor Don Leopold of Syracuse, editor of *Natural Areas Journal*, has assumed responsibility for developing the scientific agenda. He will be assisted by Lee Frelich from the University of Minnesota and Chuck Williams of Clarion University. Stand-bys—including Harvard University-Harvard Forest, Tree-Ring Laboratory-University of Arkansas, Environmental Studies Program-University of North Carolina, Western North Carolina Alliance, and *Wild Earth*—will assume their usual roles. Mainstay lecturers, including Dr. Ed Cook of Lamont Doherty Earth Observatory-Columbia University, Dr. Charles Cogbill, and Dr. Lee Frelich will be joined by Dr. Marc Abrams of Penn State, Dr. Dan Pittillo of Western Carolina University, and others. —Robert Leverett

Many Cook Forest pines surpass 150 feet. The big trees commonly reach 9 to 12 feet in girth. Ages are around 350 years. The old pines are battling it out with the elements. Many have been pruned back from greater heights. I suspect many have surpassed 170 feet at one time or another. The largest single tree I measured in Cook Forest based on American Forest's big tree formula yielded the following figures: girth 12' 3", height 153', average crown spread of 39 feet, for 310 points. The extremely tall pine earns 295 points on the formula.

I measured an Eastern Hemlock in Cook Forest to 142 feet in height. Two other Cook hemlocks were slightly over 136 feet in height. I am now confident that many Cook hemlocks grow to heights of 130-135 feet. Girths of bigger hemlocks are 9 to 13 feet. One tree reaches 16.4 feet. It is the state champion.

Berkshire Confirmations and a New Hampshire Record

Armed with laser technology, I remeasured the largest in-forest White Ash that I've found in New England. The mid-slope, as opposed to up-slope, girth is 14 feet. The height is 119 feet and the average crown spread is about 60 feet. I had previously calculated the height at 117.5 feet, using more conventional crown triangulation techniques. I remeasured a great White Pine on Dunbar Brook in the Berkshires with the new technology. At 152.6 feet in height, the measurement is virtually identical to that obtained with a transit. The pine has a large crown, but exposure to wind will likely prevent it from gaining much more height. We monitor this tree yearly to observe crown responses to wind and ice damage.

Chris Kane is keeper of the big tree records for New Hampshire. He reports a White Pine in the Bradford Pine stand that reaches 152 feet in height. The pine is the tallest measured in the state—at least so far as we know. I will be visiting Chris to confirm the Bradford Pine and other New Hampshire trees later this year.

Documenting Superlative Old Growth Sites Through New Eyes.

Our old-growth stands will gradually change as Nature inevitably takes its course; and future forests may be very different from their predecessors. Many, if not most, of our best sites are unimaginatively and incompletely, if not inaccurately, described. The on-site managers of these places often possess neither the experience and sensitivities nor the resources to do the job. Take Joyce Kilmer Memorial Forest, managed by the Forest Service. The FS descriptions are worthless. The Forest Service's failing is typical. I often read descriptions of prominent woodlands that are so generic that very different forests are descriptively indistinguishable. Individual forest personalities fail to emerge. Forest moods are obscured. Superlatives are missed or ignored. Our old-growth stands are in need of new descriptions, developed through the eyes of people from different backgrounds and compiled in a work such as the recent Island Press book on Eastern old growth.

Science is not the entire answer to better descriptions. Purely scientific descriptions of the old-growth sites may be accurate, but have limited objectives. Scientific descriptions are not intended to be artistic or inspirational.

We do want our old-growth stands to be described in terms of species composition and distribution, structural and age characteristics, disturbance history, successional patterns, geology and soils, animal populations, endangered species, composite communities, current environmental threats, and probable future. Science must do this. However, other ways of seeing and describing old-growth forests are equally critical to our appreciation of them. The forests must be experienced and described on their own terms. To walk among the pines, hemlocks, and Tulip Poplars of Cataloochee, gazing into crowns so lofty that physical features blur; to stand reverently in shafts of light piercing the spruce forests of Mt. Leconte; to gaze at distant ridges unblemished by human intervention; to experience the forest in minute detail and as an exquisite tapestry of shades and textures is to know the real forest. Hiding the lords of the coves in percentages and distributions submerges their individualities like stalks in a corn field and represents a failing of human imagination. If our old-growth forests are not alive in our imaginations, they will likely not remain alive in the physical world. ■

Robert Leverett (52 Fairfield Ave., Holyoke, MA 01040; (413) 538-8631; dbh.guru@chicopee.com.) is the indefatigable arboreal aficionado of the East. He writes regularly for Wild Earth.



Road RIPort #5

AS STATE and federal agencies continue to manage public lands for consumptive activities such as logging, mining, and livestock grazing, roads continue to roll over the land. Built primarily to provide access to timber sales, mining sites, powerlines, and fences, roads encourage motorized access even in many of our continent's wildest regions.

ROAD-RIP works in conjunction with over 200 groups and individuals nationwide to restore the integrity of North American landscapes, and to remove and prevent wildland roads. The Roads Scholar Project (RSP), an initiative of Predator Project in Bozeman, MT, is one such group making a real difference on the ground. While roads are being inventoried by ROAD-RIP member groups in Oregon, Colorado, Minnesota, Illinois, and North Carolina, the most extensive surveys have been done in the Northern Rockies. There, ROAD-RIP and RSP have collaborated on road-inventory work for several years and have also conducted joint training workshops on road inventory techniques and their applications. The latter half of this article focuses on RSP and the recently compiled results from its 1995 road inventory in the Northern Rockies.

ROAD-RIP continues to gather scientific and legal information to further incorporate road density standards into revised forest plans throughout the country. Since many National Forests do not have reliable standards for protecting road-sensitive species, ROAD-RIP is developing ways to establish road density standards for small mammals, neotropical migrant birds, and aquatic species that are adversely affected by high road densities. ROAD-RIP gathers information, disseminates it to road-fighting activists throughout the country, and serves as a national resource center on road-fighting issues.

Currently, ROAD-RIP is focusing much of its time on roadway restoration; removing and revegetating roads is critical to restoring degraded ecosystems. The Targhee National Forest, for example, has more than 5000 stream crossings in just 44 square miles of riparian area with an average road density of 15 miles per square mile in these areas. Healthy riparian areas provide important habitat and travel corridors for wildlife, and the Targhee example is typical of riparian devastation on our public lands. Well-designed road removal can eliminate the direct effects of roads, restore natural hydrologic processes, and drastically reduce sedimentation to streams. ROAD-RIP plans to incorporate the information from its first restoration workshop—held in June, 1996, on the Flathead National Forest in Montana—into a restoration guide for road-rippers in 1997.

The Roads Scholar Project has taken the methodology outlined by Keith Hammer in *The Road-Ripper's Guide to the National Forests* (available from ROAD-RIP), refined it, and applied it to monitor seventeen wildlife management units across the Northern Rockies. The data collected by RSP has already been used in lawsuits, timber sale comments and appeals, and forest plan revisions. RSP offers an excellent model of how the information and training provided by ROAD-RIP can be used to provide critical data for reducing road densities on public lands.

The results from the 1995 Roads Scholar Project are disheartening—in terms of what they mean for wildlife habitat security in the Northern Rockies—but also illustrate the utility and importance of citizen-based road inventories. For the past two years, Road Scholars have assessed road closure effectiveness and determined open and total road densities *on the ground* in vari-

ous wildlife management units. Road Scholars compare aerial photos with US Forest Service road inventory maps, then head into the field by auto, bicycle, and foot to verify the status of road closure devices and suspected "ghost roads" that appear on the aerial photos but not on agency maps. In 1995, RSP surveyed ten Grizzly Bear management units and one special wildlife management area (established primarily for Elk) in Montana, eastern Washington, Idaho, and northern Wyoming.

The results, perhaps predictably, demonstrate that the Forest Service's road closures are largely ineffective at excluding motorized use on "closed" roadways, and that hundreds of miles of roads remaining on the land fail to appear in Forest Service databases. More precisely, in addition to the 3337.6 miles of road inventoried by the FS, RSP crews found 214.8 miles of unrecorded ghost roads. Compounding the effect of these ghost roads on road-averse wildlife, a meager 33% of all closures on these units proved effective. For the closure devices checked at 404 locations during the field season, 28% did not exclude any motor vehicles whatsoever—due to extremely poor placement, poor construction, vandalism, or absence; 40% of the devices did not exclude ORV use behind the closure point. Out of the 132 closure devices that did exclude motorized use as planned, 85 were locked gates that showed signs of administrative or other types of motorized use beyond the closure. In other words, at best, one-third of the road closure devices are actually closing roads to motorized access, and if gate-accessed use is factored in, only 12% of all closures inventoried by RSP absolutely exclude all motorized use.

The purpose of the Roads Scholar Project is to determine the current status of habitat security in selected roaded

areas of the Northern Rockies. So, while the numbers alone may seem appalling, they become more serious and more relevant when translated to wildlife habitat security. To portray a more realistic picture of roads' effects on wildlife, RSP uses a Geographic Information System (GIS) to create a 0.3 mile buffer along each side of a road. This technique provides a spatial representation of impacts on road-sensitive wildlife species including Grizzly Bear and Elk. Using the GIS buffer program and FS data, habitat security based upon open road miles on the eleven wildlife units comes to an average of 66.8%. According to RSP calculations that include ghost roads and ineffective closures, thus more accurately reflecting the degree of motorized use, habitat security on the eleven units drops to 51.2%. This means only about half the land in these National Forest areas ostensibly managed for road-averse wildlife actually provides secure habitat for such species.

With the results from 1995 finally completed, and more studies already underway for the 1996 season, the challenge remains to press agencies to adopt road inventory and closure programs that comply with legal standards, and perhaps of equal importance, to press agencies to establish forest plan standards that truly provide secure habitat conditions for wildlife. The Forest Service has established itself as the most prolific road-building agency in the world; it is time we hold them to this same standard of supremacy for road monitoring and obliteration. ■

For more information about RSP, contact Predator Project, POB 6733, Bozeman, MT 59771; 406-587-3389; predproj@avicom.net. ROAD-RIP can be reached at: POB 7516, Missoula, MT 59807; 406-543-9551; roadrip@wildrockies.org.

—David Havlick, Predator Project; Bethanie Walder, ROAD-RIP

ELECTION RESULTS IN HOPE FOR MORE BC WILDERNESS

British Columbia is leading Canada in the protection of new wilderness areas. Since 1992, 167 new parks have been created, totaling over 6.5 million acres! These areas include the Stein Valley, Burke Mountain, the Kutzemateen Valley, the Kitlope Valley, and Chilco Lake. The New Democratic Party government which has been responsible for this achievement was just re-elected for a second term of office. Hope now rides high for more new parks in the next few years.

These new parks have been created through the Protected Areas Strategy and land-use planning using interest-based negotiations. Initially, the Commission on Resources and the Environment (CORE) was created to manage these processes at regional levels. Once plans were created for Vancouver Island, the Kootenays and the Cariboo/Chilcotin, planning evolved into sub-regional processes called Land and Resource Management Plans (LRMPs). Two LRMPs have finished; another 12 are in various stages. The first LRMP completed was for the Kamloops area, where over 250,000 acres were protected. In addition to determining protected areas, LRMPs also designate zones for various uses, including recreation and intensive forestry. [See Jim Cooperman's previous BC report in *WE* fall 1993 for more on CORE.]

Other land use related initiatives by the BC government include: a new Forest Practices Code; a program called Forest Renewal BC that puts increased forestry revenues back into the forest for restoration, intensive silviculture, value-added promotion, inventory and research; a timber supply review that is establishing new cut levels; an ecologically based management system for Clayoquot Sound; and a guidebook to maintaining biodiversity. Although these initiatives are an improvement over past practices, major problems continue to keep forest activists busy.

Most of the new parks that have been created protect primarily high elevation areas, while the few remaining pristine lower elevation forests are slated for logging. The government so far remains committed to a 12 percent target for protected areas, but views the 12 percent as a ceiling, not as a minimum. Agreements are nearly ready for new parks in the Northern Rockies and the lower mainland, but once these areas are protected, only .5 percent will remain for the rest of the province.

No protection is available for domestic use watersheds and as a result, massive protests may begin soon in the Kootenays. A cap has been placed on implementing the Forest Practices Code, so that it cannot decrease the cut level by more than 6 percent; and cut levels are only being reduced where forest managers are finding it difficult to fill a five-year plan. Also, clearcutting remains the preferred logging system, with maximum cutblock sizes of 100 acres in the south and 150 acres in the north.

Despite promises of sustainable management, clearcutting is still occurring in the Clayoquot Sound, along with continued erosion problems in these steep hillside forests where rainfall is so heavy. Managers still pay only lip service to biodiversity, since no landscape level planning has been completed.

Major campaigns in the next few years will focus on protecting ancient rainforests on the mainland coast, grasslands which are home to many endangered species, and the few remaining, globally unique antique rainforests in the southern interior. In addition, the government will have to move beyond its 12% percent cap on new parks in order to protect an adequate representation of ecosystems in this richly biodiverse province. ■

What you can do

Letters urging the provincial government to strengthen the Forest Practices Code and complete the BC parks system are needed. Write to Premier Glen Clark, Parliament Buildings, Victoria, B.C. V8V 1X4, Canada.

—Jim Cooperman, Editor of the *BC Environmental Report*, published by the *BC Environmental Network*. Subscriptions are \$20 from BCEN, 1672 E. 10th Ave., Vancouver, BC, V5N 1X5; (604) 879-2279.

BAN CLEARCUTTING IN MAINE REFERENDUM UPDATE

During the week of 10-14 June 1996, all hell broke loose over efforts to defeat the Ban Clearcutting Referendum in Maine. Mainstream environmental groups collaborated with timber industry leaders to strike an "Anti-Referendum Deal" that fails to protect the forest and undercuts participatory democracy. Then in late July the Maine Supreme Court dealt a blow to supporters of the Anti-Referendum Deal, the so-called "Compact for Maine Forests," when it ruled that the legislature cannot pass a "fadaway" bill—a bill that would only go into effect if a referendum is defeated.

This leaves Governor King and supporters of the Anti-Referendum Deal a difficult choice: either call a special session of the legislature and place a competing initiative on the November 5 ballot (the course preferred by the Natural Resources Council of Maine and the Ban Clearcutting Campaign), or abandon the Anti-Referendum Deal (a course favored by much of the timber industry). A third option—calling a special session and passing the Compact directly into law—cannot be taken unless there is an emergency.

If the Compact is placed on the ballot as a competing referendum, Maine voters will face three choices in November: yes to Ban Clearcutting, yes to the Compact, or no to both. If neither alternative wins 50%, a special election will be held on the initiative receiving the greater support.

The Anti-Referendum Compact would not eliminate clearcutting; it does not set science-based standards for sustainable harvesting (although it promises to do so—with industry retaining veto power, of course); it would not stop overcutting; and it would not curtail toxic herbicide spraying. Implementation of the Compact would rely on the good faith and integrity of the timber corporations.

The timber industry will almost certainly break the record for political spending on a referendum issue in Maine, held now by the Maine Yankee proponents in 1987 at \$2.6 million. Already the clearcutters have raised over \$2 million and spent \$1.8 million at a time when campaigns usually have spent no more than a quarter of their total expenditures. Look for the clearcutters to spend \$6-10 million to deceive Maine voters about clearcuts, forest health, and jobs.

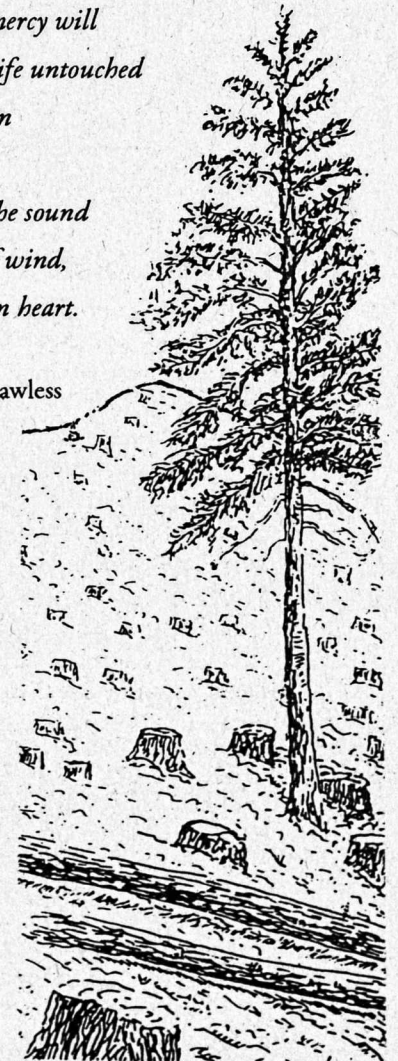
The Ban Clearcutting in Maine Campaign cannot compete with the billion-dollar multinational corporations in spending. However, even a modest media campaign that shows photos and video footage of the catastrophe in the Maine woods should be sufficient to counter the clearcutters' campaign of shame. If you can help the financially strapped Ban Clearcutting Campaign, send a check to Ban Clearcutting, POB 2218, Augusta, ME 04438, or call (207) 623-7140. ■

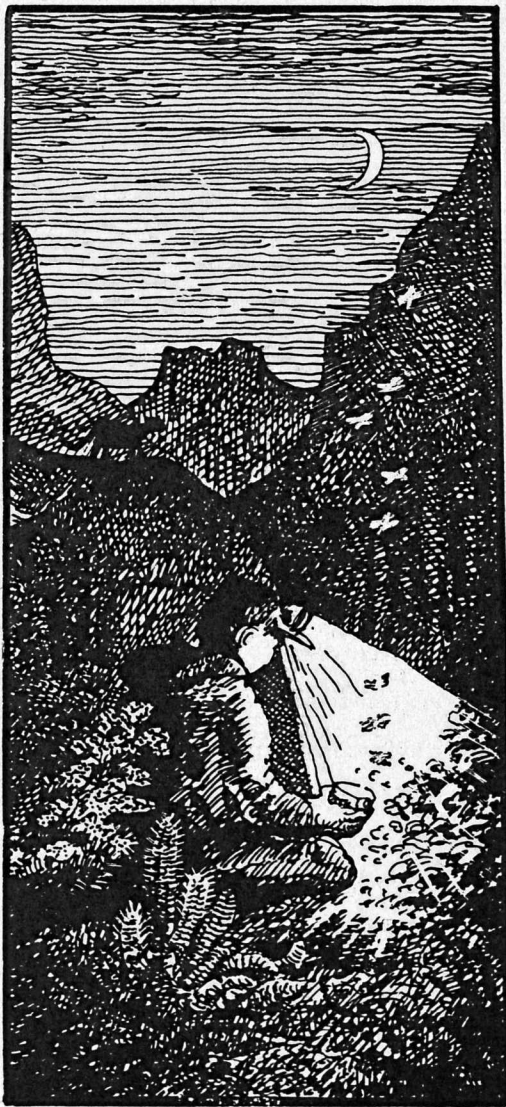
—Jamie Sayen, Northern Appalachian
Restoration Project

For those who would compromise the forest

*the spirits of the lost trees,
the spirits of the plants,
the moss spirits, the rock spirits
consign you to a hell of
no birds, a dry spare hell where
your name will not be known—
you will be known as desolation,
ruiner of planets, the lonely soul who
lives without the friendship of life,
without the solace of species—
the ghosts of those you have
pushed aside will follow you as
you move toward dryness, dust
and empty skies—
surely goodness and mercy will
leave your wretched life untouched
as you dwell forever in
a land without life,
trying to remember the sound
of birds, the sound of wind,
the sound of your own heart.*

—Gary Lawless





The Pollinator and the Predator

by Gary Paul Nabhan

AS I CAMP ALONE in a narrow canyon, waiting for a nocturnal pollinator to visit an endangered wildflower, I recite the names of threatened pollinators from around the world. I recite this litany not simply as a way to stay awake; it is also for the pure pleasure of the images they evoke:

Mahogany Gliders, Honey Possums, Dibblers, Marianas Flying-foxes, Little Flying Cows, Moss-forest Blossom Bats, Crowned Lemurs, Golden-manteled Saddle-backed Tamarins, Little Woodstars, Purple-backed Sunbeams, Turquoise-throated Pufflegs, Marvelous Spatuletails, Yellow-footed Honeyguides, Four-colored Flowerpeckers, Apricot-breasted Sunbirds, Bishop's Oos, Regent Honeyeaters and Duvaucel's Geckos.

As I mull over the music of their names, I shudder with the recognition that those sounds may be all I ever get to know of these critters. Many of these pollinators are known by just a few diligent zoologists, who have had the fleeting luck to be in the right place at the right time; such times are becoming less and less frequent. A number of these threatened pollinators—some 82 mammal species, 103 birds, and one reptile—have dwindled down to fewer than a thousand individuals.

Like the endangered wildflower I am babysitting this evening, little is known of these pollinators' life histories: their rates of reproduction under favorable conditions, their longevity, their responsiveness to rainy years, or to years of drought like this one. They are almost gone, yet all

we can say about their way of life is that they have been attracted to flowers for millennia. We presume that they were effective pollinators of certain loosely-coevolved blossoms, but some of them may merely be casual floral visitors. Or perhaps, all we know is that one individual in one species in their genus was once documented ducking its head into the blooms of a certain flower. What range of flowers it visited before invasive weeds arrived in its home, I don't know, but its beak or nose and its behavior suggest it may be a legitimate pollinator. ("Legitimate" here distinguishes it from an animal that feeds on a plant's nectar or pollen without aiding in cross-pollination of the plant.)

Three nights ago, while suffering insomnia and a fever due either to flu or to biophilia, I stayed up through the twilight hours counting how many of the vertebrate wildlife species in the 1994 *IUCN Red List of Threatened Animals* were likely to be pollinators. The 186 vertebrate species that I tallied are but needles in the haystack compared to total number of pollinators on this planet—some 100,000 invertebrate species are definitely involved in pollinating the 240,000 species of flowering plants that depend upon animal vectors for pollen transfer. We are decades away from knowing with any confidence what percentage of these 100,000 invertebrate pollinators are imperiled. Instead, I had to focus on the 186 imperiled pollinating vertebrates, which are in genera that include 1035 to 1220 species that may serve as pollen vectors. My late night calculation was that 15 to 18% of those potential pollinators are already of conservation concern; that is, they are listed by the World Conservation Union (IUCN) as rare, threatened, endangered, or possible extinct. At least 100 genera of the 165 vertebrate genera of floral visitors now include threatened species.

Tonight, I am not laboring over the numbers in superficial global surveys of threatened species; instead, I am camping in their midst within a National Wildlife Refuge perched on the line between the United States and Mexico. I have been watching Whippoorwills diving after hawkmoths, bats darting across the canyon, and micromoths landing on the flowers of the rare Kearney's Blue Star. As I reach to clamp a mason jar over an insect crawling on the blue star's inflorescence, I hear a scream echoing off the canyon walls above me. Somewhere on the higher ridges behind my back, a female Mountain Lion is caterwauling—*yowling her heart out*—while I clumsily screw the lid back on a glass jar filled with nectar-feeding insects. "Forty-five seconds of screaming, presumably puma," I write in my field journal at 8:54 p.m., in case I end up in the kill jar of *Felis concolor* later on this night.

An insight flashes into my adrenalin-inundated mind: while the relative rarity of carnivores such as Cougars is well recognized by scientists and laypersons alike, the worsening scarcity of pollinators has remained beyond the reach of our society's antennae. I can affirm "This is the first cougar I've heard caterwauling in my quarter century of living in the Southwest." My wife can assert, "I've lived in puma country my entire life, and only once, in Big Bend, did I ever see one." But who on this Earth (other than the chiroptophiles over at Bat Conservation International in Austin) has a visceral sense of pollinator scarcity? And yet, when Martin Burd sorted out hundreds of case studies of low seed set in flowering plants, he attributed 62% of these reproductive shortfalls to pollinator scarcity. An off-handed comment by Burd may be even more telling: the very showiness of flowers might be an indication that good pollinators are hard to come by.

Big, fierce carnivores may be naturally rare. If so, the last century's declines in seldom-seen nectar-feeding vertebrates may be even scarier than those that meat-eaters have suffered. A roost site in the Philippines once housed hundreds of thousands of flying-foxes; today you can witness a few hundred on the best of nights. The Panay Giant Fruit Bat is altogether gone from the Philippines. The Okinawa Flying-fox is extinct; so are the ones from Palau and Reunion. The Solomon Islands have lost their endemic Tube-nosed Fruit Bat, while Puerto Rico has lost its Flower Bat.

Cuba has lost its Red Macaw. No one is sure whether Turquoise-throated Pufflegs occur in Colombia or Ecuador anymore. When was the last time any birder you know spotted a Robust White-eye? Or an Oahu Oo? A Kloea? A Koha Grosbeak? A Black Mamo? Ula-ai-hawane? To add insult to injury, only two reptiles have ever been studied as being legitimate pollinators and one of them is already red-listed: Duvacel's Gecko, on a small island off New Zealand.

While rare carnivores and scarce nectar-feeders may differ in their *salience* (or their *intrinsic* perceptibility to humans, as the biophilicists say), they are similar in another way. Both groups of vertebrates demonstrate the *connectivity* between species essential to the healthy functioning and cohesive struc-

ture of biotic communities. If pollinator guilds are defaunated, animal-pollinated plants that formerly dominated a mature community are likely to decline, while weedy wind-pollinated plants are likely to find open niches. If carnivore guilds are defaunated, grazing or browsing populations may explode, eliminating herbaceous understories or crippling the recruitment of woody canopy plants. In either case, a shift in vegetation structure results from declines in animal populations which most of us seldom see. In both cases, the natural functioning of a biotic community is disrupted by the demise of ecological relationships between diffusely-coevolved associates.

The pollination relationship is between plants and their animal mutualists, and the predation relationship is between carnivorous animals and their prey; but *connectivity* is the unifying principle. Just as most carnivores rely upon a relatively modest set of prey items, most pollinators depend upon a rather narrow range of flowering plants that feature certain fragrances, forms, presentations, and nutritional rewards. Coyotes and honeybees may be extreme generalists, but the majority of carnivores and nectar-feeders have limits to what they can opportunistically feed upon; their food choices are not random. In fact, pollinators may generally be more restricted in food choices—and thus potentially more vulnerable—than carnivores, since bears, cats, dogs, weasels and others of their order tend toward opportunism.



As the dawn light begins to seep into the canyon shadows, I realize that I have not been selected as a Puma prey item at this time. Costa's and Broad-billed Hummingbirds arrive to visit the pale blossoms of the Kearney's Blue Star. So do bee flies and skippers. Not every visitor is an effective pollinator; not every live hunk of meat to visit this canyon gets to sacrifice itself as Cougar food. Some interactions between species are more probable than others.

I backpacked into this canyon, miles above the nearest inhabited cabin, because I had the urge to camp alone. As I awake in my sleeping bag at dawn, I remember how I am strung together with many other lives—from plant, to pollinator to predator—in a hammock of interconnected threads. ■

Gary Paul Nabhan recently compiled the Pollinator Redbook, Volume One, available free from the Arizona-Sonora Desert Museum, 2021 North Kinney Road, Tucson, Arizona 85743. His book with Stephen Buchmann, *The Forgotten Pollinators*, is now available from Island Press.

In addition to being author of *The Desert Smells Like Rain*, *Gathering the Desert*, and many other works of natural history and science, Gary is science director of the Arizona-Sonora Desert Museum, which is spearheading the *Forgotten Pollinators* campaign. Participating groups include Bat Conservation International (POB 162603, Austin, TX 78716), Sonoran Arthropod Studies Institute (POB 5624 Tucson, AZ 85743) and the Xerces Society (4828 SE Hawthorne Blvd., Portland, OR 97204).

Biodiversity in Southern Africa *an overview*

by Joseph P. Dudley

INTRODUCTION

The "southern Africa region" is defined herein as the continental mainland extending southward from 10° south latitude, approximately coinciding with the northern limits of the Zambezi River watershed. Southern Africa as defined includes the political domains of Mozambique, Malawi, southern Tanzania, central Angola, southern Zaire, Zambia, Zimbabwe, Botswana, Namibia, South Africa, Swaziland, and Lesotho. The offshore island of Madagascar, with its extraordinarily high levels of endemism in plants and vertebrates, is not included. (Madagascar has been isolated from the African continent so long that it ranks as an evolutionarily independent continental biota.)

The continental mainland of Southern Africa is a region of extraordinarily high biological diversity. Biodiversity in Southern Africa is remarkable not only for its species diversity (alpha/beta diversity), but as much or more so for its high degree of evolutionary (phyletic) and landscape (gamma) diversity. Few if any equivalent continental regions of the Earth possess comparable degrees of biological diversity at macroevolutionary and landscape scales of analysis.

REGIONAL LANDSCAPES

On an east to west transect, biotopes within Southern Africa range from deepwater tropical marine, subtropical coral reef and coastal mangrove forest to montane rainforest, semi-arid woodland, arid grassland and scrublands, and near-absolute coastal desert. The nutrient-rich antarctic Benguela current flowing northward along the western (Namib) coast historically supported a rich coastal and coldwater deep-sea marine fauna of fishes, fur-seals, whales, and seabirds (including an endemic penguin). Beaches and tropical waters of the Mozambique current along the east coast provide nesting and foraging habitat for Indian Ocean sea turtle and pelagic fish populations. Most inland areas are subject to periodic severe droughts, which have been a major evolutionary force in the region since time immemorial. Many of the region's endemic plants and animals are inhabitants of arid desert or semi-desert landscapes (Karoo, Kalahari, Namib).

The Zambezi River drains the region's largest watershed, an area extending nearly coast to coast between 10°S and 2°S latitudes. The Zambezi system, which includes Lake Malawi (southern-most of the Rift Valley Great Lakes), has a highly diverse endemic fish fauna. The headwaters of the Zambezi's western tributaries rise from central Angola, draining southward and eastward into the Mozambique Channel and the Indian Ocean. The Zambezi's Victoria Falls, one of the world's greatest natural wonders, are located at almost the geographical center of region: 18°S by 26°E. Average flow volume is 550,000 m³/minute but the river reaches 5,000,000 m³/minute in flood stage. The Zambezi gorge constitutes the southern extremity of the great African Rift Valley.

*The continental
mainland of
Southern Africa is
a region of
extraordinarily
high biological
diversity.*

Biodiversity Reports

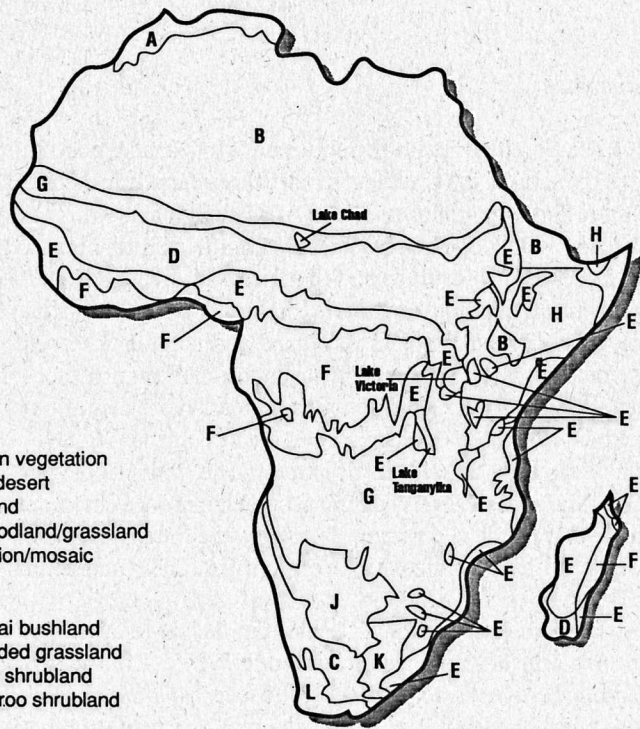
Adjacent to the Zambezi's westernmost tributaries is the Okavango watershed, which flows southeastward into a vast seasonally-inundated inland marsh on the northern fringes of the Kalahari desert. Southeast of the Okavango Delta, and into which it drains during exceptionally high flow periods, lie the great Makgadikgadi salt flats, a major flamingo breeding area. The Kalahari is a vast arid wooded grassland covering much of the south-central part of the region. Mountain ranges in the southern and eastern Cape, Angolan/Namib coastal region, and Mozambique/Zimbabwe border region support archipelagos of moist temperate montane and subtropical cloud and rainforest habitats exhibiting high levels of endemism. The Cape flora of the southern tip of the African continent is so unique that it ranks as one of the planet's six major floristic provinces (Cape, Palearctic, Neotropical, Holarctic, Australian, Antarctic).

FLORA

Southern Africa is particularly noted for high levels of plant diversity and endemism, particularly among proteas, cycads, aloes, and leguminous trees (Coates-Palgrave 1991). The southern Cape *fynbos* flora alone supports an estimated 8500 indigenous vascular plant species—70% endemics—within an area of only 71,000 km² (Stuart et al. 1990). The nearby Drakensberg Mountains of the eastern Cape region are also a very important area for plants, with some 300 known endemic species. The country of South Africa contains probably the highest concentration of endemic flowering plant species of any region on this planet (Pomeroy 1993).

The Namib-Karoo flora contains some 3500 species, over half of which are endemic forms (Stuart et al. 1990). The Namib Desert of the southwestern coast supports some particularly distinctive taxa. The Skeleton Coast region (so-called because of the beached whale carcasses once common there) is famous for its cartwheeling dune spiders. Perhaps the Namib Desert's most enigmatic organism is the endemic Wonderplant *Welwitschia mirabilis* . *Welwitschia* produces only two true leaves during its lifetime, which reach up to 3 meters in length and become shredded into leathery, thong-like strands by sun and wind. *Welwitschia* is actually a massive but almost entirely underground "tree," individuals of which (like Baobabs) are known to be among the oldest living organisms on earth (2000+ years old: Coates-Palgrave 1991).

The Zambezian flora which dominates much of southern central Africa is thought to be the continent's richest flora with



vegetation zones of Africa*

more than 8500 species, about 54% endemic. The western Angola highlands and the outlying mountains ("inselbergs") of the Chimanimani Range in western Mozambique are suspected to be reservoirs for numerous still unidentified endemic plant species. Boabab trees (*Adansonia digitata*), a distinctive inhabitant of arid savanna landscapes within the region, have been carbon dated to ages of at least 4000 years (possibly just two generations post-Pleistocene time for some individuals!).

MACROFAUNA

Birds

More than 920 bird species occur in the region, of which some 140 species may be regional endemics (Sinclair 1987). Some species found locally (Arctic Skua, *Stercorarius parasiticus* , European Stork, *Ciconia ciconia*) are Palearctic seasonal migrants, others (e.g., Rockhopper Penguin, *Eudyptes chrysolome* , South Polar Skua, *Catharacta maccormicki*) occur as Antarctic vagrants. Raptor diversity within the region is truly bewildering—Hwange National Park (12,953 km²) hosts fifteen species of "eagles" alone: *Aquila* (5 spp.), *Hieraaetus* (3 spp.), *Circaetus* (3 spp.), and one species from each of four other genera. There is also astounding regional diversity among falcons (16 spp.), vultures (8 spp.), hawks (23 spp.), and owls (12 spp.). Other notably diverse groups include warblers (73 spp.), thrushes/robins (43 spp.), weavers (34 spp.), shrikes (26 spp.), swallows (22 spp.), larks (26 spp.), quails/francolin (19 spp.), doves (14 spp.), herons/storks (28 spp.), rails/coots (21 spp.), and teeter-assed** shorebirds (60 spp.).

*map courtesy of IUCN—The World Conservation Union, from its publication "Biodiversity in Sub-Saharan Africa and its Islands" (1990)

**This last is a subjectively descriptive, not a strictly ornithological, term. —Ed.

Mammals

The Southern Africa region supports substantial populations of many of the continent's most characteristic and charismatic large mammal species (African Elephant, rhinos, Cheetah, Wild Dog, Lion, Gemsbok, Giraffe, zebras, hippos, wildebeests...). More than half of Africa's surviving Savanna Elephant (*Loxodonta africana africana*) population inhabit Zambesian dry subtropical woodland and scrub landscapes (Cumming et al. 1990). Endemism among large mammal species is limited, although distinctive regional types or subspecies of various cosmopolitan species are recognized—some of which are now threatened or extinct. The extinct Quagga (*Equus quagga*) was an endemic zebroid horse once common and widely distributed within what is now the country of South Africa; the last specimen died in captivity in 1883 (Haltenorth & Diller 1994).

Large mammals brought back from the verge of extinction by conservation efforts include White Rhinoceros (*Ceratotherium simum*), Black Wildebeest (*Connochaetes gnou*), and Bontebok (*Damaliscus dorcas dorcas*) (Smithers 1986). Black and White Rhinos (*Diceros bicornis*, *Ceratotherium simum*) had been extirpated within much of their former range by the mid-20th century, when conservation efforts began to make headway in protecting and restoring relictual populations. Translocations were used to re-establish rhinos in a number of areas from which they had been extirpated before the turn of the century (e.g., Hwange National Park, Zimbabwe).

HUMAN IMPACTS

Southern Africa supports a large, culturally diverse, and very rapidly growing (2-3% per annum) human population. Human population densities within parts of the region are estimated to have increased ten-fold or more during the past century. Botswana, Malawi, Zimbabwe, and Zambia currently exhibit human population growth rates that are among the highest on the planet, with projected doubling times of about twenty years. Human impacts within the region are consequently considerable and increasing rapidly. Deforestation of dry woodlands for conversion to croplands is proceeding at a rate of more than 700,000 ha/year. Pumping of underground water for agricultural, industrial, and domestic uses may be depleting underground aquifers. Gold, diamond, coal, copper, and heavy-metal mining are diminishing surface water quality and availability within watersheds in many parts of the region. Human impacts are a serious threat to most ecosystems and biotas within Southern Africa (BSP 1993).

Illegal killing of wild animals for subsistence or commercial purposes is rife in many areas. With some notable exceptions (Mozambique, Angola), elephant poaching levels in Southern Africa have generally remained low relative to those in East Africa (Kenya, Tanzania, Sudan, Somalia, Ethiopia). Rhino populations, however, have been decimated in recent

years by poaching and virtually extirpated from many areas. The reintroduced White Rhinoceros population of Hwange National Park was nearly wiped out between December 1992 and January 1994: 80 of 82 known individuals (many dehorned) were lost to poachers during this brief period. Although rhino poaching now appears to be under better control within Zimbabwe, Botswana, Namibia, and South Africa (at least partly because the more vulnerable populations have been wiped out) it remains to be seen whether White and Black Rhinoceros populations in Southern Africa can be sustained indefinitely [against a poaching tide which has in the past twenty years extirpated these species throughout most of their restored range (TRAFFIC 1993)].

The southern Cape of Africa has become one of the planet's premier agricultural regions, as its Mediterranean climate and good soils proved ideal for conversion to orchard crops and viticulture. Little remains of the original Cape fynbos habitats, and only a tiny fraction is protected within reserves (0.4% of its original 31,800 ha habitat area). The species-rich temperate montane moist forests, which once blanketed the slopes of the southern Cape's coastal mountain ranges, have now been largely replaced by farms and exotic pine (*Pinus*) and eucalyptus plantations. Formerly cultivated weedy exotic tree and plant species such as Blackwood (*Acacia melanóylon*) constitute a serious threat to the integrity of surviving areas of indigenous forest habitat (Vermuelen 1993). Industrial/mechanized agriculture in much of the inland region is largely irrigation-dependent due to limited and erratic rainfall. Fertile soils of the temperate/subtropical highland plateau regions of Zimbabwe and South Africa support extensive areas of commercial agriculture. Drier regions and areas of infertile soils are dominated by commercial livestock operations and subsistence communal farming and pastoralism.

Industrial trawling, sealing, whaling, and guano harvesting have severely damaged Namib marine ecosystems. Major hydroelectric/irrigation dams in the Zambezi River system have radically altered floodplain, riverine, and estuarine ecosystems along the Mozambique coast. Dynamite fishing is devastating coral reef ecosystems of the Mozambique coast. In the Zambezi Delta, destruction of estuarine mangrove forests and lowered nutrient inputs due to upstream dams are threatening the continued viability of the Mozambique prawn fishery (the country's most important export industry).

Cattle, goats and sheep are present almost everywhere outside of strict wildlife reserves across most of Southern Africa—even hyperarid desert areas, where pumping of underground water allows livestock production. Heavily-subsidized livestock disease and parasite control programs facilitate expansion of livestock populations to levels beyond long-term carrying capacities. European-based international development agencies directly and indirectly subsidize livestock production programs within the region. Cattle, sheep and goats severely overgraze rangelands in drought years before destocking is effected through drought mortality or salvage marketing.

Cultural norms in Southern Africa complicate livestock problems. Traditional cultures esteem *and communal land-occupation systems enforce* the role of livestock as the principal source of real property assets. One artifact of the "livestock as real property" syndrome is that 10 skinny cows contain greater value than 8 sleek cows; communal pastoralists are loath to sell off potential breeding stock except under extreme duress. Hence, overstocking becomes chronic within communal areas whenever conditions permit, and overgrazing/overbrowsing by cattle, sheep, and goats is often the norm even within years of adequate rainfall. As is the case with the degradation of arid rangelands in western North America due to overgrazing, livestock carrying-capacity issues are not resolvable in terms of either ecological or economic cost-benefit approaches.

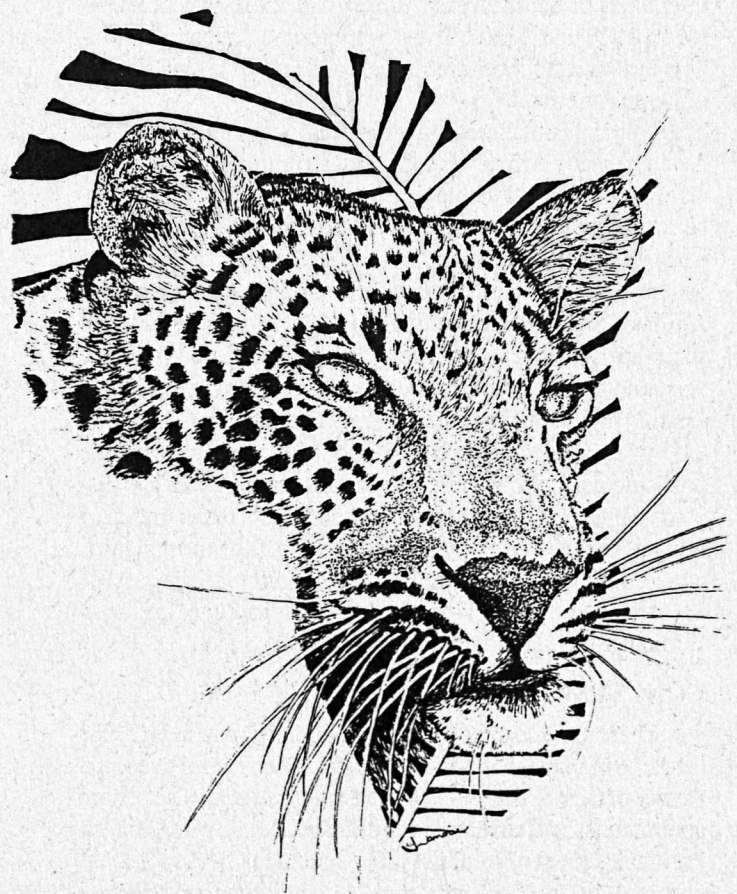
Wildlife reserves within Southern Africa are for the most part restricted to areas where tsetse-fly infestation and/or lack of perennial surface water sources historically precluded large-scale human settlement or agriculture. Fuelwood cutting and conversion to agriculture is rapidly decimating woodland landscapes throughout much of the region. Vast areas of dry woodlands newly-cleared of tsetse fly are being targeted for urban population resettlement programs and accommodation of rapidly expanding rural populations.

Animals within many of the region's largest and most important wildlife reserves (e.g., Kruger National Park, South Africa; Hwange National Park, Zimbabwe) depend on man-made water supplies during the peak dry season months. As is the case with domestic livestock, water provisioning allows water-dependent ungulates (e.g., elephant, buffalo, hippo, wildebeest) to permanently occupy vast areas of former seasonal habitat and encourages the build-up of artificially high densities of these species.

Temperature and rainfall data from Hwange National Park in western Zimbabwe show trends consistent with the predictions of global warming scenarios. Interior regions of Southern Africa may be threatened by widespread desertification due to the combined effects of global climate change and deforestation.

GEOPOLITICAL CONTEXT

The southern Cape of Africa was first occupied by Europeans some three centuries ago. European settlements spread westward along the coast and northeastward into the interior during the eighteenth and nineteenth centuries. Nonetheless, European domination of the region was not consolidated until the first decades of the twentieth century. Most available agriculturally-productive lands within the region were expropriated by European settlers, and indig-



enous black Africans often relegated to semi-serfdom (or outright slavery prior to the late nineteenth century) on the farms of European colonialists and/or subsistence farming in tribal or communal lands ("Tribal Trust Lands," "Tribal Homelands," following "Indian Reservation" paradigms used in the United States of America).

With few exceptions, ethnic African populations in colonial South Africa/Rhodesia/Namibia retained or were retroactively granted land tenure of sorts only in areas with limited agricultural potential and no mineral or timber resources of known or anticipated value. The greatest single difference between the European colonial occupation of Southern Africa and of what became the United States was that deliberate systematic extirpation of indigenous populations was rather more the exception than the rule in Africa, partly because the historically agro-pastoralist indigenous Bantu and "Hottentot" peoples provided a valuable source of labor for the farming (and later mining) enterprises of ethnic European colonials. European movement northeastward from the Cape into the interior of the present-day republics of South Africa and Zimbabwe (formerly Southern Rhodesia) was first delayed, but ultimately probably facilitated, by the decimation and displacements of indigenous peoples resulting from internecine warfare, raiding forays, and migrations of Bantu "Nguni" tribes (e.g., Zulu, Matabele) between 1810 and 1860. (Tribal warfare and antipathies similarly facilitated European territorial conquests in several regions of North America.)

Political boundaries drawn by European colonial powers have left many African nations with a complex legacy of unresolved ethnic and ideological conflicts. Some stresses may be seen as exotic in origin (e.g., political polarization of Marxist/Maoist Socialist versus "other" paradigms), others are of endemic and precolonial ethno-historical origins (e.g., Zulu/Xhosa of South Africa; Hutu/Tutsi of Rwanda/Burundi), and some are synergisms of both spheres of influence (military versus civilian executive control in national governments). Such existing or potential conflicts were often exacerbated or abetted by the political intervention of outside powers during the post-colonial Cold War era. Political instability, leading to displacements of regional populations and their concentration in refugee camps, is rapidly becoming one of the most significant environmental threats to African landscapes (cf Mozambique, Liberia/Ivory Coast, [Rwanda/Zaire/Tanzania/Burundi, Somalia/Ethiopia/Eritrea, Uganda/Sudan...).

CONCLUSION

There appears to be a growing consensus that in order for the large mammals of Southern African landscapes to escape the fate of their North American and European equivalents, rural communities will have to derive direct economic benefits from the management of local wildlife populations. The social and economic costs of free-ranging African wildlife species (especially elephants) outside reserves are difficult for Americans and Europeans to comprehend. Elephants outside reserves of-

ten raid croplands and will even enter settlements and destroy village granaries. Human deaths and injuries result from confrontations or even chance encounters between farmers and crop-raiding elephants.

The "CAMPFIRE" and "ADMAD" programs of Zimbabwe and Zambia were developed to give local communities vested economic interests in managing wildlife on communal lands, and have drawn considerable financial support and backing from both international conservation NGOs (e.g., IUCN, WWF, WCI) and international development agencies. The CAMPFIRE program, which derives 90% of its returns from the trophy hunting of elephants, has been remarkably successful in promoting the protection of wildlife on communal lands in southern and western Zimbabwe.

Wildlife conservation in Southern Africa will not succeed if promoted along the strict preservationist paradigms typically regarded by rural Africans as unwarranted and undesirable artifacts of colonial rule. Tourism provides an economic justification for wildlife conservation only within the bounds of national parks, and even so becomes viable only within those parks amenable to large-scale tourism. The importance of habitats outside reserve areas to regional biological diversity requires the development of alternative programs for enlisting support and cooperation from local human communities in protection of local habitats and wildlife. Resolving this dilemma will require tremendous inputs of energy and effort at all levels (local, national, and international), but the potential returns should more than justify the investment. The biological diversity of Southern Africa is a heritage of outstanding global significance, and needs much wider recognition as an international conservation priority. ■

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Saving Howler Monkeys in Mexico

Relocation as a Conservation Strategy

by Clara B. Jones

INTRODUCTION

European naturalists of the 19th century, such as J.E. Gray, were struck by the sonorous vocalizations of certain male monkeys encountered during their explorations, and named the genus *Alouatta* for "howler" monkey. Eight species of howlers are recognized, two of these in North America, more precisely southern Mexico. One of these species, the Guatemalan Howler Monkey (*A. pigra*) is poorly known. The second species, the Mantled Howler Monkey (*A. palliata* Gray), has a long history of investigation, especially in Panama and Costa Rica. These species are non-overlapping (allopatric) for part of their ranges in southern Mexico, and it is thought that biological similarities between them, in particular, resource and mate preferences, led to their divergence. This idea, "the principle of competitive exclusion," was first proposed by Charles Darwin to explain the ecological conditions required to permit associations of organisms to coexist.

Under the United States Endangered Species Act, *A. palliata* is listed as Endangered and *A. pigra* as Threatened in Mexico. *A. palliata*, distributed from Veracruz to Oaxaca, and *A. pigra*, distributed throughout the Yucatan and Chiapas, prefer to eat new leaves, flowers and fruit and spend much of their time each day foraging for food. *A. palliata* is among the largest of Neotropical monkeys, adult males weighing about 6000 grams, females about 4500 g. This large sexual dimorphism in weight is thought to be related to intense competition among males for mates.

PRESERVING SPECIES RICHNESS BY TRANSLOCATION

Forested areas in southern Mexico are being cut for agriculture, lumber, or other reasons. Forests are being fragmented into patches that may not support the original community of organisms. One group of howler monkeys may require as much as 125 hectares of forest for feeding, defense, and reproduction; and, although home ranges may contract appreciably when forests are disturbed, some critical minimum size is required for maintenance of viable populations and ultimate survival of the species.

An emerging conservation tactic entails the translocation of organisms from threatened areas to protected areas. Researchers at the University of Veracruz are translocating Mantled Howler Monkeys to forests adopted for the primates in southern Mexico. Translocation may supplement other programs for the preservation of biodiversity. As pointed out by Ernesto Rodriguez-Luna and Liliana Cortes in personal communication, this method may prove valuable where other tactics fail. Translocation of primate species has also been undertaken for purposes of breeding for the animal trade. Several of these efforts involve introducing monkeys to islands, where the likelihood of survival may be greater than on mainland.

In a 1994 paper published in *Large-Scale Ecology and Conservation Biology* (Blackwell Scientific Publications), John Lawton and his colleagues discuss the success rates of bird and mammal translocations and find a different rate of failure as a function of the location of the introduction relative to the historic range of the species. These authors found that translocations of species into the core of their historic ranges succeeded significantly more often than introduction into the periphery (see also the article by F. Bryant Furlow in the fall 1995 issue of

One group of howler monkeys may require as much as 125 hectares of forest for feeding, defense, and reproduction...



Wild Earth). These observations can be explained by the very low rate or lack of population increase experienced in marginal habitat. Preliminary results of translocations on an island in Catemaco Lake in Veracruz by the Mexican researchers suggest that the howler group is reproducing successfully; births outnumber deaths. Nonetheless, as Lawton and his colleagues point out, translocated populations may persist only because of immigration ("metapopulation effects") or continued relocations.

Mexico is at the periphery of the range of *Alouatta palliata* and *A. pigra*. The likelihood of success of howler translocations in North America may thus be low. It is important to investigate the patterns of distribution and abundance of *Alouatta* populations in Mexico so as to identify "hot spots" of howler population density and to avoid what Lawton and his colleagues call the "where we find them is not where they want to be phenomenon." As these authors point out, if there are several "hot spots" or population centers, *Alouatta* ranges may be expected to contract and fragment toward multiple locations rather than a single core. Howlers can be expected to adapt relatively well to habitat fragmentation due to inherent traits such as reliance on leaves for food, a plastic system of subgrouping, and a high degree of genetic monomorphism which may buffer *Alouatta* against environmental perturbations (see C.B. Jones, *Endangered Species Update*, July/August 1995).

CONCLUSION

During the Cenozoic Era—in particular the Tertiary Period (about 65 to 10 mybp)—mammals, including primates, and birds radiated, and insects and angiosperms dispersed throughout the continents (which were in roughly modern spatial configurations). Primates similar to *Alouatta* are may have reached lowland Central America during the Pleistocene (about 2.5 mybp). The endangered status of *Alouatta palliata* and *A. pigra* in North America calls for immediate action to protect the communities of plants and animals on which they depend. Translocations of howlers to areas of intact habitat may become increasingly important to minimize likelihood of extinction. ■

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What You Can Do

If you are interested in learning more about attempts to conserve *Alouatta* species in Mexico and opportunities to contribute to the efforts, contact:

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A Natural Diversity "Hot Spot" in Yellowstone Country

by Marcy Mahr

Compelling conservation strategies are currently being developed for the Northern Rockies bioregion. The Northern Rockies Ecosystem Protection Act (NREPA), Yukon to Yellowstone (Y2Y), and The Wildlands Project are three visions that go beyond the poetic to the practical in terms of mapping and preserving the physical connectivity of our wild lands. They have begun to serve as umbrellas for more localized protection efforts, for a bioregion, North America, and the Americas, respectively.

A recurring challenge, however, is actually putting concepts of conservation biology and landscape ecology to work for large-scale protection. The work of conservationists, such as defining landscape corridors and designing ecological reserves, relies on informed science. Yet, in the wake of visionary concepts and sophisticated quantitative modeling, scientists still face the dilemma of how to develop an investigative protocol that addresses tough ecological questions and considers humanity's historic and current cultural needs—needs for expression and livelihood that in the long term maybe integral to ensuring lasting protection. This article describes a conservation strategy initiated in the Centennial Valley, Montana, aimed at protecting the natural as well as cultural heritage of a high valley ecosystem.

A NATURAL PROGRESSION

Journeying east from Monida Pass into the expansive Centennial Valley in southwestern Montana, the traveler experiences a profound detachment from a world only a few years away from the year 2000. Several snow-capped mountain ranges converge on the valley from the north; to the south, the east-west running Centennial Mountains rise abruptly from 6600 to 10,000 in elevation—like a cellar door swung open on the hinge of the active Centennial Valley fault. The range's crest marks the Continental Divide and state boundary with Idaho.

The Centennial Mountains contain rock types from all geologic periods. Sequences of Precambrian metamorphic rocks (400-600 million years old) and late Mesozoic shales and sandstones (65-200 million years old) form rugged, majestic cliffs. Rhyolitic ash-flow overlies lava flows of andesite and basalt, a reminder of the Centennials' proximity to the Yellowstone caldera. Numerous mountain creeks dissect the limestone front and drain into the valley's lake and wetland complex which spans 65 miles east to west.

A conservation strategy initiated in the Centennial Valley, Montana, aims at protecting the natural as well as cultural heritage of a high valley ecosystem.

The varied geology and topography, and a steep moisture gradient produced by the valley's east-west orientation, have resulted in a highly diverse set of microenvironments. One striking result of this is floristic richness. In a Bureau of Land Management study of the Centennial Mountains, Lowry (1979) lists 362 vascular plant species; and Dorn (1968), in a broader study of the Red Rock Lakes National Wildlife Refuge and the Centennial Mountains, lists 487 vascular plant taxa (approximately 21% of Montana's flora). The distribution of flora in the Centennial Valley ecosystem generally follows topography. Progressing from the moist valley floor south and up to the Continental Divide, the vegetation changes from a mosaic of wetlands, willow thickets, and sandhill grasslands to sagebrush foothills and high elevation parkland meadows, interspersed with aspen and mixed coniferous forests, rocky slopes, and cliffs.

The Centennial Valley is an oasis of diverse, high-quality habitat for a broad range of wildlife in a region otherwise dominated by agriculture and resource extraction. The valley and its adjacent mountain ranges provide a vital biological link between the Greater Yellowstone Ecosystem and the Salmon-Selway wilderness complex of central Idaho. At the heart of

the Centennial Valley is Red Rock Lakes National Wildlife Refuge. Since its establishment by President Franklin Roosevelt in 1935, Red Rock Lakes Refuge, a Natural National Landmark, has provided sanctuary for migratory birds. There, one may find Trumpeter Swans preening on tussocks in shallow ponds, or encounter Golden Eagles perched atop ranch fence posts, or hear the screech of a young Peregrine Falcon awkwardly fledging from an eyrie. The continued prosperity of these sensitive species here is testament to the ability of the Centennial Valley to safeguard a broad spectrum of the Greater Yellowstone Ecosystem's total biodiversity.

HISTORICAL ROOTS

The promise of homestead land induced many white settlers to come to the Centennial Valley in the 1880s. Ramshackle farmsteads of hand-hewn logs and curious place names conjure a rich history. In its hey-day, when the Monida-Yellowstone stagecoach line carried thousands to the park every year; the valley community boasted 500 residents and several saloons. Resourceful, "make-do" personalities inhabited this fertile and picturesque valley. It has been home and hunting ground

to Native Americans, fur trappers, miners, mid-wives, cowmen, rustlers, and vocal suffragettes. Old newspaper accounts refer to stirrup-high grasses, mail hauled by dogsled, \$5 bounties on Coyotes and wolves, mail-order brides, and all-night dances.

In the mid-1930s the valley experienced a major change in the residents' lifestyle. The federal government purchased much of the land surrounding Upper and Lower Red Rock Lakes and condemned 7000 acres to protect the Trumpeter Swan in perpetuity. Hunting lodges were torn down, larger ranches bought up remaining homesteads, and demolished cabins were used for fence posts, firewood and walls for new summer homes. Today, due to the high elevation and short growing season, the valley remains in a largely undeveloped state, with no farming, limited mid-summer and early fall grazing, and few year-round residents. The sign "Lakeview, Population 6," means that most valley ranchers reside elsewhere much of the year.



The country demands both deep affection and fearful respect. Hardy old-timers speak of its unyielding nature. Despite the gentle, pastoral quality evoked by the verdant mountain grasses and profuse springs and creeks, the land has challenged all who have come here. The commitment of ranching families to continue working this rugged landscape is a bridge to the early, pioneering days.

After decades of struggle, residents still seem connected to this valley and the life it demands. Protecting the landscape from real estate subdivision (rampant in many other valleys in the Greater Yellowstone) and resource exploitation on public lands would benefit not only ecological but cultural values. Whether due to long-time observations of the land and its critics, or an urban-born conservationist bent, various local landowners have realized recently that preserving the natural processes and spirit of the valley requires working in partnerships.

CONSERVATION IN ACTION: THE CENTENNIAL VALLEY PROJECT

In the summer of 1993, the US Fish & Wildlife Service (FWS), the Greater Yellowstone Coalition (GYC), The Nature Conservancy (TNC), and several landowners joined forces to develop conservation strategies for protecting the valley. The group believed the refuge, the only protected area in the valley, was not large enough to be a viable ecological unit. They agreed that retaining the Centennial Valley as a conservation core area and an ecological linkage zone connecting Greater Yellowstone and central Idaho required identifying important biologic and hydrologic processes and topographic features that determine ecological patterns and boundaries. GYC initially proposed to expand the refuge boundary in their blueprint *Sustaining Greater Yellowstone*. Modifying an existing Fish & Wildlife Service acquisition boundary requires only an Executive Order from the president, rather than congressional approval as needed for changing National Forest boundaries. FWS staff have identified acquisition priorities for private inholdings within the refuge boundary and TNC's Montana staff have been evaluating unique habitats for protection outside of the boundary.

A group vision began to emerge that made ecological sense and respected private property rights and historic uses. The author, working as a consultant to the Centennial Valley Project, was charged with studying the feasibility of this vision. Three overall project goals guided the study: 1) to better document and articulate the ecological importance of the core area, 2) to identify potential and existing ecological threats, and 3) to develop partnerships between federal and local agencies, non-profit organizations, and willing landowners.

Determining the eco-“logical” boundary of Red Rock Lakes was the first step. I defined the project's core area of 481,590 acres by delineating the watershed boundary on 33 USGS 7.5 minute quadrangle maps. I then spent long hours at the Beaverhead County Appraisers's Office paging through plat maps and meticulously tracing all property boundaries onto

the quadrangles. I color coded all public lands and assigned private lands a unique landowner ID number that linked the map to database information I obtained from the County Assessor's office on the number of properties owned by a landholder, total acreage, and land use.

Land ownership in the project area is a matrix of various public agency holdings comprising almost 376,670 acres (80%) of the land, with 104,920 acres of private holdings located in the valley and along the lower-montane foothills. Public ownership is comprised of Bureau of Land Management (203,160 acres), Montana State Lands Department (66,000 acres), US Forest Service (Beaverhead National Forest, 47,360 acres), US Fish & Wildlife Service (Red Rock Lakes National Wildlife Refuge, 45,000 acres), and Agricultural Research Service (Sheep Experimental Station, 16,650 acres) holdings. Land use within the study area reflected that of the region, with 95% of the acres in grazing, 2% in timber, 2% in irrigated crop, and 1% in wild hay. Critical wetland and riparian habitat comprised 2.8% of the land, with almost half privately owned.

The second component of the feasibility study was to identify lands in need of protection from local threats. I identified local threats from conversations with residents and from scientific and management reports. Concerns include accumulating sediment in the shallow valley lakes, over-grazed riparian habitats, wildlife barriers produced by hundreds of miles of criss-crossing fences, proposed subdivisions, plans to pave the main road, logging and roading on adjacent National Forests, increased recreational use, and Animal Damage Control (ADC) practiced on the Agricultural Service's Sheep Experimental Station, in the heart of the Centennial Mountains. Additionally, plans to pave the main road will forever change the “off the beaten trail” nature of this landscape.

The third step was conservation action armed with these data. Recent purchases by the US Fish & Wildlife Service of private lands within the existing refuge boundary have begun to fill in public ownership holes. Efforts by TNC and the Montana Land Reliance, a statewide land trust, are directing conservation efforts toward riparian and wetland habitat and the rare sand dune community within the valley. On-the-ground projects sponsored by FWS's Partners for Wildlife program are effectively promoting stewardship. Restoration of riparian habitat on willing owners' lands is being accomplished by planting hardy native species along denuded banks, building small ridges over creeks, and encouraging stream channels to meander naturally. Double-stranded 6-wire fences, barriers to wildlife, are being replaced on many ranches with 3-wire removable or electric fencing. The partnership of public agencies and land acquisition and advocacy organizations is starting to show success in identifying and choosing options that fulfill the goal of protecting both the natural and cultural values of this nearly unspoiled, high valley ecosystem.

At the broader county level, regional conservation efforts are beginning to take root. The Beaverhead County Commission signed a memorandum of understanding with federal and

state land management agencies to cooperate and coordinate resource management practices. An interagency steering committee has launched the Gravelly Mountains-Centennial Valley Landscape Analysis. Their effort spawned a community forum of local citizens who regularly meet to determine the future of their county.

As future collaborative projects are discussed around kitchen tables and in town meeting rooms, the seeds of bioregionalism are being sown and nurtured, with the scope of conservation broadened to include both natural and cultural heritage. Marrying the concepts of conservation biology with an appreciation of the human community, a landscape may be protected and a rural pulse sustained. Though it is too soon to evaluate the success of this endeavor, science may yet leverage a new relationship of people with the land by fostering respect for its interconnectedness and fragility. ■

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Endangered Species

*Sometimes I feel a diminishing as if
part of me were being erased
and I wonder what in human
nature will disappear the moment copper
no longer sings the coat
of the grizzly wandering old growth, when
the pelican never again trowels the clouds
above the spray and barnacled back
of the grey whale surfacing into sky
like a Ferruginous hawk rising
from the sinews of its prey spiralled
amid the crystal quiver of tufted
hair grass where a silverspot
butterfly places its last tear
of bubbling larva while the only
male salmon flashes upstream jostled
by jets of sperm past the cut-throat
trout sashaying in rock shadow beyond
McFarlane's four o'clock folding its petals
forever as the lone western pond turtle
drags its humped knees to the frog-loud
oxbow pond that has not yet
been filled for a parking lot where you will leave
your car hurrying to your office sliced
by anxiety that you have lost something,
but you are not sure what.*

—Amy Klauke

(all species mentioned are currently threatened)



National Park Service Prescribed Fire in the Post-Yellowstone Era *part one*

by Robert Hunter Jones

INTRODUCTION

Watching land managers wrestle with the bewildering array of conflicting claims all of us have made on public lands is just another working out of the tar baby story, one that would be comic if it weren't so heartbreakingly humiliating. Nowhere is that frustration more keenly felt than in a discussion of fire policy.

The reach of fire into the human psyche lets loose such an outpouring of five cent solutions to billion dollar problems that few land managers can summon the courage of their convictions and implement meaningful reform. For several decades a consensus has been building among fire professionals that full suppression is not only ecologically untenable, it is rapidly becoming an economic impossibility as well. Economic considerations, rather than ecological ones, are gradually shifting the balance in favor of more use of fire to rebalance forest and range ecosystems skewed by a hundred years of fire suppression.

The extent to which that old oxymoron, political science, shapes the debate was manifested in the ceremonial weeping and gnashing of teeth that attended the Yellowstone Fires of 1988. Ronald Reagan, during the height of a media frenzy that consumed more trees than did the fires themselves, ambled out on to the White House lawn and said: "I don't know what the policy is, but we're going to change it."

Once the snow was falling in the final months of '88, cooler minds prevailed. The policy Reagan had promised to change did, in fact, undergo significant revision, but the concept of fire as an integral part of forest ecosystems survived attempts by some to force a return to the bad old days of full suppression. "Rebirth" is the catchword most often floated in reference to the positive effects of the Yellowstone fires; but, as fire historian Stephen Pyne has noted, the metaphoric spot fires Yellowstone threw out in

People need to think about what fire does in the forests we now have, not just what fire might have done in the forests we wish we still had.

—Nancy Langston, in *Forest Dreams, Forest Nightmares*, 1995

Fire will have to be used in careful combination with other controversial strategies if we are to have any hope of restoring grassland and forest landscapes to some semblance of their earlier biotic vibrance.

front of itself burned across the political landscape with variable rates of intensity. Some of the badly burned areas have been slow to recover; others have come back quickly and seem reinvigorated by the experience. The long-term effects of those fires, though, are open to a variety of interpretations.

In upcoming issues of *Wild Earth* we'll look at some reasons to feel hopeful about fire policy in the National Park Service, as well as a couple of examples that give cause for concern. To some extent, both the positive and negative aspects of this discussion apply to other federal agencies as well. With luck we may stumble on a strategy or two to help move fire policy in a direction that serves the larger goal of managing public lands for biodiversity rather than as a collection of separate but competing commodities.

In my view, much of the rethinking of fire policy after Yellowstone has resulted in positive change. I am cautiously optimistic. The change has been uneven, however, and continued improvement remains uncertain. Short-term airshed and watershed concerns join a variety of unknowns concerning the effects of burning on certain threatened or endangered species as issues that often hinder attempts to reintroduce fire to ecosystems that benefit from it. Reintroducing fire into ecosystems demonstrably out of balance poses very real risks, but those pale beside the implications of doing nothing at all.

At the outset, though, it seems important to introduce a note of caution. The seductive image of fire as the great cleanser of past sins, or as a panacea for all the ills that face us with regard to range and forest health, poses as great a danger as some of the now infamous management techniques wielded with unwarranted optimism in the past. Fire will have to be used in careful combination with other controversial strategies

if we are to have any hope of restoring grassland and forest landscapes to some semblance of their earlier biotic vibrance. Preconceived notions on all sides of the public land debates will have to be put aside in favor of a willingness to face whatever new challenges emerge from a good faith effort to set things right.

There will be setbacks and ample opportunity to remind ourselves, as Meister Eckhart did in the thirteenth century, that the root word of *humility* is *humus*. We are in for a figurative return to the soil, a place where old forms break down and nourish the original ground of being toward the birth of something new.

SEQUOIA-KINGS CANYON NATIONAL PARK: THE MINERAL KING PROJECT

As the ship lifted off the helipad I had the familiar feeling of hollowness in my belly, the unreality of vertical lift that ended too suddenly when the pilot let the helicopter fall away to the left and swoop down into a drainage of the Kaweah River. Out the plexiglass window the huddle of buildings that housed the headquarters area of Sequoia National Park rushed by beneath us. The neat rock facade of the visitor center quickly gave way to more utilitarian buildings behind it—administrative offices, the maintenance area, the fire cache. The whole complex looked neater from the air than it actually is on the ground, but less real, too. The scene was gone so quickly it was possible to believe it wasn't there at all.

Chaparral fields lace themselves into impenetrable thickets on the steep slopes above the Kaweah. They give way higher up to a mixed conifer forest dominated by Ponderosa and Sugar Pine thickly undergrown with manzanita and White Fir. I plugged my flight helmet into the intraship communication system and listened to Dewey, my squad boss, chat with the pilot.



Dewey and I were the last of our squad to be ferried up to Paradise Ridge, a drop point near the top of the Atwell Burn. We were to take over a firing operation begun a couple of days before and carry fire down the west flank of the burn unit toward the Mineral King road 4000 vertical feet below. I was still a bit giddy with our squad's good fortune. The other half of our hotshot crew was probably still swerving its way up the Mineral King road to the point where the west line met the pavement. Their assignment was to relocate that section of line through a thicket of manzanita on the steep slopes above the road—hardly on a par with flying to the top bringing fire back down.

The pilot pointed to something off to the northeast.

"There they are," he said.

Several ridges away a gauzy line of smoke rose into the sky, blending at first with the gray rock of the mountains deeper in the backcountry, then wisping up into the empty blue above. The pilot swung the ship to the south of the column, then radioed the helispot on Paradise Ridge to advise of our arrival time.

Among the first things I heard when I rejoined the Arrowhead Hotshots in May of 1995 was that Sequoia-Kings Canyon (SEKI) was beginning a five year prescribed fire project in the Mineral King area which was meant to act as a litmus test for future large-scale projects of the same kind throughout the NPS. Arrowhead's station is located in Kings Canyon National Park, and we frequently participate in prescribed burns within the Sequoia-Kings Canyon system. In late May the acting Fire Management Officer for SEKI, Ed Nelson, visited our station and talked to us about the Mineral King project. He told us there might be an opportunity for us to be involved in the project later in the season.

As summer progressed we heard rumors that the park's new superintendent, while supportive of the project generally, felt more public relations time was needed prior to ignition, particularly given the concerns of cabin owners in the area. What had changed his mind I didn't know. With 24,000 acres on the block over five years, there may have been concerns about falling behind. When weather conditions are right you have to take advantage of it. Now, in mid-October, conditions were right.

As the ship approached Paradise Ridge the telltale shape of Sequoia groves appeared in the canyon beneath us. From the air they resemble huge broccoli stalks rising above surrounding stands of pine and fir.

A crewman appeared on the ridge in front of us to guide the pilot in. As the ship settled down, rotor wash blew granite dust over a line of coolers and camping gear ranged along the ridge to the west. Beyond that the rest of our squad were kicked back against their packs, affecting the ennui typical of type-one crews, a sort of I've-seen-it-all attitude meant to inspire awe among the lesser mortals who make up type-two crews. Jim Cook, the crew superintendent, was over there too. When he turned his head and said something, the pose evaporated, and the squad scrambled to their feet.

Dewey and I climbed out while the crewman unloaded our packs, a bundle of fire tools, and a chainsaw from the storage compartment of the ship. We grabbed the gear and walked bent-over beneath the whirling rotor toward the rest of our group. By the time we reached them the ship was lifting off and falling away from us back down canyon. The vibrating sense of chaos and purpose that attends helicopter shuttles went down slope with it. Suddenly it seemed weirdly

quiet. There was the ridgetop breeze blowing lightly out of the northeast, then Cook's mock-goofy voice saying:

"Welcome to Paradise, fellers. And not a moment too soon."

Cook had flown up first to assess the situation. We gathered around him for a quick briefing. Just east of us Sequoia's firepro crew was bringing fire down slope toward us. They were close enough that we could hear the occasional surge of fire torching a group of saplings or rushing through a patch of manzanita. I heard the burners calling back and forth to each other, a routine practice to avoid entrapment.

"Ok, listen up," Cook said. "Once firepro hands off the firing operation to us we'll be taking it down canyon toward the rest of the crew. The plan is to get a good deep blackline around the top of this thing and down the west line. That'll let the fire back down canyon through the Sequoia groves beneath us. We can expect some pretty hot runs from time to time as this thing fingers down slope then runs back up. That won't be a problem so long as we get a good deep blackline for it to bump into. Any questions so far?"

Nobody said anything. I looked back over my shoulder and saw Dave Hemrick, firepro's crew leader, standing on a granite loaf the size of a school bus. He was looking down slope and talking into a radio hung in a harness strapped across his chest. His lead burner emerged from a patch of manzanita a hundred feet below him, dabbing spots of fire in the leaf litter as she went.

Dewey and Cook clarified who would be burners and who would follow behind and hold the line. Dewey would coordinate the burners—myself, McClellan and Taylor. Owen would have the rest of the squad for holders.



As we worked down slope firepro would fall in behind us to provide additional protection against slopovers.

"That's it then," Cook said. "Let's get after it. Everybody stay heads up."

He turned and walked off down the west line to a good lookout point he'd noted earlier. The rest of us shrugged our packs into place and picked up our tools.

McClellan, Taylor and I followed Dewey out to the helispot where firepro's first burner was waiting to hand off her torch.

"Gray," Dewey said to me, "you're going to be our bottom burner. Take Cindy's torch and head down about three hundred feet. Lucky will be above you, and Taylor will light along the line up here with me. Talk to each other."

Dew and I walked the last few yards out to where Cindy waited.

"Ms. Champion, I presume," I said, tipping my hard hat.

"Yes," she said. "You do presume."

"We could chit-chat all day," Dewey said, "but Gray's got bushes and bunnies to burn. Top it off before you head down slope," he said, handing me her torch.

I refilled the drip torch from a five gallon jerry can before weaving down slope through chest-high manzanita. Three parts diesel for staying power, one part gas for flash. A few minutes later Taylor started burning the first twenty feet below a two foot wide line scraped to mineral soil and running down the ridge. Then Lucky made a pass with his torch below him, adding another fifty feet of depth to Taylor's blackline.

Finally, Dewey gave me the thumbs-up sign. I dabbed puddles of fire into the dead leaves and pine needles just above a game trail. The flames lifted into the limbs of the manzanita field, gathered there like held breath, then spread laterally as the field exhaled them upslope. The searing rush of heat made

me stumble downhill. The spot ran up into Lucky's fire in one sustained, red-orange shout. I climbed up again, steadied myself, and fired another spot. Taylor let out a long howl which the roar of my second fire segued into seamlessly.



Sequoia-Kings Canyon (SEKI) seemed a natural choice to host a national caliber experiment in prescribed burning, but my knowledge of the park's fire program was based on an uneasy mixture of direct experience and anecdote. Once the season wound down I arranged to interview a couple of the principals. In March I spoke with Ed Nelson, acting fire management officer at SEKI, and Steve Botti, budget officer for the entire NPS fire program, at the National Interagency Fire Center in Boise.

As the man who holds the purse strings, Steve Botti is a key player in NPS fire circles. Though his office allocates both suppression and prescribed fire monies, his background prior to coming to Boise was grounded in the prescribed fire program at Yosemite. I asked him what prompted this experiment and why Sequoia-Kings Canyon was chosen to host it.

"What prompted it," Botti said, "was the need to find out what the limiting factors really are on what we call an 'ecologically significant' prescribed burn program for a larger park, and how we would overcome those impediments.

"Sequoia is a good test case because there's probably more ecological knowledge on fire there than in any other park, so we know what the role of fire should be. We know that, even though they've been burning there for a long time, they've never even come close to restoring fire to its natural regime, which is their stated goal in their resources management plan (RMP). So we wanted to find out if [that goal] is feasible. If it isn't

feasible, then we document that and they would change the resources management plan to reflect some other vegetation management goal."

The ecological feasibility of Sequoia's fire program is well documented already, as we'll see later. The Mineral King project aims to quantify both the economic and the political sides of the equation. Feasibility in these contexts begins to reveal the multifaceted, and decidedly problematic, world in which fire managers live and work.

According to Botti, meeting SEKI's management goals as currently articulated in the RMP "would mean a very large expansion of the prescribed burning program there. We wanted to choose an area [for the experiment] that had some values at risk... What are the real cost benefits? How do we quantify those? That's always been a problem for fire management agencies. You intuitively know that if you burn an area of land and reduce the fuels, somehow you've reduced the fire danger. But how do you quantify that?"

The fiscal and environmental implications of full suppression attempts are forcing a dramatic shift in priorities among all federal agencies. We will discuss this in depth in the next sections of this essay. For now it is enough to say that the Mineral King project is, in part, an effort to display the budget-friendly face of prescribed fire.

"There is some economic research going on," Botti says, "to try to quantify what the park gains by prescribed burning from a hazard fuels standpoint. In other words, how much do they reduce the risks to those cabins at Atwell Mill? How much do they reduce the risk to those Sequoia groves, and how do we quantify that? How do you present that to the public, or to Congress, in a way that they can understand the benefits of that type of burning program?"



"The hope is that, if [the program is] successful, we'll be able to document why it's successful, how [SEKI] did it, the lessons learned, and pass those on to other parks so they can devise their own programs. Of course, [the resulting programs] won't be the same as the one at Sequoia, but the lessons will be transferable."

Transferable lessons are part of what SEKI's fire program has always been about. Sequoia has a history abounding with reasons for returning fire to its ecosystem. As the outsized fire scars on virtually every mature Sequoia testify, the species is fire tolerant. The most celebrated justification for prescribed fire at Sequoia, however, one that has been elevated in the retelling to an almost mythical status, is embodied in the tale of the Redwood Canyon Burn. Here an error in judgment yielded evidence that Sequoia are not simply fire tolerant, but the ecosystem itself is fire dependent.

Fire people are rivaled in their hyperbolic flights of fancy only by such legendary liars as loggers and fishermen. We are so given to the retelling of favorite fire events, and the inevitable tossing-on of kindling they occasion, that I refer to such as "reburns," episodes of exaggerated intensity owed to the consequences of the earlier event, but related to them only as the prodigal son is to his more prosaic father. Such is the case with the Redwood Canyon Burn.

As I heard it told, Redwood Canyon was the very first prescribed burn undertaken in Sequoia National Park, sometime back in the early sixties. In their naive confidence in the Giant Sequoias' fire tolerance, the burners, it is said, lit the canyon off at the bottom and let the fire run the two thousand feet to

the top of the ridge. The resulting fire raged upslope, crowning through the Sequoia stand, killing many of the giants.

To test the truth of this tale, I spoke to Ed Nelson—the venerable old man of fire at Sequoia, these same sources assured me. He's been around, they said, since the Grant Tree was a sapling.

As with many mythic figures, Ed was disguised as a mortal man the first time I spoke with him, standing at a switchback on the General's Highway a few miles above the park headquarters at Ash Mountain. He was demonstrating a unique lighting device he sometimes drops out the side door of a helicopter while flying over a brushfield in the backcountry that needs burning.

"See?" he said. "You pull this string and it lights a fuse inside this sleeve here, then you just drop it out the window and hope it lands in something combustible."

He tossed what looked like an eight inch length of clothesline into the grass at our feet. A few seconds later there was a popping sound, then a blossom of flame at one end of the line about like a book of matches going up.

"Actually," he said, stepping on the flame, "you have to toss quite a few of them out the window."

Ed Nelson, you can tell without counting his rings, is not nearly as old as the Grant Tree. Still, he started working on the park's fire crew as a seasonal in 1963, the same year the Leopold Report* came out, and he's been there ever since. His long-term commitment to the landscape is one of the reasons Sequoia's fire program has been a success. Let's take another look at the Redwood Canyon Burn as filtered through his memory.

To begin, the burn took place in the fall of 1975, not in the early sixties. Nor was it the park's first significant pre-

scribed burn. The park had been burning in the Redwood Canyon area since 1969, with earlier work of the cut-pile-burn variety reaching back into the late fifties.

Finally, and perhaps most important from the perspective of those involved, the burn was NOT lit off from the bottom. The unit was about 300 acres on an east facing slope. They began firing from the top of the unit, creating a blackline for the subsequent strip fires to run up into—the standard procedure. Strip widths, according to Nelson, depended on the steepness of the slope above them. The steeper the slope, the narrower the strips of fire.

As the burners moved down slope, their strip fires, running north to south, got wider. Why this happened is not clear. Nelson speculates that the burners were getting tired, and, being human, began making wider passes across the slope in an effort to finish the burn in a timely fashion.

What is clear is that the strips of fire that earlier had been less than two hundred feet below the burned area above them, suddenly widened to something nearer four hundred feet—roughly twice the prudent width under the circumstances. Equally clear is that this error in judgment proved among the most serendipitous in NPS history.

The hottest fire burned in a thirty acre patch of Sequoia thickly undergrown with Bear Clover and White Fir, which served as ladder fuels. The resulting conflagration raged upslope, severely scorching several of the largest Sequoia and killing many smaller ones outright. SEKI's nascent fire program was badly burned, too.

The park management was widely criticized by the scientific and environmental community for the "insensitivity"

*the famous report in which Starker Leopold and co-authors made a case for a let burn fire policy in National Parks and advocated retaining "vignettes of primitive America," a philosophy now ridiculed by some because it implied freezing parks in time



We have so thoroughly altered the fire-dependent ecosystems that it is difficult to ascertain what would constitute "natural" fires in the present circumstances.

of its burners. It looked for a time as though careers might be on the line. Over the next couple of years, however, thousands of Sequoia seedlings sprouted in the area. Now, those who criticized the burn in the seventies showcase it as evidence that Sequoia need a hot burn in order to regenerate.

Redwood Canyon is a classic example of how mistakes managers spend their careers trying to avoid sometimes yield the most important data. Nothing ventured, nothing gained. Despite the lessons of Redwood Canyon, a lot more "nothing" is being ventured out there than are risks being taken.

This is not an argument in favor of foolhardiness, but against timidity. The system clearly has to change to encourage risk-taking—indeed, to insist on it. An educated public that insists on fire policy reform might force less courageous managers into implementing their fire management plans. We would also provide cover for the many managers already trying to bring about change. A frustrated Forest Service manager told me recently that a single rancher calling his congressman is often enough to stop a prescribed natural fire in a wilderness area. Those who support fire never say anything, he told me. That has got to change.

I VISITED the Redwood Canyon Burn last fall. The area is so thickly undergrown with Sequoia fifteen to twenty feet tall that it is not possible to walk among them. I asked Nelson if there were any plans to reburn the area in order to thin the stand.

"There's nothing planned in there that I know of," he said. "It might be interesting to run a backing fire through there and see what happens."

The priority at present is to burn around areas that are considered "values at risk." Those include all developed areas and the big-name Sequoia groves, such as Grant Grove and General Sherman, and places like Giant Forest, which contains both giant trees and giant developed areas.

Nonetheless, what was learned in Redwood Canyon in 1975 continues to influence all burning done in and around Sequoia groves elsewhere in the park.

"Research," Nelson says, "is telling us that we aren't burning hot enough to perpetuate the [Sequoia] species. We have to do more of what occurred out at Redwood Canyon."

The need for pockets of hot fire poses interesting challenges for fire managers at SEKI. Nelson speaks of burns they've done south of the Sherman tree on the system of trails that run up away from the road. "Some of those areas we burned hot, but our researchers say we need some pockets of very hot fire, 10-30 acres in size" in order to stimulate the germination of new Sequoia. "Punching holes in the canopy," as fire managers refer to this, provides the open, sunny seed beds both pine and Sequoia need to regenerate and germinates the Sequoias' latent seed source in the duff layer.

This type of burning has a couple of obvious risks. First, "very hot" patches of fire of the size researchers are suggesting dramatically increase the chance of an escaped fire and all of the political hazards that involves. Equally problematic are the perceptions of an under-informed public. These hole-punching fires consume many large trees, some of them magnificent Sugar

and Ponderosa Pines hundreds of years old, the sight of which makes even dyed-in-the-wool fire dogs like me wince a little. It takes some doing to keep the larger goals in mind.

The willingness of SEKI's management team to take these risks makes of their efforts an ideal example of a successful fire program. The unwillingness to take such resolute action for fear of political consequences typifies the failure of fire programs elsewhere in the West. So long as we make heroes of fire managers who dither for decades, then jump into the breach with their unlimited budgets to fight the catastrophic fires their own incompetence and cowardice have fueled, we will get nowhere. It isn't a lack of science, but a lack of nerve, a lack of political backbone, that most plagues efforts throughout the United States to reintroduce fire into ecosystems that depend on it.

I know the notion of using fire as a management tool is abhorrent to many readers of this publication. To those of you who would let every natural fire run its course, I refer you to the quote from Nancy Langston's 1995 book, *Forest Dreams, Forest Nightmares*, which begins this essay. So-called natural regulation may be an ideal to strive for, but its complete implementation at present would be an unmitigated disaster which would almost certainly result in a public outcry and a return to full suppression. We have so thoroughly altered the fire-dependent ecosystems that it is difficult to ascertain what would constitute "natural" fires in the present circumstances. With the systematic treatment of unnatural fuel accumulations, which have resulted from a hundred years of suppression, we should, little by little, recreate the conditions that will allow free-ranging fire to produce something other than the stand replacement conflagrations that would likely result from an end to fire management at present. We will discuss this dilemma in detail in later sections of this report.

Sequoia has already weathered significant political spot fires with regard to its program, but it has contained them

and moved on. In addition to the fiasco surrounding the Redwood Canyon burn, SEKI's program was shut down for some time because of complaints from the public about the "black bark" that prescribed burning caused on Sequoia trees. These objections, which seem so absurd today, were supported at one time by the Sierra Club, among other environmental groups, and serve as quaint reminders of how far the NPS, particularly at SEKI, has moved public opinion in the direction of reality.

In many ways SEKI is in an enviable position. The park is surrounded at its lower elevations by a belt of explosively volatile chaparral brush fields, which can and do send fire storms racing upslope into one of this nation's rarest ecosystems, a fact that argues forcibly for an aggressive management-ignited prescribed fire (MIPF) program. Park officials can point to at least two instances when such fires, burning upslope with terrifying intensity, ran into old prescribed burns in or around Sequoia groves, dropped to the ground and were subsequently "caught" and corralled by fire crews. In 1987, the Pierce Fire came rushing up out of Forest Service land until it hit an old burn in the Redwood Canyon area and stalled. In '88 the Buckeye Fire ran up out of the Kaweah drainage above Ash Mountain and might well have taken out Giant Forest, but it too ran into a prescribed burn and lost enough steam to give fire crews a chance to get around it.

It doesn't take many such stories to convince Congress of what's needed to protect and perpetuate this one of a kind ecosystem. Indeed, both Nelson and Botti agree that hazard fuel reduction sells much easier to Congress, and the public, than do the subtler arguments about long-term ecological processes. Add to that a strong economic argument for a proactive burning program—the very thing the Mineral King Project is meant to demonstrate—and the future looks rosy for SEKI's program.

Nonetheless, SEKI managers have a long way to go before the park's fire regime can be considered natural again.

Research indicates that somewhere between 7000 and 20,000 acres burned annually in the roughly 900,000 acre SEKI area prior to the arrival of Europeans. The fire return interval was eight to twenty years. Though the RMP calls for a goal of replicating such acreage levels and fire return intervals, both Botti and Nelson stress that the park is nowhere near meeting those goals.

"This year we got around 8500 acres [burned]," Nelson says. "Of course, that's a combination of PNF [prescribed natural fire] and MIPF."

SEKI's PNF program benefits from a preponderance of natural barriers in the high country where it is implemented—a situation not replicated in many smaller parks, or, notably, at Yellowstone. Indeed, for this reason, SEKI officials let most natural fires that meet prescription burn with relative impunity. A Yellowstone-type scenario is far less likely to occur here.

The park is vulnerable to the other great leveler of fire programs—air quality concerns. Even here, though, SEKI's problems pale beside those of some other parks—Grand Canyon, for example.

So in many ways Sequoia-Kings Canyon presents a best case scenario for the reintroduction of fire on a large scale. There are abundant reasons for cautious optimism.

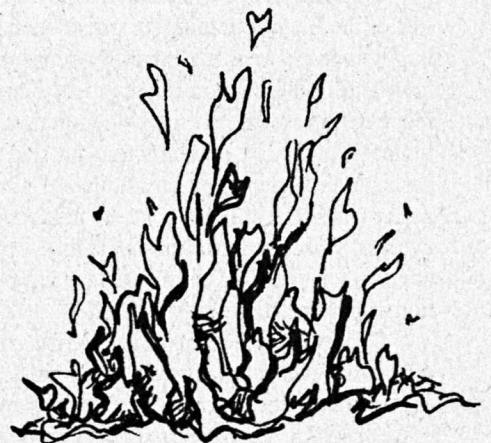
"We've made the argument," Botti says, "that if we can really address the fuels problems we can start to reduce these astronomical suppression costs. We've actually gotten money shifted over from suppression so that we have more to budget up front [for prescribed burning] at the same time that other [NPS] programs are being cut severely. Within five or ten years we're going to have to demonstrate that it's made a difference."

Botti feels that enough money is in place to move prescribed fire programs into the future, and his argument in some ways is convincing. He points out that the prescribed fire budget for the Western Region (California/Oregon/Washington) has come up from 250,000 dollars in 1994 to 1.25 million dollars

in 1996. But a look at the money allocated for the Mineral King Project is suggestive of the current balance; 1.25 million dollars over five years is supposed to carry Mineral King's 24,000 acre project, only about 400,000 more than was spent, for example, to suppress the 150 acre Berry Picker Fire at Crater Lake National Park in the summer of 1994.

For purposes of comparison, the cost of suppression across all federal agencies during 1994 was nearly one billion dollars. Numbers like these are driving the debate. ■

Robert Hunter Jones (Arrowhead Hotshots-Swale Center, Box 925, Kings Canyon National Park, CA 93633) will draw from his extensive and ongoing experiences with wildfire to report in upcoming issues of Wild Earth on efforts to return fire to its natural roles in Western ecosystems.



Wild and Prescribed Fire in Forests of the Intermountain West

A Policy Statement

by Joy Belsky

The paradigm on forest fires is shifting from one of fire as a destructive force, to one of fire as a regenerative force. Although most forest scientists have made this shift, most forest managers in state and federal agencies have not. They are still attempting to suppress fires in wilderness and roadless areas and to halt the natural cycle of renewal and re-growth in forests damaged by past fire suppression. They further damage forests while fighting fires by spraying toxic fire retardants near streams and bulldozing steep slopes and fragile riparian zones.

In order to encourage the US Forest Service and other agencies to adopt guidelines to fit our new understanding of fire in forested ecosystems of the Intermountain West, the Oregon Natural Resources Council (ONRC) has prepared its own fire policy. We are distributing it to members of Congress and the public to inform them of the role of fire in forest ecosystems, to the media to educate them about this paradigm shift, and to forest activists to encourage them to begin the process of educating their own members and the general public. Resistance to change is part of all large institutions, including the Forest Service. The public will have to exert steady pressure on land management agencies to force them to incorporate new ideas and behaviors into their decades-old but misguided policies. ONRC hopes to facilitate the process by issuing this fire policy statement.

Over a hundred years of logging, grazing, fire suppression, road-building, and development have resulted in widespread fragmentation and degradation of the magnificent coniferous forests of the Intermountain West. Many of these forests are recognized by the scientific community as being critically destabilized. Still, significant areas, including wilderness, roadless areas, and moist forests, remain relatively unchanged.

Originally, most Ponderosa Pine and mixed-conifer forests of the Intermountain West were open and park-like, with large, majestic trees underlain by dense grass swards. These low- and mid-elevation forests were shaped by millennia of recurrent forest fire, which helped maintain the forests' ecological integrity by reducing tree densities, controlling forest pests, and releasing a steady supply of nutrients into the soil. Many of the wildlife species in these arid Western forests evolved with fire-return intervals as short as 7-30 years and are dependent on the conditions created by fire for regeneration, rapid growth, food, and shelter.

Due to nearly a century of active fire prevention, fire-fighting, and livestock grazing, which eliminates the fine fuels necessary to carry low-intensity surface fires, ever greater numbers of tree seedlings and saplings have survived to maturity. Forests that were once open and park-like due to periodic thin-

ning by low-intensity ground fire now develop into dense thickets. During dry seasons and prolonged drought, these trees become stressed, limbs fall to the ground, and trees die. Consequently, dead woody debris accumulates and forests become increasingly prone to intense fire. Without periodic fire to reduce this fuel load and limit tree numbers, species composition of the forests changes from dominance by fire-tolerant, sunlight-loving species such as Ponderosa Pine and Western Larch, to dominance by fire-sensitive, shade-tolerant species such as Douglas-fir and true firs. These changes, in combination with selective logging of large, fire-tolerant trees, have created conditions in which many of the original park-like forests have been converted into dense, fire-prone, and increasingly disease- and insect-prone stands.

Nevertheless, many forests in the region have not been significantly affected by recent changes in the fire regime. Riparian forests and wetter forests on north-facing slopes and at higher elevations traditionally experienced fewer fires. And forest types such as high-elevation Lodgepole Pine and Engelmann Spruce-Subalpine Fir have always developed into dense flammable forests, which were periodically consumed by stand-replacing fires.

Because of drought, selective logging, high tree densities, high fuel loads, and the loss of a mosaic of burned and un-

burned forest stands, low-elevation forests and those on south-facing slopes are now more vulnerable to destructive fire, insects, and disease than they were formerly. The Oregon Natural Resources Council (ONRC) advocates that land managers initiate measures that mimic Nature in reducing fuel loads, so as to return forests to their pre-EuroAmerican-settlement densities and fire regimes. These activities include prescribed burning, thinning of small fire-sensitive trees, removal of livestock, a let-burn policy in some areas, and less destructive fire-fighting techniques. Salvage logging, as currently practiced, should be prohibited since it damages already disturbed soils, watersheds, and wildlife habitat. Despite pronouncements by the timber industry, commercial thinning and post-fire logging may not reduce the frequency of fire. In fact, these activities often increase the intensity and rate of spread of fire because of increased fuel loads from logging debris left on the ground. Consequently, salvage logging is incompatible with ecosystem-based management.

PRESCRIBED FIRE

The long-range goal of fire management policy should be to restore forest types, fire cycles, and habitat mosaics to those found before EuroAmerican settlement. For some areas, this is best achieved by manually igniting fires, which thin the understory and remove excess fuels.

- A region-wide, long-term plan for restoring Intermountain West forests needs to be developed. The plan should include a 30-year schedule of prescribed fire to reduce fuels, as well as district-by-district maps delineating areas targeted for a let-burn policy, fire prevention, or fire suppression.
- Priority for prescribed burning should be given to forests near developed areas (the urban/wildland interface), low-elevation or south-facing forests most transformed by past fire suppression, and areas with unnaturally high fuel loads.
- Where absolutely necessary to reduce ladder fuels that carry fire into canopies, small non-commercial trees may be thinned, lower limbs pruned, and litter raked away from large tree trunks and snags.

FIRE PREVENTION

Fire prevention should not be a goal of forest management in the Intermountain West except when human life and extraordinary ecological values are at stake. Since fire is an inevitable and ecologically essential component of forest ecosystems, managers should focus on restoring historical fire regimes.

- Artificial fire breaks should be constructed only where proven effective, and not at all in wilderness, wild and scenic rivers, roadless regions, municipal watersheds, or ecologically sensitive areas.
- Livestock grazing should be eliminated from public for-

ests and wild ungulates maintained within their year-round carrying capacities so that dry grasses can once again fuel low-intensity surface fires.

- Private property owners should be required to take measures to "fire proof" their property by clearing flammable vegetation, adding fire-resistant roofs and shutters, and taking other reasonable precautions. By choosing to live in or adjacent to wildlands, homeowners must assume the risk of protecting or replacing their property rather than relying on taxpayers through public funding of fire-fighting agencies.

FIRE SUPPRESSION

Fire suppression activities should be conducted only when absolutely necessary and with utmost care for the long-term integrity of the ecosystem. Low-impact fire-fighting techniques should be used.

- Fire suppression should be conducted only where human life, developed property, or irreplaceable ecological values (e.g. rare forest types or a major portion of the population of an endangered species) are at stake, or in areas that should be protected until prescribed burning can reduce excess fuels.
- Fire suppression should not be allowed in wilderness, wild and scenic rivers, or roadless regions, unless these areas have irreplaceable natural values *and* are scheduled for prescribed burning.
- Fires should not be actively fought where nearby natural fire barriers such as bodies of water or rocky ridges are likely to extinguish the fire.
- Due to the risk of de-watering, surface water should not be taken from small streams and lakes for fire suppression. Fire-fighting retardants and foams, which are toxic to fish and other aquatic organisms, should never be used near streams.
- Bulldozing and other forms of disturbance should be prohibited in stream channels, riparian areas, wetlands, and on sensitive soils and steep slopes.
- As much funding should be available for restoring natural forest ecosystems as for fire suppression.

POST-FIRE ACTIVITIES

"Restoration" activities such as salvage logging, grass seeding, bulldozing, and stream clearing may be as damaging to forests as fire suppression and should be prohibited unless proven effective and beneficial.

Note: Municipal watersheds should be evaluated for non-commercial thinning, prescribed fire, and fire suppression on an individual basis. These activities are appropriate for some, but not all, watersheds. ■

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Why Are Cougars Killing People?

Theories and implications

by Chris Bolgiano

Two photos: The first, of a human hand almost buried in forest duff except for long red fingernails. The second, of a Cougar with red-splotched fur lying limp on a lab table. These are lingering images from a presentation by the California Wildlife Forensics Laboratory at the Fifth Mountain Lion Workshop, held last February in San Diego. The hand belonged to a 120 pound jogger found half-eaten in a wooded park near Sacramento, California in April 1994. Eight days later a lactating Cougar weighing 82 pounds was shot nearby. The forensic lab matched bite marks, hair and DNA to confirm that this was the Cougar that killed the woman.

Both the woman and the Cougar left young behind, whose respective fates became a media circus that sensationalized the increasing number of Cougar attacks across western North America. From 1890 to 1970, Cougars killed five people in documented cases of unprovoked attacks, with two of those deaths considered indirect because they resulted from rabies rather than from wounds. From 1971 to today, Cougars have directly killed eight people, three of them in the 1990s. The number of verified non-fatal, non-rabid attacks rose from thirteen in the period 1890-1969 to at least thirty-six since 1970.

For more than a century, natural historians have refuted the folklore of early settlers, who portrayed the animal called Panther, Catamount, Cougar, Puma and Mountain Lion as a blood-thirsty menace. "His courage is not great," wrote John James Audubon in the mid-nineteenth century about the Cougar, "and unless very hungry, or when wounded and at bay, he seldom attacks man." At the beginning of the twentieth century, Theodore Roosevelt described Cougars as "abject cowards." In their 1946 classic, *The Puma, Mysterious American Cat*, Stanley Young and Edward Goldman wrote that "as a rule [the puma] is notoriously timid in relation to man." One of the words used most often by contemporary wildlife experts to describe the Cougar is "shy." So why are Cougars suddenly behaving in ways that are anything but bashful?

A better question might be, have Cougars really changed, or is the rise in attacks an artifact of human perception? Cougars are enormously powerful carnivores with a healthy measure of the unpredictability that characterizes wild animals. Shyness is the norm, but the historical record shows Cougars to be quite capable of treating people, especially children, as prey. Until the 1970s, the risk of attack was low because few people lived in Cougar country and most of them tried to kill every Cougar they could. At least one of those factors has changed dramatically.

*People have moved
with stunning speed
into areas where
Cougars live.*



The least disputed explanation for the rising tide of human-Cougar conflict is habitat invasion. People have moved with stunning speed into areas where Cougars live. For several decades the Mountain West has been the fastest growing region of the country; the density of people per square mile has almost doubled since 1970. During those same years Nevada had and continues to have the highest growth rate in the nation, followed closely by Arizona, Idaho, Colorado, and California.* More people mean more chances for encounters of the Cougar kind.

There is also no question that the attitude of newcomers tends to be more tolerant; many moved to rural areas precisely because they value wild places and the animals that belong there. For wildlife managers, this attitudinal change crystallized in the removal of bounties by the early 1970s and subsequent laws regulating trophy hunting. Argument begins with the interpretation of these changes.

Many biologists feel simple common sense dictates that Cougars *must* be rebounding since bounty hunting ended, and that expanding Cougar populations contribute to the rise in attacks. Cougars are hard to count, and field evidence to support this idea is spotty. Sightings are being reported in a number of areas where the cats were extirpated years ago, but sightings are considered unreliable. Some states have tallied rising num-

bers of legally killed Cougars and assume that this means there are more Cougars out there to kill; but new roads that give better access, snowy winters that make tracking easier, and greater numbers of hunters are never figured into the formula. A couple of years-long studies have quantified an increase in Cougars in those study areas, but track counts done elsewhere have been inconclusive.

Bounty records from 1910 to 1974 average out to thirteen hundred Cougars killed annually across western North America. Today, trophy hunters kill an average of two thousand a year. That number is higher now than it was in the 1970s, so there may have been a brief respite between the end of bounties and the growing popularity of trophy hunting that allowed more Cougars to survive.

On the other hand, it's been well established that Cougars don't multiply endlessly. They are considered self-regulating because of complex social dynamics that keep them sparsely spread across the landscape, even when prey is plentiful. Some biologists think that Cougar numbers haven't changed much through the twentieth century except in specific locales with particular circumstances.

The more widespread belief that the cats are teeming underlies the theory that Cougar habitat is fully occupied, and that young Cougars searching for territories are being pushed into

* *Science Ed. Note:* Growth rate can be measured in several ways. The statistics reported here reflect percent change in population density over some time period. Nevada leads under this measure, according to most calculations. For the decade 1982-1992, the top five states in terms of percent change were Nevada, Arizona, Alaska, Florida, and California, in that order (Noss and Peters 1995. *Endangered Ecosystems. Defenders of Wildlife*). Growth rate can also be measured as the net population gain per unit area. The five states with the greatest number of people added per square mile from 1982 to 1992 were Maryland, Florida, New Jersey, Delaware, and Rhode Island—all Eastern states (though California ranks sixth). Growth rate statistics must be interpreted carefully.

LEARNING A NEW LANGUAGE

HOW TO COMMUNICATE WITH A THREATENING COUGAR

With Cougars, unlike Grizzly Bears, the best defense is a good offense. The worst response to an approaching Cougar is to turn and run; this stimulates the cat's instinct to chase. A solitary person is at greater risk than people in groups. Children are most at risk because their small size and constant activity attract Cougar attention. Always keep them in sight while in Cougar country, and if a Cougar approaches, position older children behind adults and pick up small children. But don't crouch down to do so, because that makes you look more like prey.

Face the Cougar and maintain eye contact at all times. People who have been threatened by a Cougar report that the cat moved quickly toward them when they briefly looked away. Make yourself as big and menacing as possible by raising your arms and waving them slowly, or opening your jacket wide. Throw rocks, sticks, a pack or anything you can grab without bending down. Speak firmly in a loud voice. If there is higher ground you can reach without turning around, or a boulder or a tree you can put between you and the cat, move slowly toward it, but don't lose sight of the animal. Backing away carries the risk of stumbling and falling down. One wildlife researcher suggests smiling, which bares the teeth in a threat display. If an approaching Cougar stops, looks away, and starts to groom, return the courtesy by reducing your own aggression; but keep the cat at least in your peripheral vision.

Attacks most often come by surprise from a hidden Cougar. If you or someone you are with is attacked, don't fold up and play dead. Fight back with whatever comes to hand, or just with hands. Cougars have been repelled by resistance. —CB

less desirable areas. These include the edges of human developments, where the cats can get used to people. Based on these assumptions, many hunters and ranchers conclude that Cougars need to be hunted to control their population and to prevent their habituation to humans. Proponents of the habituation theory point out that many of the attacks have occurred in parks where hunting is prohibited. All of the five recorded encounters in Texas, for example, took place in Big Bend National Park, one of the few Cougar refuges in the only state that has never adopted restrictions on Cougar killing. Of course, parks concentrate people in the outdoors, increasing their risk of attack.

California lies opposite to Texas on the Cougar continuum, but it, too, has been used to illustrate the dangers of habituation. Until recently, California was the only state whose citizens expressed in law the view that killing Cougars for fun is wrong; Cougars have been protected there since 1972. [Oregon recently passed a law banning hunting of Cougars using dogs, which is the way Cougars are most commonly and easily killed. Wildlife proponents in several other states are now trying to protect large predators through ballot initiatives. —Ed.] It has also suffered perhaps the steepest rate of increase in attacks. With 200 people per square mile, California has more than double the density of any other state with Cougars (except Florida, where the Panther population is tiny and imperiled). The attacks have prompted some voices to call for removal of Cougars from public lands. Parents of a child who was severely mauled in an Orange County park successfully sued the county for harboring a dangerous animal without giving adequate warning. Potential wilderness advocates such as trail runners and mountain bikers joined hunters and livestock interests to try to remove the ban on Cougar hunting by ballot in March, 1996. They were defeated, but the influence of their ideas, particularly in rural areas, can't be voted away.

Evidence discrediting the habituation theory came from Vancouver Island (British Columbia), which has both the highest concentration of attacks and very heavy trophy hunting. Or so it was thought, until a presentation at the recent workshop showed that most attacks occur on the virtually un hunted western side of the island. Wildlife authorities there believe that the popular pastime of hazing Cougars on the eastern side—chasing them with dogs but not killing them—keeps the cats afraid of humans.

The wetter, western side is so densely vegetated that large prey is scarce. In addition, the island lacks many of the small animals, like porcupines and rabbits, that adult Cougars eat between deer kills and young Cougars rely on while learning to hunt deer. Some biologists speculate that these factors may make Vancouver Cougars more willing to attack anything that moves.

Studies of Cougars in desert, Rocky Mountain, rain forest and other habitat types show that different populations of the highly adaptable cat are capable of behaving differently in various environments. With so many variables, and so few attacks, it's hard to find patterns. (For perspective, keep in mind that dogs kill about twenty people every year and send 200,000 to hospitals.)

One of the few tenuous patterns emerging seems to be that the attacking Cougars are likely to be young. This can be interpreted as support for the full-habitat theory. It could also support another hypothesis that is counterpoised to, but not exclusive of, the habituation theory: that hunting by humans heightens Cougar aggression. Cougars live by a sophisticated land tenure system. When it's constantly disrupted by removal of the established adult males that normally kill some of their younger rivals, more adolescents may survive to fight over territories and food.

A number of Cougar researchers have come to the conclusion that trophy hunting has no biological justification, serving neither to control populations nor reduce the risk of attack. Several researchers are beginning to express concern about its impact on Cougar evolution. Trophy hunting is by far the single greatest cause of Cougar death. How does this profound exploitation influence the process of natural selection? The Inca carried out large circle hunts in which all predators caught were killed, but there is little other evidence of systematic, large-scale hunting of Cougars before Europeans arrived. For millennia, Cougars seem to have been shaped mostly by their own social codes, the presence of prey, and—as new research reveals—relations with neighboring predators. Only recently have scientific method, mind-set, and opportunity conjoined in the analysis of Cougar interactions with Grizzly and Black Bears, Gray Wolves and Coyotes. So startling are the early results that previous studies of Cougars in isolation have in some ways become suspect.

We have always thought of Cougars solely as predators, but they are also prey, and providers. Black Bears and Coyotes commandeer Cougar kills. So do Grizzlies and wolves, who also kill Cougars outright or track them to dens and eat kittens. Where Grizzlies and wolves are present, fewer Cougars survive than in adjoining areas without them. These co-predators have been absent across much of North America for many years, and there is speculation that without them Cougars have grown cocky. My own theory is that the best way to keep Cougars from overstepping the human tolerance for wilderness might well prove to be ecosystems populated by a full complement of native predators.

There is yet one more theory about why Cougars are killing people, one that does not carry the weight of science or even common sense. Instead, it packs the gut-level punch of nemesis. I first learned of it from graffiti on a Cougar warning in Henry Cowell Redwoods State Park in California. The large metal sign was stamped with capital red letters and lurid pawprints. In the margin, someone had scratched, "Give Thanks! The Goddess is Coming Back!" ■

Chris Bolgiano is the author of Mountain Lion, An Unnatural History of Pumas and People, Stackpole Books, 1995. She has written for many wildlife periodicals, including Defenders and Wilderness.

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Alaska: *The Wildlands Model?*

by Brad Meiklejohn

*By many measures,
Alaska's conservation
system works. Alaska
has fewer endangered
or threatened species
than any other state,
and no endangered
ecosystems.*

ALASKA MAY BE the world's best conservation model. The 49th state turns typical reserve design on its head. Instead of habitat islands in a sea of humanity, people inhabit "island cities" embedded in a matrix of wild land. Rather than ineffectual wildlife corridors between distant core reserves, Alaska's sparse road system connects distant human centers.

Alaska leaves lots of room for wildlife. Roughly 40% of the state's 365 million acres are in state or federal protected status. This system of parks, preserves, and refuges encompasses 25-50% of every major ecosystem type in the state (Phillips and Meiklejohn 1996). Seventeen habitat reserves are larger than Yellowstone National Park, ranging from the 2.5 million acre Yukon-Charley National Preserve to the 19.6 million acre Arctic National Wildlife Refuge. Many of the protected areas are contiguous, some forming wildland complexes in excess of 30 million acres. The international linkages between national parks and refuges in Alaska and Canada result in the world's largest protected areas.

Alaska's designated reserves are also buffered by millions of acres of de facto wilderness. Less than 5% of the state's land area has been altered by agriculture, industry, or urban development (Schoen and West 1994) and less than 1% of its wetlands have been lost or degraded (Dahl 1990). At one person per square mile, Alaska has the lowest population density of the United States. Seventy percent of the people live in three major cities, and at present only seven major roads connect these population centers. Much of the "unprotected" land is wilderness by default because it is inaccessible from the nation's lowest density road system.

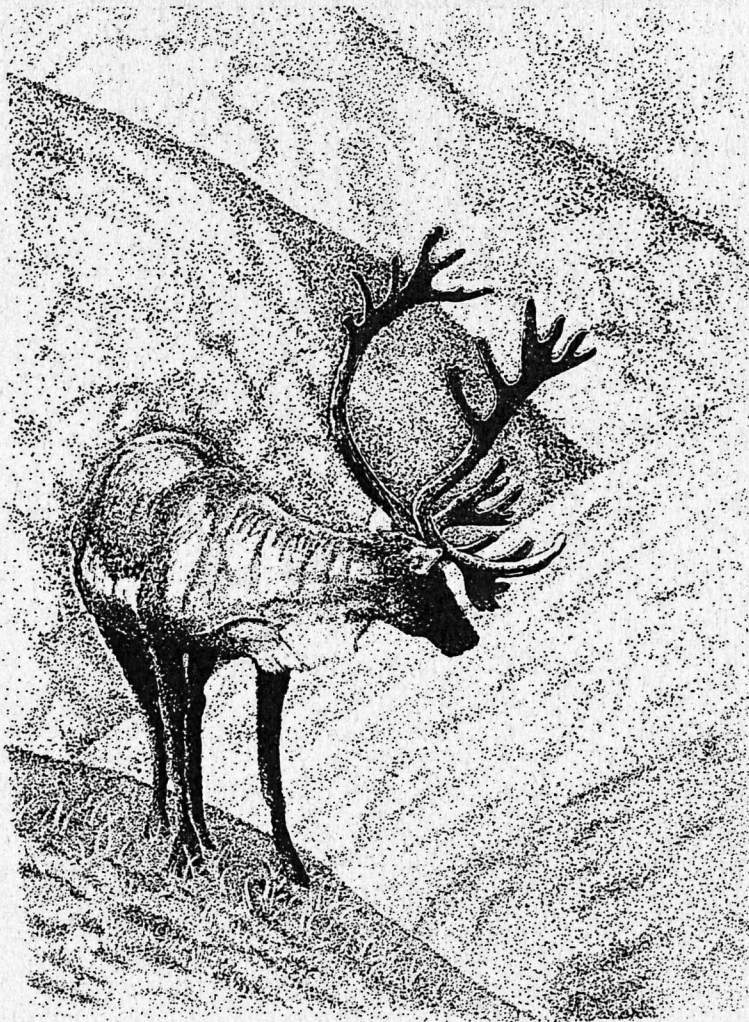
By many measures, Alaska's conservation system works. Alaska has fewer endangered or threatened species than any other state, and no endangered ecosystems (Noss et al. 1995). All of the state's large carnivores exist in viable, even abundant, populations. In fact, Alaska still retains most of its post-Pleistocene plants and animals in near-natural patterns of abundance and distribution. Alaska has an estimated 31,000 Brown Bears, 7500 Gray Wolves, and healthy populations of Wolverine, Lynx, and Coyote (Sydeman 1995). One million Barren Ground Caribou roam in 25 distinct herds, 100 million seabirds occupy coastal waters, 10 million waterfowl nest in the wetlands, and over 300 million salmon spawn in the rivers where 40,000 Bald Eagles eat the fish carcasses.

Alaska also retains viable populations of its native people. There are 96,000 Native Alaskans, roughly 16% of the total state population, and many are still engaged in traditional subsistence lives. Wild foods, harvested at generally sustainable levels, remain vital to the many Native villages scattered across "Bush" Alaska. Subsistence is still a viable way of life because of the extensive wildlands and abundant wildlife.

While biological integrity is Alaska's strong suit, biological diversity is low compared to temperate and tropical regions. Despite its size, the state has relatively* few endemic species. Most plants and animals found here are northern populations of species occurring further south; many others are circumpolar in distribution. Alaska has only two frog species, one toad, and no snakes. Only 33 tree species occur in the state, roughly half the number found in most states (Vioreck and Little 1972). Large portions of interior Alaska are low in biological productivity, and most of the region's mammals have broad ranges and low population densities. Alaska's extensive system of reserves is necessary to protect viable populations of highly migratory species such as Caribou.

WILD, BUT NOT PRISTINE

Despite the large amount of protected land and the remarkable wildlife aggregations, Alaska is not pristine. People have had major impacts on the distribution and abundance of wildlife populations. Musk Ox were extirpated by explorers and whalers in the mid-1800s, Northern Fur Seals, Ribbon Seals, and Pacific Walrus were severely reduced, and Sea Otters were nearly eliminated by Russian and American fur trappers** (Matthiessen 1987). The state, through various bounties and predator control programs, has manipulated population levels of wolves, bears, Wolverines, and even Bald Eagles in efforts to enhance "game" species. Caribou, though still abundant, have declined substantially in the past century, and several herds have been eliminated entirely (Leopold and Darling 1953). The Exxon Valdez oil spill of 1989 affected myriad species, from salmon to seabirds, and may have prompted the on-going decline of Harbor Seals in Prince William Sound.



The most severe ecological problems in Alaska have resulted from the introduction of alien and exotic species. In particular, the intentional and accidental release of rats and foxes caused the decline and disappearance of puffins, auklets, petrels, eiders, and Aleutian Canada Geese from many islands (Bailey 1992). The list of transplanted or introduced species bespeaks Alaskans' fascination with ecological tinkering. Roosevelt Elk, Sitka Black-tailed Deer, Bison, Mountain Goats, Reindeer, Beaver, Ring-necked Pheasants, Dall Sheep, Musk Oxen, Muskrats, ground squirrels, Northern Pike, Rainbow Trout, Ruffed Grouse, Marten, Bobwhite, Chukar, and even Moose have been shipped to new habitats around the state. Kodiak Island, with the highest density of Brown Bears in the world, has more non-native than native mammal species.

*Science Ed. Note: Gentry's calculations of endemic plants by state show 25 plant taxa endemic to Alaska, which is relatively high considering Alaska's latitude and even its size. Many US states have no plants endemic to their political boundaries.

** Musk Ox were reintroduced in 1930 and now number approximately 2200; Northern Fur Seal and Ribbon Seal populations remain low; Pacific Walrus are estimated at over 200,000; Sea Otters have recovered to nearly 150,000.

WILDLANDS FOREVER?

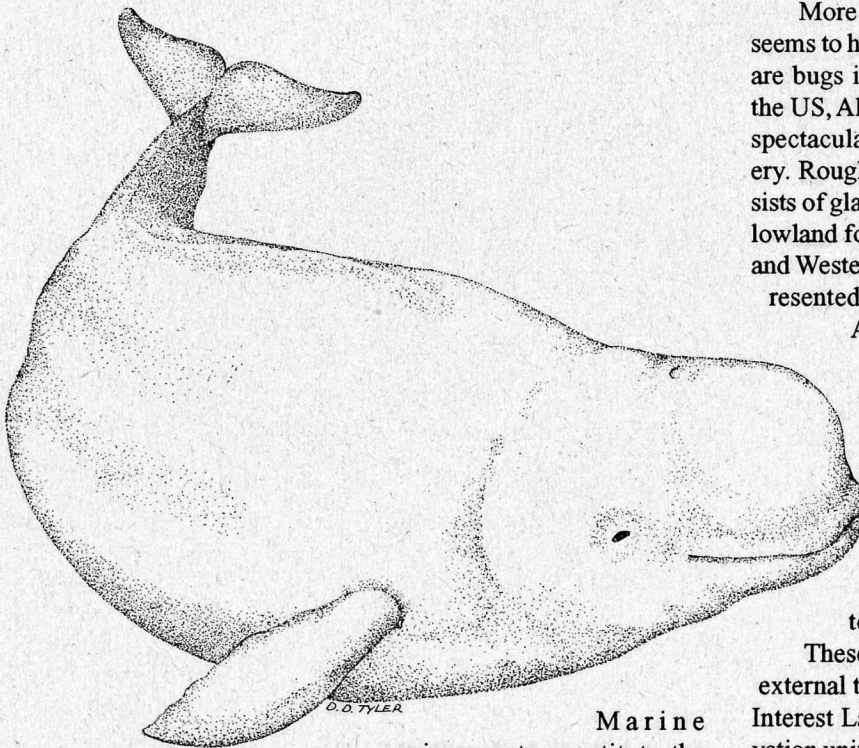
More than any other place in the world, Alaska seems to have a conservation system that works. There are bugs in the system, however. Like most areas in the US, Alaska's parks and refuges tilt heavily toward spectacular but comparatively sterile mountain scenery. Roughly one-third of the protected acreage consists of glaciers, bare rock, or alpine tundra. Productive lowland forest types, such as old-growth Sitka Spruce and Western Hemlock, are proportionately under-represented in reserves (USDA Forest Service 1991).

And again, despite the extensive system of terrestrial reserves, Alaska lacks a viable system of marine sanctuaries. Other "gaps" in Alaska's conservation system will probably be revealed by a statewide biological inventory, but this daunting project is far from complete.

It is too early to tell whether Alaska's conservation system will suffice to protect biodiversity for the long haul.

These habitat reserves face a host of internal and external threats. ANILCA, the 1980 Alaska National Interest Lands Conservation Act, created the conservation units for "the maintenance of sound populations of, and habitat for, wildlife species of inestimable value...including those species dependent on vast relatively undeveloped areas." Yet ANILCA left the door ajar for oil drilling in the Arctic National Wildlife Refuge (ANWR) and massive logging on the Tongass National Forest. ANILCA designated 57 million acres of Wilderness, but left these lands open to off-road vehicles, motorboats, and aircraft. ANILCA also virtually guaranteed that no additional federal parks or refuges can ever be created. From this point on, we are working to protect the integrity of what we have.

Over the next century the most severe impacts are likely to result from development of state-owned and Native-owned lands. The State of Alaska owns 103 million acres and is intent on logging, mining, selling, and developing much of that land. The State has proposed to build a giant network of roads reaching all corners of Alaska. Native corporations own 44 million acres and Native individuals own another 2.5 million acres. The Native lands are of particular concern because many lie within the boundaries of refuges, preserves, and parks. Every single conservation area in Alaska, from the Arctic National Wildlife Refuge to the Tongass National Forest, is checkerboarded with Native lands. In many cases Natives own the most productive river valleys, salmon spawning streams, prime stands of old growth, lakeshores, harbors, and estuaries.



Marine environments constitute the biggest gap in Alaska's conservation system. Of Alaska's 20 federally listed Endangered or Threatened species, 8 are marine mammals, 3 are marine turtles, 3 are seabirds, and 1 is an anadromous fish. Spectacled Cormorant and Steller's Sea Cow, two of the four species extirpated from Alaska, were marine animals (Sydeman 1995), and other marine species, such as Beluga Whale, Northern Fur Seal, Harbor Seal, and Red King Crab, are experiencing serious population declines. Among the current threats to marine ecosystems are offshore oil development, interactions between hatchery and wild-stock salmon, marine contamination, and overexploitation of marine fisheries.

Despite the opportunities for proactive conservation, the state seems mired in regressive wildlife management. The current state legislature has proposed "intensive game management" to control wolves and Brown Bears through sterilization, airborne hunting, trapping, and bounties. Similar legislation would curtail state funding for nongame programs such as bear viewing, endangered species research, and habitat conservation. The principles of conservation biology remain virtually unknown in this frontier state where the primary focus of the wildlife agencies is on increasing harvest levels of ungulates and sport fish.

Native ownership would not be a threat to conservation if Natives continued practicing traditional lifestyles. Alaska's animal populations are strong enough to allow subsistence harvests. However, Native corporations are increasingly driven to produce shareholder dividends, and Native individuals are increasingly attracted to a cash economy. Native corporations have been responsible for indiscriminate clearcutting of coastal rainforest, and Native individuals are eager to sell their 160-acre allotments to the highest bidder. It is now possible to buy prime habitat within any park or refuge in Alaska. Fortunately, cash settlements from the Exxon Valdez oil spill of 1989 have been used to purchase more than 250,000 acres of Native corporation land on Kodiak Island, and the acquisition of other lands in the spill zone is likely. The Exxon money, however, will barely touch the surface of the problem presented by Native inholdings.

Alaska is likely to be a very different place in 100 years. Climate and distance have so far protected the state, but the second wave of emigrating Californians has hit the shores of Southeast Alaska. Likewise, resource industries, in partnership with the state government, are eyeing Alaska's stores of coal, oil, timber, water, and fish. It has been said that Alaska offers the last chance to get it right. In fact, Alaska has it right—the challenge is in keeping it that way. ■

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Brad Meiklejohn is the Alaska representative for The Conservation Fund (9850 Hiland Road, Eagle River, Alaska 99577). He is working to purchase important bear habitat on Kodiak Island.



What You Can Do

Sad to say, US Representative Don Young and US Senators Frank Murkowski and Ted Stevens are representative of the majority of Alaskans. All three occupy powerful chairs on important congressional committees and in the past year have used their clout to mar the American environment. Alaskans broadly support their efforts to open the Arctic Refuge to oil development because, thanks to oil revenues, we pay no sales or income taxes and we annually receive roughly \$1000 each from the oil-generated Permanent Fund.

Alaskans resent "outsiders" meddling in Alaska's affairs, but 61% of the state belongs to all the American people. We need you to remind your congressional delegation that Alaska's fate should not simply be left for Alaskans to decide.

There are so many pressing environmental issues in Alaska that the dedicated cadre of conservationists is always stretched thin. The two largest battles at present center on logging in the Tongass National Forest and oil drilling in the Arctic National Wildlife Refuge. Contact the following grassroots groups to find out how to be most helpful on these issues:

Tongass logging:

**Southeast Alaska Conservation Council
419 6th St.
Juneau, Alaska 99802**

Arctic Refuge oil development:

**Northern Alaska Environmental Center
218 Driveway
Fairbanks, Alaska 99701**

Alberta Oil Rush

by Christopher Genoali

The biggest oil development scheme in the history of North America is about to commence in northern Alberta. Corporate investors are planning to put \$25 billion over the next twenty years into the mining of the Alberta oil sands. As a measure of the seriousness of the oil sands players, Imperial Oil, the largest Canadian oil company, has abandoned conventional oil development and is focusing solely on the oil sands. Formerly known as "tar sands," the oil sands are located in four main geographic areas of northern Alberta: Athabasca, Cold Lake, Peace River, and Wabasca.

The oil industry demanded and was given major tax breaks and sweetheart royalty regimes by the Alberta provincial government and the Canadian federal government for oil sands development. Under a new royalty regime recently announced by the province, companies will pay a minuscule 1% royalty on all oil sands production, in yet another larger-than-life Alberta style natural resource give-away. This is the same province where two of the most infamous transnational forest destroyers on Earth, Mitsubishi and Daishowa, were basically handed over 15% of the entire land base of Alberta, to convert boreal forest into pulp and chips.

The Alberta oil sands occupy a vast area in the boreal forest zone, about the size of New Brunswick. The oil sands are thought to contain approximately one-third of the world's oil resources; it is estimated that some 300 billion barrels of oil from the sands are ultimately recoverable, equal to or greater than the reserves of Saudi Arabia. The oil industry claims that the oil sand reserves hold enough recoverable oil to supply Canada for 200 years, and that by the year 2020, the oil sands will be producing as much as 1.2 million barrels a day, much of which will be exported to the US market.

The profligate consumption of natural resources by the United States, Japan, and western Europe continues to drive the destruction of Canadian wilderness. International trade agreements such as the US-Canada Free Trade Agreement (FTA), the North American Free Trade Agreement (NAFTA) and the General Agreement on Tariffs and Trade (GATT), supported by Canadian federal and provincial governments, will force Canada to feed the seemingly insatiable American, Japanese, and European appetites for pulp, timber, oil, natural gas, etc. For example, Article 409 of the FTA states that with regard to natural resources, even if Canada for whatever reason declares a shortage, it cannot impose restrictions on exports to the United States.

Additional pipeline capacity to the US market is in the works. Alberta environmentalists have raised questions about the environmental impacts of the proposed "Express Pipeline," as it is

The Taiga Rescue Network (TRN) is an international network consisting of over 120 environmental NGOs and indigenous nations working to preserve boreal forests worldwide. The boreal forests of northern Alberta are one of the TRN's campaign "hot spots," areas imminently threatened by clearcutting and industrial resource development. You can contact the TRN North American Center c/o Pacific Environment & Resource Center, Fort Cronkhite, Bldg. 1055, Sausalito, CA 94965.

What You Can Do

Write letters expressing your concern about the development of Alberta's oil sands to:

The Right Honourable Jean Chretien
Prime Minister
Room 309-S, Center Block
House of Commons
Ottawa, Ontario K1A 0A6

The Honourable Sergio Marchi, MP
Minister of Environment
Room 105-S, Center Block
House of Commons
Ottawa, Ontario K1A 0A6

planned to be routed through native prairie grasslands, a highly threatened ecosystem supporting more than 100 endangered species in Alberta. The company behind the pipeline project, the Alberta Energy Company, says the Express Pipeline is needed to provide an impetus for further oil sands development.

Environmentalists are calling on the federal government to include assessments of oil and gas export projects in the Canadian Environmental Assessment Act. Meeting projected export demand to the year 2000 would require drilling thousands of more wells. A report by conservation biologist Brian Horejsi of Western Wildlife Environments Consulting details the staggering scope of current habitat fragmentation in Alberta from oil and gas development: in total over 225,000 wells have been drilled to date; 1.5 million kilometers of seismic road access have been cut; 750,000 kilometers of all-weather road access built; and 500,000 kilometers of pipeline right-of-way cut—none of it subjected to provincial or federal environmental impact assessment. The existing threats to ecosystem integrity and wildlife population viability from widespread oil and gas development will be greatly exacerbated by the oil sands mega-projects.

The oil sands are located at various depths, from surface outcroppings to several hundred meters below the ground. Reserves at or near the surface are recovered by strip mining. Huge mounds of oil sand are excavated and moved by gargantuan trucks to extractors where the material is heated until the sand separates from the oil. On average, it takes two tons of sand to produce one barrel of oil.

Since opening its operation in 1978, Syncrude has excavated 1.5 billion tons of so-called overburden—the 20 meters deep layer of muskeg, gravel and shale that sits atop the actual oil sands—creating what may be the largest surface mine in the world. The deeper oil sands reserves are recovered by drilling horizontal wells and injecting massive amounts of steam far into the ground. Using this extraction method, it takes nine barrels of water to produce one barrel of oil. Alberta environmentalists report that a Shell Canada oil sands plant has dried up one lake and has so lowered the level of another that it froze solid, killing all the fish. Shell is currently taking enormous amounts of water from the Peace River for its oil sands production. There is serious concern about long-term adverse environmental impacts of the steam injection process (with its immense water requirements) on boreal hydrology. "The drying up of the boreal from oil sands development and processing, combined with global warming and increased fire patterns, will transform the boreal forest into a huge carbon bomb," says Gray Jones, executive director of the Western Canada Wilderness Committee's Alberta Branch.

Oil sands development produces four times more upstream greenhouse gas emissions than does development

of conventional oil reserves. Oil sands development is already the biggest single emitter in Alberta of sulphur dioxide, a component of acid rain and greenhouse gases. Petroleum operations in Alberta and nearby parts of British Columbia constitute the second largest source of sulphur emissions in North America, next to the industrial regions of eastern Canada and the United States.

So what has been the response of the far right Alberta provincial government? Premier Ralph Klein's solution has been to slash the budget for the provincial Environment Department. In the next three years the Klein government will cut 500 jobs from the department and reduce its budget by \$164 million.

Oil sands development will directly affect indigenous peoples in the boreal forest, overlapping much of the 10,000 square kilometer unceded traditional territory of the Lubicon Cree. The Lubicons are already struggling to preserve their homeland from industrial forestry, conventional oil and gas development, and the political machinations of a racist provincial government.

As oil sands development accelerates, enormous areas of boreal forest will be stripped bare and excavated, destroying biodiversity and substantially increasing the emission of greenhouse gases. Oil sands development is the latest industrial attack on the boreal forest, which has been under siege by transnational corporate clearcutters such as Mitsubishi, Daishowa, Weyerhaeuser, Louisiana Pacific, and Repap. Boreal forest covers over a third of Canada's land mass. Roughly two-thirds of Canada's boreal forest is under long-term tenure to timber companies for the purpose of liquidation logging. With its shallow soils, harsh climate and slow growing season, the boreal forest is especially vulnerable to the ravages of clearcutting and industrial development.

As well as being important carbon sinks, boreal forests also store vast amounts of frozen methane in the permafrost zone, a greenhouse gas 20 times more powerful than carbon dioxide. When boreal forests are clearcut, the micro-climates are affected, which in turn can affect regional climate. Loss of forest cover and higher temperatures may thaw and cause retreat of the boreal's frozen peat lands, releasing methane. The more methane released, the warmer the climate becomes, and the greater the northward shift of the permafrost zone. Even a warming of one degree Celsius has the potential to eradicate 25% of the boreal forest. Climatologists forecast the boreal forest will be reduced by 50 to 90% in the next century, being widely eliminated west of James Bay. Given this scenario, one has to wonder if the development of the oil sands will be the final nail in the coffin of Alberta's great boreal forest. ■

Christopher Genovali is the North American Coordinator for the Taiga Rescue Network.

Blowdown in the Adirondacks

by Mike S. Stevens

Windfalls are so common and so ordinary that it seems statistically impossible for a stand to remain untouched for more than a few centuries. Windfall is as natural an event as can befall a forest.

—Barbara MacMartin, *The Great Forest of the Adirondacks*, 1994

Let the unsalvaged timber serve an educational purpose. If proponents of 'forever wild' think that letting nature take its course is such a fine idea, then let the public see the results of poor management, i.e. waste and general ugliness.

Editorial, *Northern Logger and Timber Processor*, 1995

Disturbance triggers conflict. On 15 July 1995, an intense cyclone-like storm blasted the western side of the Adirondack Park with winds over 100 miles per hour. Nearly a million acres within the Park were affected, and thousands of trees were blown down.

Two sets of issues central to the management of wildlands emerge from the debris of the Adirondack storm. These issues and the questions they raise are analogous to those that emerge after any large natural disturbance, whether it be a Yellowstone fire or Mississippi flood. The first set of issues concerns our understanding of the ecological role of the storm. Citizens, politicians, and land managers need to know the answers to some basic questions. Are large, "catastrophic" events like the July 15 blowdown a natural component of the ecosystem? What actually happens to the ecosystem in a blowdown? Will the ecosystem recover on its own?

This article deals with the ecological aspects of the July 15 blowdown, and is based on field research in the Five Ponds Wilderness I am doing as part of a Master's thesis. However, I have drawn extensively from invaluable work done by Jerry Jenkins for the Wildlife Conservation Society (Jenkins 1995), and by the New York State Department of Environmental Conservation's Ecological Assessment Team (DEC 1996).

The second set of issues concerns the human reaction to a large natural disturbance. Both conservation and utilitarian perspectives, reflected in the above quotations, are represented strongly among the people within the Adirondack Park. The blowdown essentially has been a test of whether existing political and legal processes can serve the goals of wildland protection and recovery. The companion article by Michael DiNunzio of the Adirondack Council addresses the legal and policy issues that emerged after the blowdown.

THE ECOLOGICAL SETTING

The Five Ponds Wilderness Area in the western Adirondacks lies at the heart of the most intense storm impact. From a hilltop lookout above the Five Ponds, one can see what may be the most unusual forest landscape in the Northeast—a large, continuous area of forest that has never been logged. Purchased by the State of New York in 1896, these 50,000 acres of old-growth Eastern Hemlock, White Pine, and northern hardwood forests, rolling hills, lakes, streams, and wetlands form the core of the Five Ponds Wilderness. The upland forests in the core of the Five Ponds range from open groves of large White Pines and Eastern Hemlocks reminiscent of Western forests to mixed stands of maples, birches, American Beech, Red Spruce, and Eastern Hemlock with an abundance of saplings crowding the understory.

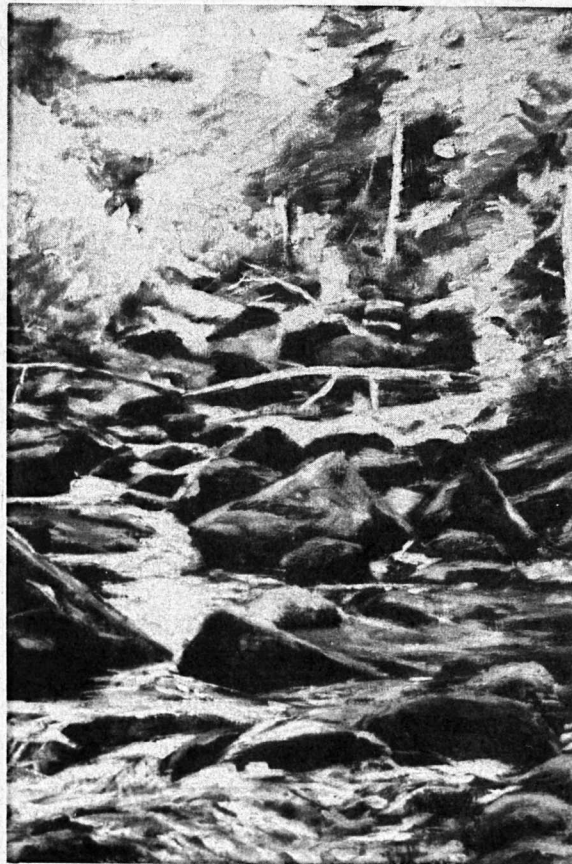
While most old-growth stands in the Northeast are small, isolated fragments, the Five Ponds is big enough to contain a diversity of landform and vegetation types and represents the closest approximation of the presettlement landscape in the Northeast.

Moving out from this core, one travels through a spectrum of human impact. For example, as one travels north from the Five Ponds, the old-growth forests transition to second-growth forests which were cut once between 1904 and 1912. The upland second-growth forests are dominated by a canopy of Sugar Maple, Red Maple, and American Beech; Black Cherry, a species indicative of past disturbance, is common. Conifers, like Red Spruce and Balsam Fir, are conspicuously absent outside of the wet, low areas where they dominate. The loss of conifers from upland hardwood stands is a common legacy of logging in the Northeast. North of this second-growth area are the village of Wanakena and the managed and planted stands of the Wanakena Ranger School, run by the State University of New York's College of Environmental Science and Forestry in Syracuse.

THE HISTORIC PRECEDENT

The 1995 storm is only one of a long string of windstorms that have shaped the forests of the western Adirondacks. The Adirondacks have "historically been affected by recurrent windstorms of magnitudes comparable to the 1995 storm" (DEC 1996). Other historic blowdown events include those of 1805, 1815, 1845, 1888, 1916, 1950, and 1984 (DEC 1996; MacMartin 1994). Land surveys of the Adirondacks made between 1795 and 1825 indicate that, at any one time, about 5% of the presettlement Adirondack landscape was occupied by recent windfalls and areas of fallen trees (Cogbill, unpublished data, in DEC 1996). Though each storm varies in its geographic impact, cause, intensity, timing, and effects on vegetation, it is clear that windstorms are a part of life in the region.

Studies from other parts of the northern hardwoods region support a view of wind as an influential and recurring agent of disturbance. In the presettlement forests of Wisconsin, which constituted the western extension of hemlock-White Pine-northern hardwood forests, Canham and Loucks (1984) estimate a 1210 year blowdown return interval for the average site. They state that "catastrophic windthrow maintained at least 17-25% of the presettlement landscape in forests of successional composition and structure."



In northeastern Maine, presettlement land surveys suggest that windfalls occupied 2.6% of the presettlement forest and the average recurrence interval for large-scale windthrow was 1150 years (Lorimer 1977). Lorimer estimates that 16% of his study area would have been comprised of young forests less than 75 years old, and an additional 25% would have been less than 150 years old. Just 59% of the landscape was climax forest with a mix of age classes.

Henry and Swan (1974), after a detailed historical reconstruction of an unlogged stand in the Pisgah Forest in New Hampshire, concluded "that disturbance in the Pisgah Forest was the predominant occasion for change and that autogenic processes did not cause any significant alteration of forest composition over the 300-year history... Tranquility does not appear to be an important mediator for change, but external events (fire and windstorms) are extremely important."

What makes the western Adirondacks susceptible to windstorms? Likely reasons include 1) relatively flat terrain which allows rapid movement of storms and winds, 2) the region's continental position near relatively frequent storm tracks, and 3) susceptibility to blowdown of shallow-rooted Red Spruce and Balsam Fir, which dominate large areas of low, wet terrain (DEC 1996).

WHAT DID THE STORM DO?

The July 15 storm was a *derecho* (the Spanish word for straight ahead). Derechos are a complex type of thunderstorm that repeatedly create downbursts as they move along (Williams 1992). Derechos have wind speeds of at least 58 mph and spread damage across an area at least 280 miles long. Simply stated, they are caused by the vertical mixing of warm, dry air with moist, cool air.

Cooled air, which is heavier, plunges to the ground with the added momentum of the fast winds pushing the entire storm (Williams 1992). These downbursts are what toppled and snapped trees in the Adirondack Park.

The storm affected both private and public lands in the Park. Of a total 968,000 affected acres, 430,000 acres (44%) are within the state-owned Forest Preserve, 6700 acres (0.7%) are other state-owned lands, and 532,000 acres (55%) are pri-

vate lands. Based on aerial surveys, DEC characterized storm damage as low (0 to 30% of trees damaged), medium (30 to 60% of trees damaged), or high (60 to 100% of trees damaged). Of the total acreage damaged, 85% is classified as low damage, 11% as moderate damage, and 4% as high damage.

Media reports on the July 15 storm might lead one to think the blowdown flattened the entire Park. In fact, the patterns of storm impacts are complex and vary with the imagery and scales used to assess them. Even within the 20-meter radius circular plots I used in my research, storm damage varied from one part of the plot to another.

As anyone who has walked through Five Ponds since last July 15 will tell you, there *are* areas of intense damage where nearly all the trees have been uprooted or snapped. However, many of these patches are bordered by areas where the forest is mostly intact. Of 49,000 acres of old growth in the Five Ponds Wilderness Area, 78% is mapped as low disturbance, 15% as moderate disturbance, and 7% as severe disturbance (DEC 1996). So even within one of the hardest hit areas of blowdown in the Park, most of the forest has only been moderately affected.

The ecological assessment of the blowdown conducted by the New York State Department of Environmental Conservation (DEC) reveals a variety of storm impacts. The DEC's findings include:

- soil productivity not impaired;
- possibly increased acidification of lakes and streams due to release of nutrients in watersheds with substantial blowdown damage;
- regeneration processes still intact, or may be speeded up by the blowdown;
- very little impact to rare ecological communities, including wetlands and old-growth northern hardwoods;
- only limited conversion of ecological communities to other types;
- short-term and/or localized increases in nonnative species;
- potentially-adverse impacts of canopy removal on rare woodland species, such as Ram's Head Lady-slipper (*Cypripedium arietinum*);
- either positive or no effects on mammal populations;
- potentially both positive and negative impacts on deer;
- no long-term impacts on rare nesting birds, such as Bald Eagles, Spruce Grouse, and Osprey;
- possibly negative impacts on Brook Trout populations due to blockage of streams by blowdown debris, siltation of gravel spawning beds, and changes in stream conditions due to lack of forest cover along some stretches;
- increased populations of borer beetles and bark beetles in blowdown trees, but unlikely that these beetles will infest adjacent healthy trees;
- increased populations of decay fungi.

A Legacy of Wildness

New York State's Forest Preserve

by Michael G. DiNunzio

With a few minor exceptions, the New York State Forest Preserve consists of all lands owned by the State in twelve Adirondack and four Catskill counties. Formed by statute in 1885, the Preserve now totals nearly three million acres.

Most of the Forest Preserve lies within the boundaries of the Adirondack and Catskill Parks, each of which is characterized by a patchwork pattern of ownership that is roughly 60% private land. The Adirondack Park holds the bulk of the Preserve, some 2.5 million acres of mountains, rivers, lakes, and forests.

The Forest Preserve is a legacy of wildness, passed on from one generation of New Yorkers to another for more than a century. This legacy is guarded by an amendment (Article XIV) to the New York State constitution, passed unanimously by the delegates to the constitutional convention of 1894 and ratified by the voters that year. The core of this amendment, virtually unchanged over the course of five generations, states that the Forest Preserve "...shall be forever kept as wild forest lands. They shall not be leased, sold or exchanged, or be taken by any corporation, public or private, nor shall the timber thereon be sold, removed or destroyed." The "forever wild" provision of the New York State Constitution stands as the strongest legal defense of wildlands in the world.

The Adirondack Park is home to 130,000 people who live there year-round and about as many who stay seasonally in vacation homes and camps. Roughly 10 million visitors come to the Park each year in search of recreation, solitude, and various other pursuits centered largely around the abundant natural amenities of the region. Over 100 communities serve the needs of residents and visitors alike. And roughly two million acres of private forest land provide jobs, recreational opportunities, and other open space benefits that complement the Forest Preserve. Private land use and development in the Park is regulated by the Adirondack Park Agency, which also provides oversight of state management of the Forest Preserve by the Department of Environmental Conservation.

The way protected wildlands are integrated with human communities and privately-owned "working forests" in the Adirondack Park is fundamentally an effort to sustain the myriad public and private values of the region. It is a delicate balancing act, fraught with controversy and ambiguity. And it is a constantly evolving model which is buffeted by the winds of political and social change.

Despite the seemingly unambiguous language of the state constitution prohibiting timber in the Forest Preserve from being sold, removed, or destroyed, attempts to undermine and circumvent Article XIV abound. Perhaps the most egregious example of such an affront, and one that bears directly on the issue at hand, resulted from the state-sponsored "salvage" of the Forest Preserve following the blowdown of November 1950.

Official estimates of damage from the 1950 wind storm, which was the worst such storm of record in the state, tallied some 250,000 acres of Forest Preserve and about 170,000 acres of private land that suffered in excess of 25% blowdown. The threat of wildfire in the blowdown, along with the desire to "clean up the mess" while providing some jobs for loggers, prompted calls for a massive salvage effort on the Preserve. The opinion of the state attorney general was sought, and he quickly determined that the dead trees could be removed to lessen the fire danger, but that the trees could not be sold without an appropriate act of the legislature. The legislature soon acted, and "Operation Blowdown" commenced in 1951. By the spring of 1956, when Operation Blowdown finally concluded, pulpwood and sawtimber had been salvaged on about 80,000 acres of the Preserve. Subsequently, there were virtually no wildfires of consequence in the unsalvaged Forest Preserve; and the state lost money on the operation. More important, activities associated with timber salvage resulted in reopening nearly 86 miles of truck trails, reconstructing 184 miles of telephone lines, opening 139 miles of trails to observation towers, and opening over 21 miles of new truck trails to the Preserve. It is instructive to note that there is no legal authority to "waive" provisions of the state constitution, even in so-called emergency situations.

Following the blowdown of July 1995, the initial response by public and private emergency personnel focused appropriately on public health and safety issues. But these actions were soon followed by cries from some quarters to ignore the constitution and, as in the 1950s, to salvage timber on the Preserve. Fortunately, this time calmer heads prevailed, prompted in part by stern warnings from the environmental community and others that a repeat of Operation Blowdown would be challenged in

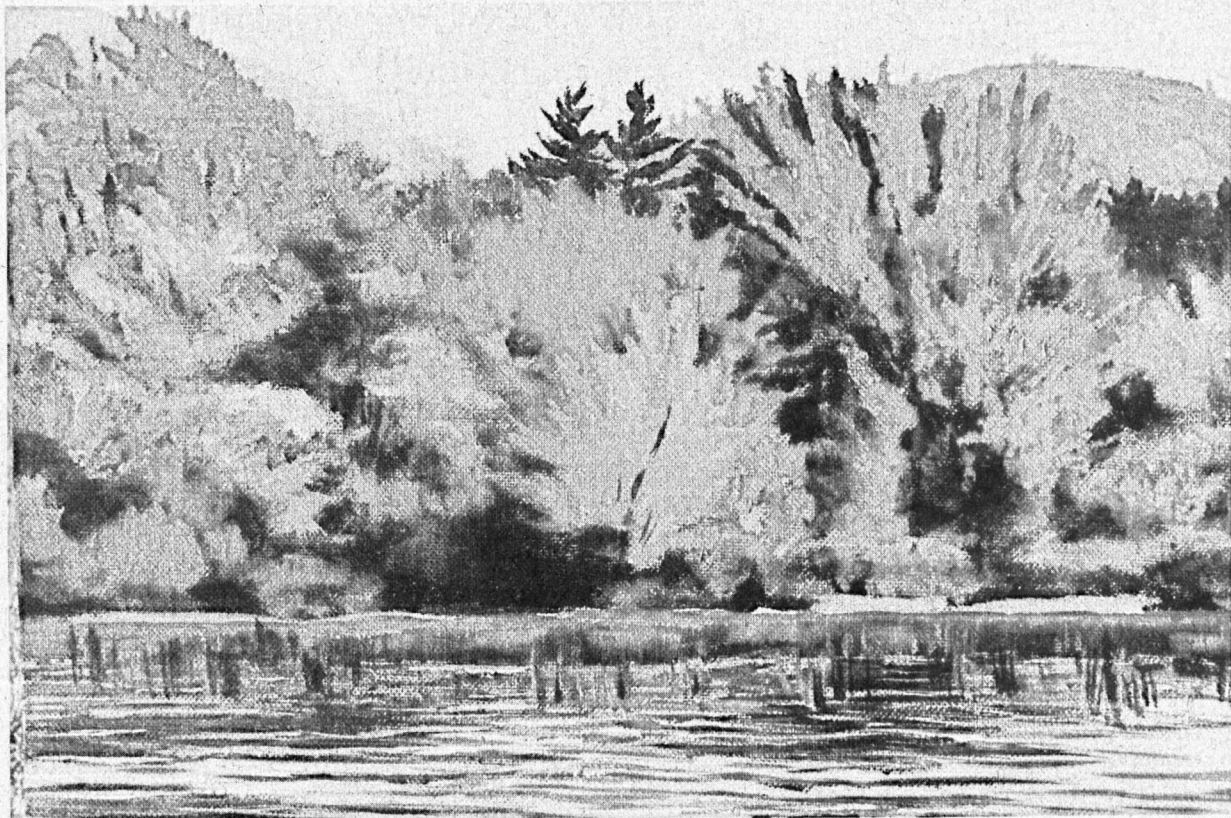
court. The Department of Environmental Conservation undertook a thorough internal assessment of storm damage and established a broad-based public participation process to advise the Department in drafting an appropriate response to the windstorm.

Some key provisions of the final storm response plan are:

- No salvage of timber will take place on the Forest Preserve.
- Lower the potential of fire from dead and downed trees in high risk areas around public and private structures, public campsites, and along trails and public roadways by cutting small (less than one inch) branches and limbs and leaving them on the ground where they will decompose rapidly. No such wood is to be removed from the Preserve.
- Progressively restrict use of and access to affected public lands as the danger of fire increases, through public education and restrictions on open burning, encouraging extraordinary care with smoking and camp fires, and by prohibiting public use in areas where fire danger is extreme.
- Establish an aerial detection system using overflights, for early detection of fires.
- Station fire detection and suppression equipment and supplies at appropriate staging areas.
- Develop and implement an expanded fire prevention and control training program.
- Assure emergency access to affected areas by reopening trails and roads blocked by the storm, for their originally intended purposes.
- Use the Unit Management Planning Process, including full public participation, to decide on trail closing or major trail relocations.

The most recent battle to uphold the constitutional protection of the Forest Preserve against misguided, illegal attempts to salvage blowdown has apparently been won. But it is only one battle among countless others that have been fought over similar issues during the past century and that will no doubt be fought long into the future. Constant vigilance, and the willingness to partake in advocacy and legal action if necessary, is required to prevent losses of irreplaceable wildland values. We must all work together if we hope to safeguard the public lands of the Forest Preserve as a legacy of wildness for all time. ■

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This general list characterizes the impacts within the Five Ponds area well, with one exception. The large size, geographic continuity, and lack of roads that characterize the Five Ponds Wilderness mean there are few corridors for invasion by non-native plant species. Jenkins (1995) reports only four weedy plants in the upper Oswegatchie basin, which comprises much of the Five Ponds. In addition, protection from major human disturbance for the last 80 years has allowed the forests to reach mature stages where early-successional species like aspen and Gray Birch are rare. There will likely be minimal if any increases in the number and abundance of non-native species in the Five Ponds. Forest regeneration will be dominated by the bank of seedlings and young trees that were established before the storm. Most of these are species like American Beech, Red Spruce, and Red Maple that already dominate the canopies of most Five Ponds forests.

A DYNAMIC DEFINITION OF OLD-GROWTH

The Five Ponds Wilderness Area is famous for its large, old White Pines, Yellow Birches, and Eastern Hemlocks. Many of these trees were blown down in the storm, to the dismay of people who have long admired and visited them.

Due to natural disturbance, some of the sampled old-growth portions of the Five Ponds do not look like old-growth. One site I sampled, located on Partlow Mountain, lacked all but a few live, mature trees and was dominated by a dense thicket of 5 to 8 meter-high American Beech. Most of the big-

gest trees, what should have been the canopy, had been killed by the 1995 storm or had fallen to the ground in previous isolated events.

The question becomes: is blown-down old growth still old growth?

Most biologists would agree the answer to this question is yes. According to Charlie Cogbill, an expert in Eastern old growth who conducts research in the Five Ponds, blowdown effects appear to be necessary for the continuation of old-growth characteristics. The effects include differential survival of trees leading to a range of tree sizes and ages in the stand, opening up of the canopy, accumulation of deadwood on the forest floor or as snags, recycling of accumulated organic material and nutrients, and creation of a variety of gap environments at a landscape level (Cogbill, pers. comm. 1996).

Most definitions of old growth focus on the great age of the trees in question (see Davis 1996, for a full discussion of old-growth forest definitions). In a survey of old growth in the Adirondacks, Leopold et al. (1988) offered the following definition for old-growth forests:

1. The (forest) structure is heterogeneous and includes a mosaic of canopy gaps of variable size with corresponding woody debris and tree regeneration within the gaps.
2. The stand must have an intact and undisturbed ground layer with no evidence of selective or clearcut logging, clearing, planting, exotic species, or other evidence of human activity.

3. The minimum acceptable size for an area with homogeneous composition is 8 hectares.

4. The stand age is approximately half the average maximum life span of the dominant tree species. In the Adirondacks, this translates into a median stand age of 150 years (Woods and Cogbill 1994).

The Partlow Mountain site I describe above reinforces the importance of process and scale, in addition to age, in determining what is old growth. Taken alone, the site might not qualify as old growth. Many of the heavy blowdown gaps in the Five Ponds would not. But when observed from a larger scale (hundreds to thousands of acres), these sites are seen to play a crucial role in maintaining the old growth and characteristics of the entire landscape.

WILL THE FOREST RECOVER ON ITS OWN?

Before one of my trips to do research in the Five Ponds, I stopped at a large hiking and camping equipment store to buy a fresh topographic map of the area. In a conversation about the blowdown, a retail clerk expressed her concern that the big trees were all blown down and that only time would tell whether the forest would grow back. Her statements were troubling because they are reflective of the opinions of many people in the area.

I have found no evidence, either through direct observations in the field or through a literature review, that suggests forests in the Five Ponds will fail to regenerate. Although severe disturbances may occasionally degrade a site through lower water availability or disruption of nutrient cycling, there is generally a positive relationship between a disturbance event and the availability of resources for plant growth (Canham and Marks 1985).

The tree species of the northern hardwoods are well-adapted for a disturbance like the July 15 storm. The diversity of strategies employed by the bank of seedlings and saplings unaffected by the blowdown ensures that tree regeneration will occur. In areas of low damage, remaining trees will expand their canopies. Even in areas classified as having heavy damage, American Beech, Sugar Maple, Red Maple, Yellow Birch, and Red Spruce saplings in the understory layers were frequently left intact; they will experience greater light regimes and probably accelerated growth rates. Other regeneration mechanisms include: stump and root sprouts, common in American Beech and Striped Maple; seed germination; and cloning (Bormann and Likens 1979).

SUMMARY OF THE ECOLOGICAL ASPECTS OF THE STORM

- The damage is patchy. Areas of intense, nearly complete blowdown are frequently surrounded by patches of low to no blowdown damage.
- The forest will regenerate on its own. In areas of intense damage, many saplings and seedlings remain and they will form the next generation of canopy trees.

- In the Five Ponds Wilderness, species composition will undergo little change, since saplings and seedlings are generally of the same species as previous canopy dominants.
- The blowdown debris will decompose into the forest floor and enrich the soil.
- The numerous tipped-up trees expose a diversity of soil horizons and increase microtopography, enabling trees with a diversity of germination requirements to get established.
- Forest processes have not been fundamentally altered. The blowdown is a fundamental forest process. This event simply occurred at a large scale and in a short period of time.
- Blown-down old-growth stands are still old growth.
- At a landscape scale, the blowdown helps diversify and maintain the features of the presettlement forest.

THE HUMAN REACTION

For the human communities hit by the storm, the winds were destructive. Five people were killed and more than 1000 residences and farms sustained structural damage. Repair costs for park facilities like campsites, trails, and parking lots alone are estimated to be between \$4 and 5.5 million. Blowdown debris around houses and farms may well constitute a fire hazard and should likely be cleared.

While little debate surrounds efforts to return people's lives to normal, questions about forest management on private timberlands (the buffers) and the state-owned Forest Preserve (the core reserves) in the aftermath of the storm generated an intense debate. The two major issues revolve around salvage logging and the possibility of wildfires. I present a brief overview of much fuller discussions found in the referenced DEC and Jenkins reports.

Certainly, the blowdown poses a challenge to commercial forest managers. Roughly 500,000 acres of private lands in the Adirondack Park were affected, with 30% or more of the canopy blown down on 51,000 acres. Managers are faced with the choice of immediately salvaging trees that would otherwise have been cut over 10 or more years or losing them to insects, fungi, and decomposition. Salvage efforts did begin immediately, and the DEC estimates that \$39 million worth of timber may be salvaged from these lands.

On the state-owned Adirondack Forest Preserve lands, which include the Five Ponds Wilderness Area, there are strong ecological reasons for not salvaging, in addition to the legal and economic reasons presented by Mike DiNunzio in his accompanying article.

Although the simple removal of fallen tree trunks from a blowdown may not be profoundly harmful in terms of soil productivity, nutrient levels, or wildlife habitat, salvage logging entails other negative impacts. The most significant impact of salvaging blowdown debris is the construction of roads into roadless areas. Roads commonly lead to increased soil erosion and sedimentation in streams, and serve as corridors for introduced plant species. In the Five Ponds, road-building would

be particularly undesirable. As Jenkins (1995) points out, the Adirondack Park is "biologically pristine," in terms of nonnative species, to an extent rare in other parks in the United States. This unique characteristic would almost certainly change in the event of road construction.

Salvage logging reduces the amounts of dead wood and the pit-and-mound topography in the logged area. Salvaging tipped over trees can cause the root balls to fall back into place and cover the exposed pits. Both pits-and-mounds and dead wood diversify the structure of natural forests; salvaging diminishes that structural diversity.

A quick history lesson reveals the difficulties of salvaging after blowdown. In 1950, a large windstorm caused an even larger blowdown than the 1995 storm. Although salvage logging in the Forest Preserve was permitted, only some of the contracts were completed. Logging the salvage was found to be dangerous and the expense of road-building prohibitive. The sudden influx of wood into the mills depressed timber prices in the region for several years. Clarence Petty, a DEC ranger at the time, recalls that some loggers abused the salvage contracts by cutting many intact trees in areas next to blowdowns.

Proponents of salvage logging argue that salvaging is necessary to reduce the high fire hazard created by the blowdown. Within the Five Pond Wilderness Area, however, the likelihood of a large wildfire in blowdown areas, given normal rainfall, is probably low. Jenkins (1995) projects that increased fire risk will not be significant unless there are extended dry periods followed by lightning events. The blowdown has increased the fuel load in some large continuous patches of blowdown, but the flammability of that fuel will rapidly drop within 1-5 years (Jenkins 1995). The most likely source of ignition is people (DEC 1996).

Historical records suggest the likelihood of large fires in the blowdown areas is low. First, large historically-recorded fires in the Adirondacks were all associated with intensive logging in conifer forests (MacMartin 1994). Second, none of the major eastern blowdowns in the last 50 years has produced a large fire (Jenkins 1995).

In conclusion, we can view the blowdown as a natural, recurring event in Adirondack forests. Difficulties emerge in reconciling human goals and values with the effects of the blowdown. In human-dominated areas, it is necessary to restore people's lives to normal and ensure safety, through steps such as fire hazard reduction and infrastructure repair. In the "Forever Wild" core reserves, however, the reverse is true. Human activities should adapt to the storm.

The most difficult choices lie in the buffer areas, the "gray zones" where human values and ecological integrity are both important goals. How does a commercial forest manager conduct a salvage cut? Is there really a natural fire hazard in a blowdown area or should people (the main cause of fire in the Park) be kept out during the relatively hot, dry summer months? Those decisions are not made easily, and will require a careful blending of ecological understanding and human priorities.

A FINAL NOTE

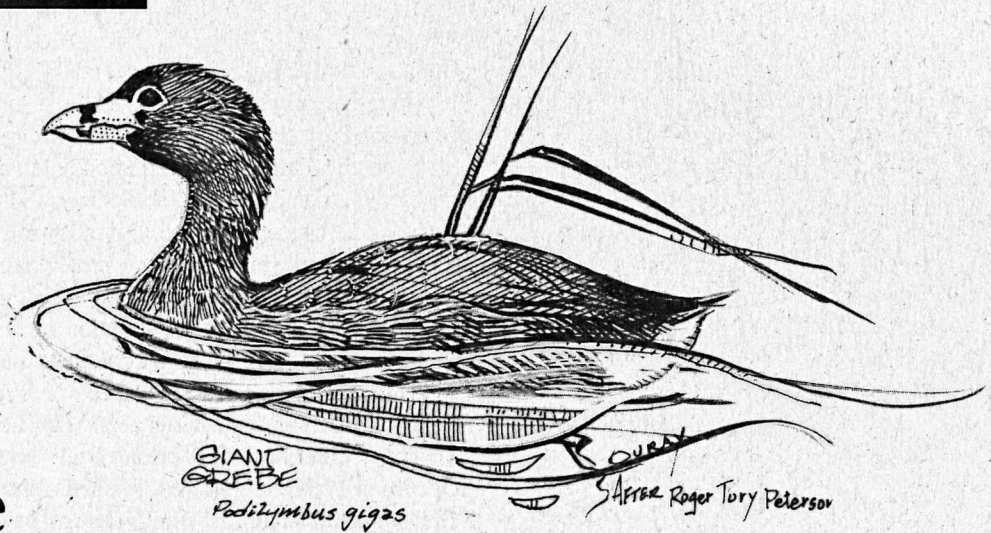
On a mosquito-infested June afternoon, I walked through an old-growth forest of American Beech, Yellow Birch, and Red Maple near the Five Ponds. I watched a Black Bear shuffle through a dense ground layer of Wood Fern, Common Mergansers swim with their young, and a Beaver work on a dam. A hundred yards away, trees lay jumbled like pick-up sticks on a long, narrow ridge, the spires of young Red Spruce and Balsam Fir jutting through the tangled debris.

Amidst the complexity and uncertainty engendered by the storm of 1995, one thing is certain: Life goes on, rich and diverse, in the Five Ponds Wilderness. ■

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Mike Stevens endured the Five Ponds' legendary biting biota—blackflies, mosquitos, and deerflies—while doing research for his final project in the University of Vermont's Field Naturalist Program.



Too Late for the Giant Grebe

by Anne LaBastille*

Real estate development and civil war doomed a 24-year effort to save the Giant Grebes of Guatemala's Lake Atitlan, or *Pocs* as the Mayans called them. The grebe population on the lake plummeted from a stable, healthy population of over 200 individuals to extinction in this short time span. The fate of these apparently flightless birds bears grim testimony to the fact that a species can be lost even while being studied closely by scientists who are working to save it, if local people and governments don't have the resources to help.

Ecology

Discovered and named *Podilymbus gigas* by ornithologists Ludlow Griscom and Alexander Wetmore in 1929 and 1936 respectively, the Giant Grebe was described by Griscom as much larger and darker than the common Pied-billed Grebe (*Podilymbus podiceps*) and unable to fly. The Giant Grebe was, however, no larger than a Wood Duck.

The reeds of Lake Atitlan were the only place where the Giant Grebes could court, nest, roost and hide from danger. The reeds also provided the principal habitat for other aquatic life such as freshwater crabs, tiny fish, insects, and amphibians which made up the grebes' diet. Each breeding pair built a massive floating nest—typically weighing about a hundred pounds—of sodden reeds. The soft low, *poc-poc-poc* sound of the parent bird calling to its young gave the Giant Grebe its Mayan name.

Warning Signs

A population decline among the Giant Grebes in the 1960s was attributed to the introduction of Largemouth Bass as a potential sport fish by Pan American Airlines and the Panajachel tourist board. The carnivorous bass decimated the indigenous fish and crabs, thus diminishing the grebes' prey base. The Maya also experienced lack of fish, hence a protein deficiency. Adult grebes succumbed to starvation and chicks as prey to the bass. A plan for a hydroelectric plant, which would have lowered Lake Atitlan's water level 20-40 feet, was narrowly defeated by conservationists. A massive earthquake in 1976 opened fissures in the bottom of Lake Atitlan, causing the lake level to drop 19 feet in 13 years and drying up Guatemala's then only national wildlife refuge. Pressures from human population growth and development and the decimation of shoreline vegetation resulted in a worsening decline in the Giant Grebe population.

* adapted, by Tricia Griffith, from "The Giant Grebes of Atitlan: A Chronicle of Extinction," *Living Bird*, winter 1992



Conservation Efforts

In response to declining Giant Grebe numbers, the author established Operation Protection Poc in the 1960s with grant funds from World Wildlife Fund, the Smithsonian Institution, International Council for Bird Preservation, National Geographic Society, and others. These funds went to hire a game warden. Operation Protection Poc worked to enforce the local wildlife laws which ostensibly protected all water birds at Lake Atitlan and declared the lake's surface and watershed a national park, educated the public on the need for conservation, and managed the lake habitat. An agreement was made with the local reed cutters to protect half of the reed and cattail beds each year. In places where reed-harvesting was allowed, the cutters had to leave a buffer zone of uncut vegetation around any nests. This agreement became a presidential decree in 1968. In June of 1968 Operation Protection Poc established a three-acre refuge for the Giant Grebes, Guatemala's first wildlife refuge, near Santiago Atitlan. Bass were removed from the refuge, 6000 small native fishes reintroduced, and two pairs of Giant Grebes set inside.

These efforts reversed the downward trend in the grebe population. Their numbers continued to rebound until 1975 when they reached a high of 232. However, the massive earthquake of 1976, which killed 25,000 Guatemalans, opened fissures in the bottom of Lake Atitlan. Seepage dropped the water level so much that the grebe refuge dried up. Edward Bauer, the game warden, released the captive grebes. Operation Protection Poc itself came to an end in 1982 when Bauer was murdered, allegedly by guerillas in Guatemala's civil war. The military took over the visitor's center at the refuge. The sanctuary was lost—few cared about the environment during war.

Civil strife frustrated the author's efforts to return to Guatemala for four critical years. When she and other biologists returned, hoping to begin a captive breeding program (1984-1987), it was too late. The Giant Grebe population had dropped to 50-55 birds and reed habitat had diminished by 80 percent. By 1991 there were 501 chalets on the lake and no Pocs.

Lessons from Extinction

Although the Guatemalan government showed renewed interest in conservation and sustainable development on Lake Atitlan in the late 80s and early 90s, it was too late for the Giant Grebes. The grebes had been both biological indicators of Lake Atitlan's condition and martyrs to the country's fledgling conservation movement. They had alerted everyone to the growing ecological ruin of the lake, but the news had come too late to help them.

The factors that caused this tragedy are biological, geological; political, and social. The thoughtless introduction of sport fish into a fragile lake environment foreshadowed developmental and economic pressures, which, unchecked, caused the Giant Grebe's extinction. Agreements forged with Mayan reed cutters were worthless against wealthy development interests. The lesson reinforced time after time is that human population growth and unrestricted development, with no sewage or land-use plans to protect wild lands and waters, leads to wildlife extinction. ■

Anne LaBastille is an international advocate of wildlife conservation and author of Woodswoman, Beyond Black Bear Lake, Women and Wilderness, Mama Poc and other works of natural history and ecology. She is presently writing a sequel to Woodswoman and Beyond Black Bear Lake.

The Yukon Wildlands Project

by Juri Peepre

AFTER THE ROCKY MOUNTAINS of British Columbia meet the Liard River, the Selwyn Mountains rise and stretch north for another 400 kilometers along the Continental Divide. These seemingly endless folds of sedimentary rock then curve west, turning grey and white like rows of bleached vertebrae from an ancient time. This is the Yukon, a vast and varied land, from the icy expanses of the St. Elias Mountains, to the wetlands and arctic tundra of the north coast.

Grizzly Bears, Gray Wolves, Moose, Dall Sheep, Hoary Marmots, Peregrine Falcons, Pileated Woodpeckers and hundreds of thousands of waterfowl (along with all the other native floral and faunal species) depend on Yukon's wildlands. It is a landscape still alive with fully functioning, healthy ecosystems. It's here that the great migrations of Caribou and salmon shaped the cultures of northern native peoples.

THE CHANGING NORTH

Only two generations ago, there were no highways in the Yukon. Now more than 5000 kilometers of roads and countless more vehicle access routes have left a spaghetti pattern across much of the territory. Wildlife populations in some parts of the Yukon are already at risk, due to loss of habitat and over-hunting from easy road access. Logging of old-growth spruce in the southeast is fragmenting riparian ecosystems and reducing the habitat of some forest songbird species. Toxic waste from industrial development and mining since the days of the Klondike Gold Rush are part of our inheritance.

Still, in the Canadian north, we are the custodians of much of the planet's remaining wildland. Our challenge here is to slow down, question, and redirect the headlong rush to develop a better road map. What must we do to sustain our way of life and protect wild Nature? Which choices will lead to enduring communities?

In the Yukon, we find The Wildlands Project vision compelling. The meaning of northern protection as spoken by many First Nations people and other environmental advocates is not merely protection of examples or remnants of wild Nature, but protection of complete functioning ecosystems, entire traditional territories—protection of all that is required to sustain wild Nature.



HOW MUCH OF THE YUKON IS PROTECTED NOW?

Six of Yukon's 23 ecoregions are represented by protected areas. These areas are National Parks large enough to help ensure the survival of a full range of plant and animal species found in the ecoregion. Five other ecoregions have smaller protected areas, such as Ecological Reserves or Habitat Protection Areas. None of these is large enough to represent a full range of wildlife habitat types or species. More than half of Yukon's ecoregions have no protected areas now, but future settlement of land claims agreements will increase the number of areas set aside from development.

Although much of the Yukon remains wild today, our land use laws are conduits for the extraction of all that can be carried away. The federal government owns the vast bulk of the territory. For a hundred years it has offered the land to any prospector able to hammer four corner posts in the ground. Recently, it has tried a similar approach to forests, but with less success. Land claims agreements and devolution of federal powers will turn over control of land use to the territory, First Nations and communities. But the tradition of converting wild Nature to plays on the Vancouver Stock Exchange will be here for a while.

In 1989, the national Endangered Spaces Campaign, led by World Wildlife Fund Canada, to protect a representative part of each natural region by the year 2000, seemed audacious. Yet its logic caught on and now all jurisdictions in Canada ostensibly support the initiative.

We have not strayed from that goal. In the context of the Yukon, however, we asked: what about the rest of it? The notion of eliminating most of the Yukon's immense wildlands in the name of sustainable development, while at the same time setting aside an example of each ecoregion for posterity, seemed outrageous.

The Wildlands Project and the Endangered Spaces Campaign together seem to have provided an answer: a system of core protected areas (and sometimes large de facto wilderness), linked by corridors and buffers. The Yukon Wildlands Project, with the Endangered Spaces Campaign as an integral part of it, has provided us with the language, logic, passion and science to carry our protected areas work into the next century. In relation to the scientific model described by Reed Noss (*Wild Earth* special issue on The Wildlands Project, #1, 1992), we have adopted the reverse matrix (connected pockets of development, where wildlands form the matrix) with a bit of a twist. Given the Yukon's history and pattern of land use, we see no alternative but to also work hard on representative core protected areas, sometimes in the midst of vast wilderness—odd perhaps, but an insurance policy nonetheless.

Our question to Yukoners is simple. How much of the Yukon do we need to protect to ensure that in 200 years the wild species and biodiversity that now characterize the north will still be here? The Yukon Wildlands Project started in 1993, and in 1995 we announced an ambitious plan for wildlands

and protected areas research, planning, and public education to be carried out during the next five years. These projects are just the beginning of a far-reaching plan to advance wildlands protection in the Yukon.

The Yukon Wildlands Project is not a new group, but a collaboration of three environmental organizations: the Yukon Chapter of the Canadian Parks and Wilderness Society (CPAWS), the Yukon Conservation Society, and the Friends of Yukon Rivers. CPAWS coordinates both The Wildlands Project and the Endangered Spaces Campaign in the Yukon.

We've focused much of our energy on public education, introducing the science and ideas behind The Wildlands Project and the Endangered Spaces Campaign. *Yukon Wild: Natural Regions of the Yukon*, raised public awareness of ecoregions and biodiversity, and showed why we need to complete a representative protected areas system. We have hosted a northern protected areas conference and a conservation biology workshop, produced a calendar featuring Yukon ecoregions, held Wildlands benefit concerts, lobbied hard, and tried almost every other trick familiar to activists in the south.

But we are also on the ground, because without places to protect, all of our efforts at public education will dissipate into the clear northern air. This article summarizes some of our key projects.

YELLOWSTONE TO YUKON BIODIVERSITY STRATEGY

The Yukon Wildlands Project is now an integral part of the Yellowstone to Yukon Biodiversity Strategy. [For background information on Y2Y, see Harvey Locke's article in *Wild Earth* winter 1993/94 as well as recent TWP Updates.] The Selwyn and Mackenzie Mountains of the Yukon and Northwest Territories are the northern cousins of the Rocky Mountains. In the Yukon, there is still a chance to protect these primeval ecosystems that form the northern third of this continental mountain chain.

The Yellowstone to Yukon strategy is anchored in the north by the Wind, the Snake, and the Bonnet Plume watersheds. These river valleys have been the subject of many a fanciful scheme to develop open pit mines, roads, transmission lines, coal and hydro-electric power plants and more. We aim to keep this part of the Yukon in full production, as it is now.

Far to the south of the Bonnet Plume, the headwaters of the Coal River rise in the rugged Logan Mountains, west of Nahanni National Park. This watershed forms part of the ecological link to the northern Rocky Mountains. Along the southeastern border of the Yukon a timber rush is on, with scant thought given to the landscape scale impacts of each new road and cut-block. If logging and future oil and gas developments are allowed to proceed unchecked, as has been the habit, these ecosystems will be fragmented before we understand the measures necessary to protect them.

It's a long way from the Coal to the Bonnet Plume, and we know very little about the ecosystems that lie between. The

Conservation Strategy

Yukon Wildlands Project work on these two parts of the Yellowstone to Yukon strategy is just a beginning. Yet in both the Bonnet Plume and lower Coal River watersheds, we are already nearing a critical choice: what room will we leave for wild Nature and the species it supports?

THE WIND, THE SNAKE, AND THE BONNET PLUME

The Wind, the Snake, and the Bonnet Plume Rivers flow nearly side by side for hundreds of kilometers through the rugged Wernecke Mountains, then converge with the Peel River and the arctic lowlands. Fast and clear in their alpine upper reaches, the rivers separate into braids as they spread out in broad forested valleys. Grizzly Bears, Dall Sheep, Caribou and Moose all live among the grand sweeps of these mountains. Golden Eagles, Gyrfalcons and Peregrine Falcons nest in the cliffs. Both the Nacho Nyak Dun and Tet'lit Gwich'in First Nations have a long standing heritage of hunting, fishing and trapping in the region.

In 1993, the Bonnet Plume was nominated as a Canadian Heritage River, overwhelmingly exceeding the selection criteria of the Heritage Rivers system according to the background study prepared for the government. The following year the federal government issued a land use permit allowing Westmin Resources of Vancouver to bring heavy equipment into the heart of the Bonnet Plume.

The Yukon Chapter of the Canadian Parks and Wilderness Society (CPAWS), with the help of the Sierra Legal Defense Fund, launched a lawsuit in the spring of 1994 challenging the federal government's environmental assessment that permitted winter road access and mining exploration along the Bonnet Plume River. CPAWS advocates a moratorium on mineral exploration and development until a conservation and land use strategy is in place. We lost the first round of the legal challenge, but our Wildlands Project research to map out a protected areas strategy has begun in earnest.

MAPPING AND CONSERVATION BIOLOGY

Yukon Wildlands Project research is underway to assist with a land use and protected area plan based on conservation biology and traditional ecological knowledge. To support this goal, World Wildlife Fund Canada and others have contributed funds to complete ecosystem mapping, conservation biology research, and public education that will lead to protected area proposals. This two year project will complement First Nations mapping and planning in the region. Rather than wait for the site specific research that always accompanies industrial development projects, we see an urgent need to complete our own work in advance of land use decisions forced by proponents of "progress." We hope our initiative will encourage government agencies to undertake further inventory work in the region.

The highlights of the project to be carried out by Wildlands Project staff and volunteers, scientists and cooperating partners are:

- **Ecosystem classification of the Wind, Snake and Bonnet Plume watersheds** (~32,000km²), using Landsat satellite imagery. This is a cooperative mapping project with the Tet'lit Gwich'in Renewable Resource Board. We also contracted Gwich'in Geographics to complete the initial map.
- **Background research on all aspects of the watersheds, including natural and cultural features, land use and tenure.** We are also participating in various multi-stakeholder forums planning the future of these watersheds.
- **A summer field research program to ground truth the satellite-based mapping** and develop a suitable legend for vegetation types. The research program will include a reconnaissance wildlife habitat inventory, with a focus on large carnivores and ungulates. We have invited First Nations to participate in the protected areas research and contribute traditional ecological knowledge.
- **Ecosystem classification map refinement** based on the summer field work, followed by a second season of research focusing on critical habitat, indicator species and movement corridors.
- **Preparation of a land use and protected area proposal based on the principles of conservation biology, gap analysis, and traditional ecological knowledge.** We will advocate a system of large core protected areas set within the greater Peel River watershed.

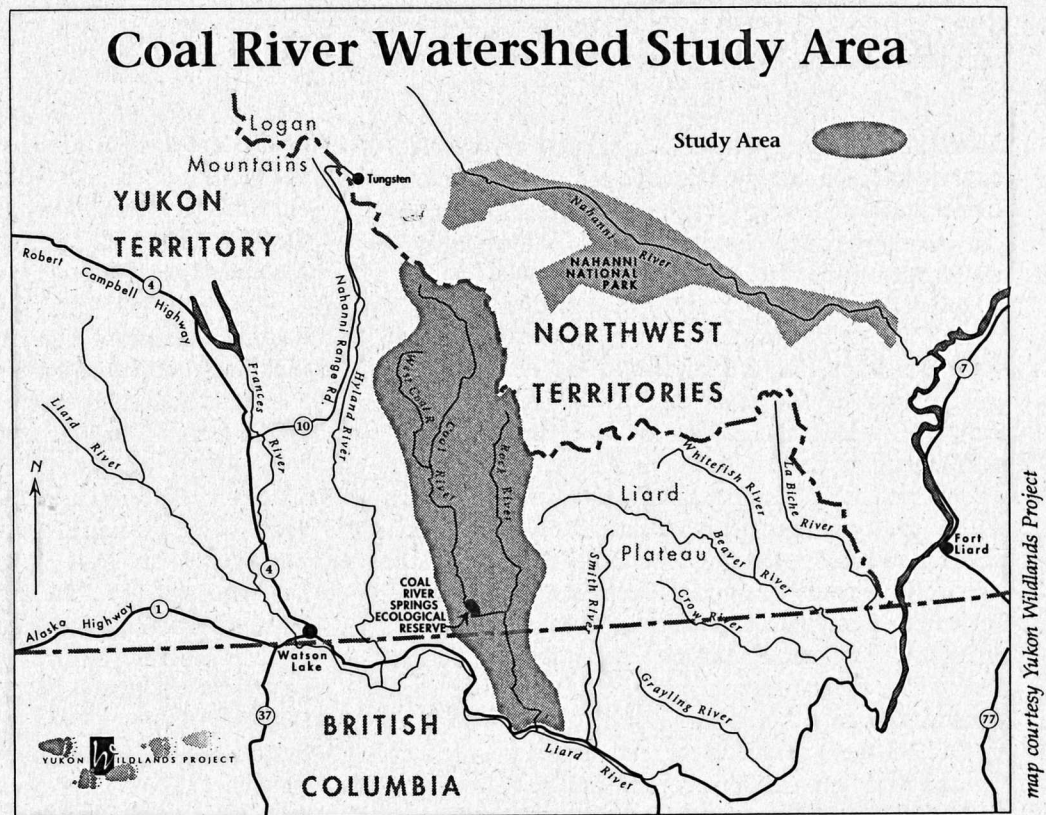
COAL RIVER WATERSHED: A LINK TO THE NORTHERN ROCKIES

The Coal River flows through southeast Yukon to the Liard River, just north of the Rocky Mountains. It flows through the traditional territory of the Kaska people, specifically the Liard First Nation. It is also part of the Yellowstone to Yukon Biodiversity Strategy.

The Coal watershed is one of very few unroaded and unlogged major drainages remaining in the southeast Yukon. The watershed has three ecoregions, the Liard Basin, Hyland Highland, and Muskwa Plateau, each with a distinct character and diverse wildlife habitat—but no sizable protected areas. Large-scale logging is pressing in on the Coal River watershed, but little assessment has yet been made of other values, such as wildlands or wildlife.

Two recent biological research and mapping projects will help. Ecosystem classification and mapping completed by the Yukon government in the southeast will assist with land use planning, forestry, and protected area selection. Work by the Canadian Wildlife Service on songbird habitat, vegetation, and species distributions in several watersheds will further identify areas of interest for protection, and help develop guidelines for forestry practices.

Large-scale logging is pressing in on the Coal River watershed...



map courtesy Yukon Wildlands Project

The Yukon Wildlands Project has launched a two year biodiversity survey and public education effort in the Coal River watershed. We chose the Coal because of its naturalness and its location in ecoregions with little or no protection. Moreover, we need to shift the public debate from who gets to log how much and how fast to how best to protect some of the richest riparian habitat in the territory.

The Yukon Wildlands Project does not have the funding necessary to carry out a full-fledged science-based assessment of the Coal River watershed. Nonetheless, our Coal River Wildlands Study will include many components similar to those of our Wind/Snake/Bonnet Plume Study.

TOMBSTONE MOUNTAIN AND BLACKSTONE UPLANDS

The Tombstone Mountain and Blackstone Uplands area is one of Yukon's most beautiful landscapes, known for its rare plants, cultural features, and striking mountains. There is widespread support for a territorial park here, including the Tr'ondek Hwech'in First Nation who endorse a park large enough to protect key wildlife habitat. They were close to negotiating a territorial park of 80,000-100,000 hectares when there was a change in government. The new government reduced the size of the proposed park to 38,000 ha. The smaller park would showcase the Tombstone's most dramatic scenery, but leave unprotected critical wildlife habitat and rare plant communities.

The Yukon Wildlands Project is cooperating with the Tr'ondek Hwech'in First Nation to educate the public on the protected area potential of the Tombstone Mountain region. We want the public to know what the government

has left out of their park proposal. The public needs to know that the park area, as proposed, won't protect wildlife and that mining could still threaten the ecological integrity of a place many people hold dear.

The Tombstone Mountains is a key campaign for the Yukon Wildlands Project. We did not carry out the original research to demonstrate the optimum core park area and surrounding buffer zones. We did move the government information from the back rooms and developed it into a proposal based on science and local knowledge. The public response has been very positive.

Our approach to protected areas research, planning, and advocacy as described here is well understood by those more experienced than us. But in the Yukon we are still flush with our discovery of a language that makes sense in the north—where wild Nature still shapes the landscape.

The catalyst for the Yukon Wildlands Project was an inspirational workshop held in the Rockies of Alberta. Reed Noss, David Johns, and others described the ideas behind a new vision for protection of biodiversity across the continent. We married the Wildlands idea to the Endangered Spaces Campaign and our protected areas work seemed to take on a new vigor. Now we just need to protect a few million hectares of Yukon wildlands! ■

Juri Peepre is the coordinator of the Yukon Wildlands Project (39 Dawson Rd., Whitehorse, Yukon, Canada Y1A 5T6) and the regional coordinator of the World Wildlife Fund Endangered Spaces Campaign. He is the national chair of the Canadian Parks and Wilderness Society and sits on The Wildlands Project board of directors.

What To Do Until The "Revolution" is Over: New Legal Techniques for Saving the Wild

Part Six: The Gonzo Guide to Environmental Law

by Ned Mudd II and Ray Vaughan

The new Congress got you down? Have the special interests and their puppet politicians upset you with their ongoing efforts to subvert the Clean Water Act, the Endangered Species Act, and other protections for the environment and public health? Are lawless "salvage" sales ravaging your forests? What can we do when greedy Republicans and spineless Democrats give away our legal rights to protect the Wild?

Fear not, friends and neighbors. Congress may be the puppets of conniving greedheads, politicians may have no moral center, but we are smarter and better looking. Your Gonzo Guides are prepared to handle this so-called "revolution" of radical right-wing nonsense, and we shall make you prepared.

When life gives you lemons, throw the damn things at the bad guys. Squeeze the juice into their eyes. Keep up the fight! Here are eleven handy-dandy legal techniques to use to save the wilds even if the traditional environmental laws we have used in the past are taken from us.

(1) Use the Freedom of Information Act (FOIA) repeatedly and often. See Part Two of *The Gonzo Guide* (*Wild Earth* winter 93/94). Sending a FOIA request is easy, requires no lawyer, and costs just 32 cents. Agencies are legally required to respond to FOIA requests within ten working days, and answering your inquiries may take a lot of their time. If they are busy copying and sending documents to you, they have less time to despoil the wild. Also, the documents you get make great media fodder. If the federal agencies ignore your FOIA requests, use technique number 2.

(2) Consider an Eleventh Day FOIA Suit. If the agency does not respond properly to your FOIA request within ten working days, you have a right to sue them for those documents. If you are willing to employ this technique, have a lawyer ready when you file your FOIA request. On day 11, sue the agency immediately. Even if only one of the documents you requested exists (make sure you ask for at least one thing you *know* is in the agency files), you will win your case, and your attorney will get his or her fees from the agency. A few of these suits will make any agency jump when you say jump with a FOIA request. Again, keeping them occupied in a FOIA suit delays their actions to waste the high country and exposes their shenanigans to the public.

*When life gives you
lemons, throw the
damn things at the
bad guys.*

First, the mandatory legal disclaimer: nothing in this article is intended to be legal advice to you. Due to the complexities of the law and of each, individual fact situation, no book, article or anything else can substitute for legal advice from an actual, real attorney familiar with the facts of your case.

We cannot claim credit for this technique. Normally, we have been very patient with our FOIA requests and have given agencies more than ten days to respond; sometimes we have allowed agencies months to get us documents if there were many of them and we did not need them right away. A big time industry lawyer pioneered this technique. We saw him delay and set back the listing of the Alabama Sturgeon under the Endangered Species Act by using technique number 3 below and by sending a FOIA request that the Fish and Wildlife Service could not answer within ten days. On day 11, he and his industry clients sued, thus tying the agency up in court over FOIA. So, if any industry people claim that your appeals and lawsuits are designed to delay matters, remind them that industry thought up and utilized such delaying tactics first, and all is fair in love and war.

(3) Use the Federal Advisory Committee Act (FACA)¹ to oppose meetings of the federal agencies with their industry bosses. Again, we learned this from industry itself, which has used the technique all over the country. When an agency plans to do something, it often asks a group of experts or other people outside the agency to review and comment on the action. If this group issues a report or gives advice to the agency, then, under FACA, the public must be given notice of the group's meetings and an opportunity to participate. Usually, the government forgets to comply with FACA. When they have these meetings, which could be anything from a gathering of industry "experts" to a meeting with senators and representatives, you can sue them, get the work of the group thrown out and delay the planned action of the agency.

Using this technique, industry ran Bruce Babbitt through the ringer and seriously crippled the listing of the Alabama Sturgeon even though the fish clearly needed the ESA protection. Using FACA, corporations circumvented the ESA. Turnabout is fair play; thus, if the ESA and other laws are gutted, we can use FACA whenever the feds get cozy with the greedheads to do something despicable.

Likewise, when your state government yahoos start having back room meetings with industry to plan and permit environmental destruction, take them to court using your state's open meetings law. Every state has one of some sort, and depending on their language, these laws may make it illegal to hold secret meetings with companies seeking permits and other concessions. These cases are often relatively easy to win, depending on the language of the statute. Alabama's open meetings law (the "Sunshine Act") is quite plain, and we have successfully used it to stop agency-industry shenanigans.

(4) Learn about takings laws; their passage may be unstoppable. Every state legislature and the US Congress are working to pass laws that require the government to compensate a landowner every time an environmental law, regu-

lation, permit or other government action (including enforcement of criminal laws) causes even a minor diminution in the property's value. Most of these laws are broad and poorly drafted, and can work both ways.

When a nasty project is planned, go buy an acre nearby, or downstream, anywhere within the zone of impacts. If the government gives a new paper mill, say, a permit to dump toxic chemicals into the air and water without meaningful limits, because the plant threatened to sue under the takings law if they didn't get the permit, you can then sue the agency for the diminution in value to your land from the agency's action of granting a permit that allows pollution of your land. Unless the greedheads really fix the language in these bills, this technique is very viable. What the outcome of this Buy Land and Sue technique will be is anyone's guess—it has not yet been tried—but you can bet it will cost the bad guys millions to fight.

(5) Another version of Buy Land and Sue is to buy land in or near sensitive ecological areas and use the common law of your state to defend your property and its ecological attributes. Under common law, you have the right to sue a polluter or anyone else that is causing a nuisance or is causing pollution to trespass onto your land. Nuisance and trespass cases, even over minute amounts of pollution (such as dioxin in the parts per quadrillion) often generate jury verdicts in the millions of dollars. Jurors cannot be bought off like congressmen can be, and they understand when one's land has been violated, and they do not like it.

If, as a result of weaker environmental laws, a company starts injuring your property, you have a right to seek an injunction to stop them and/or money for the damage to your land. A public nuisance case is used to stop a nuisance that affects great numbers of people; private nuisance is used to attack a nuisance that impacts a few people in a way not experienced by the general public. Trespass applies when you can prove that the injury actually affected your land.

Because of the specter of multi-million dollar jury verdicts, corporations fear trespass and nuisance cases much more than citizens suits under the current environmental laws. So-called "tort reform" laws will reduce the impact of trespass and nuisance cases slightly, but you can still hit them up for injunctions and money, and if lots of people are affected and sue (class action!), "tort reform" laws won't help the despoilers much.

(6) Use the media more effectively. Congress cannot silence you or the press. Speak out, and shine the light onto the nastiness. You enviro folks know how to use the media; do much more of it. Buy advertisements, particularly in college papers and in alternative city papers where ad space is amazingly cheap. The last thing Newt and Company want people to read is the truth about what they are doing.

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(7) Use the public trust doctrine. This legal theory says that public resources (usually applied only to waterways) are held in trust by the government, and anything the government does that diminishes the value of that resource violates the public trust. Most states have not even addressed the public trust doctrine, but those state supreme courts that have done so have issued big victories for the wild.² The case ordering that Mono Lake be protected was based on the public trust doctrine.³

(8) Resurrect the constitutional right to a clean environment argument. Decades ago, many litigants tried to get the courts to recognize a constitutional right to a clean environment. The courts declined to do so, because the new agencies and environmental laws and regulations had just come into being and judges wanted to give them a chance to work first. Now we know that the laws and regulations are inadequate, and Congress is even rolling back those limited protections. Thus, if people are to protect their air, water, food and land, they must assert some fundamental right to a clean, healthy and natural environment.

Recognition of such a constitutional right will not be a mere exercise in judicial activism; it will even be much more than an astounding leap in constitutional jurisprudence. It will be a statement of humility and compassion, a recognition that money is not the measure of all things. It will be a profound testimony of ethical considerations and obligations toward the Earth, which the law has long desperately needed.

We tried to get Alabama's courts to recognize a right to a clean environment under the state constitution. We lost, but we got incredible media coverage including scathing editorial cartoons blasting the government for openly advocating a position contrary to the public interest. People naturally *think* that they have a right to clean air and water; make the greedheads tell the world that people have no right to drink clean water but that *they* have a right to pollute it. If we do this all over the country, in the long run, the resulting outrage will do more good than a thousand court orders.

(9) Desperately Seeking Suing. This technique is only for those who think they can pull off the ultimate Br'er Rabbit "Please don't throw me in that briar patch" ploy. As shown in Part Five of *The Gonzo Guide* (Wild Earth fall 1995), the Empire often uses SLAPP suits to intimidate, harass, and silence opponents. These frivolous abuses of



the legal system can be turned around by hardy folks who beat the SLAPP and then countersue for millions of dollars. Several polluting corporations have actually been put out of business because they were stupid enough to file a frivolous suit against a strong person; when the environmental activist won the SLAPP-back case with a multi-million dollar jury verdict, the company had to sell off its assets to pay up. One woman ended up owning the incinerator she was fighting and sold it for scrap.

If you have the backbone and/or are confident in your poverty such that you are "judgment proof," you may want to see if you can goad a greedhead into making the mistake of filing a SLAPP suit against you so that you can sue them back for violating your rights. This daunting technique requires that you be vocal and obnoxious, but you must also always speak the truth and you must never break the law. A SLAPP suit against you must be groundless for you to win millions against the enemy; and to prove their suit groundless, you must keep your actions they are attacking pure and correct. Consult a lawyer before even thinking about trying this risky tactic.

Without forcing the federal land agencies to move to true ecosystem management, there will be no hope of preserving our wildlands...

(10) Use NEPA and the APA more. The National Environmental Policy Act of 1969 (NEPA)⁴ was the first big environmental law, and Congress is not currently considering gutting it (although it was abrogated in the clearcut timber rider for "salvage" sales). NEPA is a procedural statute that requires federal agencies to prepare an environmental impact statement (EIS) for any major federal project. Even if the project is small, agencies must still comply with NEPA by preparing an environmental assessment (EA); an EA is basically a mini-EIS. The requirement of NEPA is that before every major federal action significantly affecting the environment, the lead agency must assess the possible environmental impacts and consider a range of reasonable alternatives. Nothing in NEPA requires the agency to adopt the most environmentally-benign option, only that they take a "hard look" at the impacts from what they plan to do.

NEPA can be used in a variety of new ways. Traditionally, environmentalists waited until an EIS was finished and then attacked its flaws after the fact; this technique rarely convinces a federal judge to stop the project. When you sue a federal agency claiming that their science in the EIS was bad, most federal judges will defer to the agency's "expertise."

Thanks to Jasper Carlton of the Biodiversity Legal Foundation, we are engaging in a new NEPA technique wherein we become active participants in the entire process of preparing the EIS and develop our own alternative which they must include in the draft EIS during the public comment period prior to the final decision.

With the new draft EIS for the management of Alabama's four National Forests, we are developing a conservation biology alternative based upon scientific research which we fund. The Forest Service has committed itself to using "ecosystem management" for these forests, and we intend to use the world's top conservation biologists (headed by *Wild Earth's* own science editor, Dr. Reed Noss) to show the Forest Service and the public what ecosystem management should be here in Bama. Thus, instead of making Monday morning quarterback attacks on the Forest Service's science once the EIS is done, we are engaging over two dozen PhDs to do much better science than the Forest Service has. Then, when the public sees their plan next to ours and demands that our alternative be adopted, the agency will be hard pressed to explain why their scientifically weak plan is preferable to ours.

If the Forest Service does not include our alternative in their draft EIS, they will be in violation of NEPA, and open to lawsuits. Although an agency doesn't have to adopt any particular alternative, they must include and consider reasonable alternatives in the planning process; the cases are clear on that. If the Forest Service does not adopt our alternative or at least make major changes in its adopted alternative that incorporate much of our science, they will again be vulnerable to legal challenge.



The legal principles under the federal Administrative Procedures Act⁵ are that an agency cannot make arbitrary, capricious and unreasonable decisions and that an agency cannot violate its own rules and regulations. It is hard to win such a case, but if we can show that the Forest Service in its rules committed to doing ecosystem management and that the science shows that their final decision actually goes against ecosystem management, we can convince a reasonable federal judge (admittedly, now a rare thing) to strike down their decision and make them do things better.

This technique is very intensive both in legal work and scientific research; thus, it is also very expensive. The payoff, however, could be tremendous. If such work is not undertaken, we will be unable to implement any of The Wildlands Project's goals; without forcing the federal land agencies to move to true ecosystem management, there will be no hope of preserving our wildlands and their biodiversity.

(11) Use international law. When NAFTA (North American Free Trade Agreement) and GATT (Global Agreement on Tariffs and Trade) were passed at the request of big multinational corporations, some of the big environmental groups moaned about how the international treaties would undermine US environmental laws. Well, those treaties do call for some weakening of US laws, but they also have "floor" provisions that require countries to raise their environmental laws to a certain level. Basically, NAFTA and GATT set limits on how good or bad environmental laws can be in the countries that signed them.

Jasper Carlton has already used NAFTA to challenge Congress on whether they can impose a moratorium on the protection of endangered species. None of the challenges under these treaties have worked so far, but a fair World Trade Organization panel may one day rule correctly, and these challenges could cost the bad guys an arm and a leg.

Basically, the idea is that the US is limited in what it can do with its domestic laws by the treaties it signs. NAFTA and GATT may prevent the rape and scrape crowd in Congress from going too far in their quest for unlimited industrial development of our wildlands. It will depend on what statute you are dealing with, what the treaty language is, and what the environmental impacts will be. If gutting the Clean Water Act would give American companies an unfair advantage over European companies who have to live under their countries' laws, then the World Trade Organization under GATT may be able to order the US to strengthen the Clean Water Act again or face severe trade sanctions.

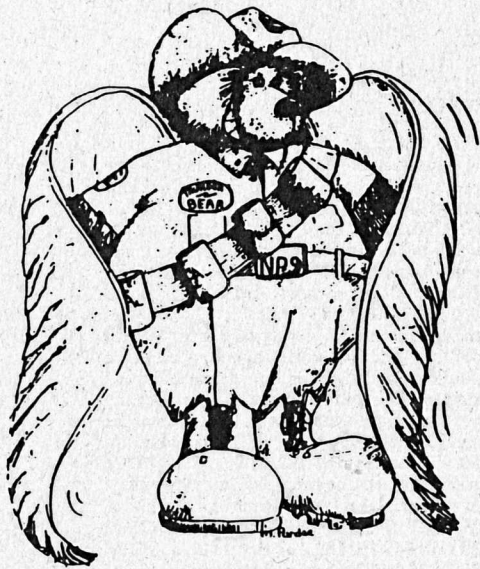
The radical right wing wants international free trade, and they want to eliminate environmental constraints. Be creative. Play the two ends against the middle.

So, grumble about the new dark ages if you want, but get up and start moving as you do so. Your Guides say there is always a way to fight the good fight; these eleven new techniques should get you started. There are more ways, and we will pioneer them just as soon as we sober up and think of them. Now, get to it. ■

Ned Mudd and Ray Vaughan, environmental attorneys and (arguably) regular writers for Wild Earth, recently led the first successful legal challenge under the notorious savage logging rider. For information, write them at Alabama Wilderness Alliance, POB 223, Moulton, AL 35650.

References

1. 5 U.S.C., App. 2, § *et seq.*
2. This judge-crafted area of environmental law protects a "deeply inherent right of the citizenry," *Neptune city v. Avon-By-The-Sea*, 61 N.J. 296, 294 A. 2d 47, 53 (1972), and protects water-related uses such as recreation, aesthetic enjoyment and preservation of flora and fauna, *District of Columbia v. Air Florida, Inc.*, 750 F. 2d 1077, 1082-83 (D.C. Cir 1984). Under the doctrine, a state's obligation as trustee is to see that water resources are both open to the public use and protected from degradation, and state government is obligated to "protect and preserve those waters for fishing, recreation, and scenic beauty," *Just v. Marinette County*, 56 Wis. 2d 7, 201 N.W. 2d 761, 768 (1972), and to "protect the people's common heritage of streams, lakes, marshlands and tidelands," *National Audubon Society v. Superior Court*, 33 Cal. 3d 419, 189 Cal. Rptr. 346, 658 P. 2d 709, 725 (1983). As stated by one commentator:
"Since its law contains at least some provision for the public trust, Alabama is one of those states in which the requirement upon the state to maintain that trust 'is particularly emphatic... [because the public trust doctrine] takes on the mantle of supreme law, where it complements and reinforces the other forms of constitutional provisions demanding environmental protection.'"
Davis, "A Proposal For Constitutionally Guaranteed Environmental Rights in Alabama," 22 *Cum. L. Rev.* 281, 292 (1992) (quoting McLaren, "Environmental Protection Based on State Constitutional Law: A Call for Reinterpretation," 12 *Haw. L. Rev.* 123, 150-51 (1990)).
When a resource is held in trust and available for the free use of the public, "a court will look with considerable skepticism upon any government conduct which is calculated either to reallocate the resource to more restrictive uses or to subject public uses to the self-interest of private parties." Sax, "The Public Trust Doctrine in Natural Resource Law: Effective Judicial Intervention," 68 *Mich. L. Rev.* 471, 490 (1970) (Professor Sax's article is cited as "the leading analysis" of the public trust doctrine by Rodgers, *Environmental Law*, § 2.16, at 171 n. 8 (1977)).
3. *National Audubon Society v. Superior Court*, 22 Cal. 3d 419, 189 Cal. Rptr. 346, 658 P. 2d 709, 725 (1983).
4. 42 U.S.C. §§ 4321-4347.
5. 5 U.S.C. §§ 551-596, 601-612 and 701-706. These are the most applicable sections.



Mad Cows and Montanans

by PJ Ryan

At least our cows are sane.

—statement on a Montana T-shirt

Well, yes.

One has to give the Montanans credit for a wry, self-depreciatory sense of humor regarding the unfortunate recent events in the Treasure State. One also can only commiserate with the British who face the possible grim necessity of slaughtering their entire cattle herd of some 11 million animals due to the Mad Cow Disease.

Now wait a minute! Eleven million beef cattle in England? Must be a misprint somewhere; a zero in the wrong place perhaps? Nope. I checked with the British Embassy; the public information office confirmed that Britain has some 11 million cattle, in addition to all sorts of pigs, sheep (lots of them!), chickens, and so on, as well as quite a bit of wildlife.

Eleven million cows! I mean, when you think of Britain you think of Princess Di, the Beatles, castles, Shakespeare, roads with the wrong sides on them, strange beer, and people who speak English in a funny way. You don't think of cattle.

Now buckaroos, the 11 million British beeves are more than the combined public land beef herds of Montana, Wyoming, and Nevada.

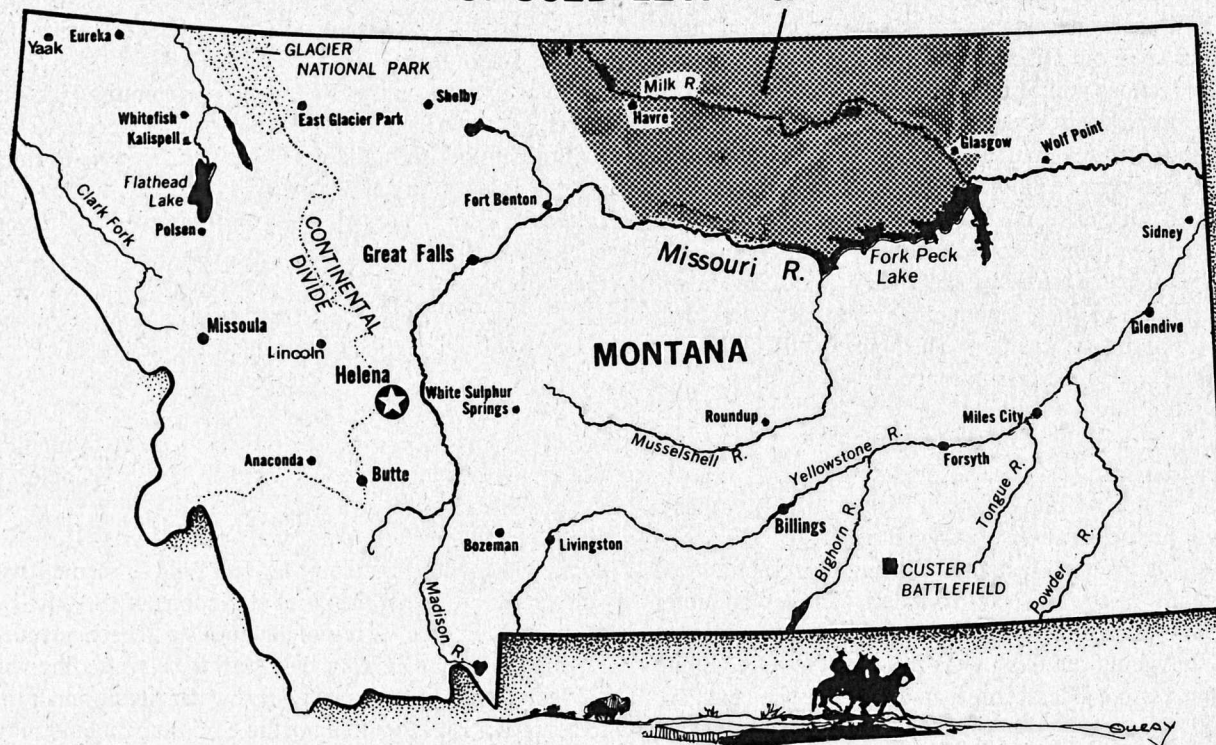
Amazingly, the Brits have been doing this for hundreds of years without the benefit of John Wayne, big hats, Gene Autry, the Western Cattlemen's Association, silver belt buckles, the US Forest Service, rodeos, Levis, the Bureau of Land Management, chewing tobacco, cowboy boots, Senator Domenici, lariats, or whoopi-ti-yi-oh's.*

Now, I'm not saying that the above institutions and artifacts are not quaint and even useful. I'm just saying that the British found another way to put a burger on the bun, relying mainly on private farm land in Britain, a country that God obviously had in mind when he invented beef cattle as it never stops raining and the grass never stops growing.

Since the British produce more beef on their allotted private acreage than do the public lands of the Western states, it might follow that the production of hereford, short-horn and black angus cattle may not be the highest use of the public lands of the Rocky Mountain West, particularly Montana. Since only around 4% of our beef comes from public land ranchers (about 28,000 permittees nationwide), we might possibly look at some alternative land use for our public lands.

*However, I couldn't resist writing a British Country & Western Cowboy song: "I say, old chap! My name is Slim an' I'm an ol' cowhand from the Rio Thames!" etc. etc.

PROPOSED LEWIS & CLARK PRESERVE



Why not consider, for example, a Lewis & Clark Preserve in north-central Montana that would stretch from the Missouri Wild & Scenic River and the Charles M. Russell National Wildlife Refuge north to the Canadian line, where it would intersect with Canada's Grasslands National Park. It would be around 8 million acres, somewhat larger than New York's Adirondack State Park. The cattle and agriculture (mainly wheat farming) would go, the fences would be taken down, native grass and other plants reseeded, and the Preserve restocked with Buffalo, Elk (originally a plains dweller), Pronghorn, Gray Wolves, Grizzly Bears (Lewis & Clark seemed to encounter herds of them!) Beaver, prairie dogs, Black-footed Ferrets and all the bit players that made up the shortgrass plains.

"But what about the private land owners! Not all of that land in north-central Montana that shows up on a map of the federal lands of the US is really public land! Much of it is checkerboarded with private and state land! This is America! You can't seize private land!"

Right you are, buckaroo! We can't and we won't! Therein lies the beauty of the Lewis & Clark Preserve; cooperation to reach differing goals.

For the most part, private land within the Lewis & Clark Preserve would remain private. If private land came on the market, and the Preserve had the funds, then the Preserve might want to buy the land; but incentives will be offered for the private land owner to remain on his/her land and not sell out. If the rancher chose to join the Preserve, he would simply sell his cattle, take down his fences, and allow Bison and other

wildlife to range his land. If he chose not to join the Preserve and preferred to continue cattle ranching or wheat farming, then his property would be protected by a Buffalo-proof fence built at the cost of the Preserve. However, he/she would not be able to lease federal land for stock grazing, as that would be allotted to wildlife. Access roads to his/her property would be maintained and nothing would be done to prevent the owner from using his/her property.

"But wait! You heartless federal bureaucrat! This is not wilderness! There are TOWNS within this Lewis & Clark Preserve idea of yours! PEOPLE! People with DREAMS, and HOPES, and ASPIRATIONS. Little towns with corner cafes and high school basketball teams and ..." (sound of right wing violins playing softly in the background).

Now hold on, buckaroo! We said nothing of abolishing towns or existing roads. If you'll look at a map of New York State, you'll find many towns within the boundary of Adirondack State Park. Interestingly, the biggest complaint from many townspeople is that New York State's environmental regulations are not stringent enough! As for basketball, it's kind of hard to play without kids. The population of north-central Montana has been declining for decades. Now one school of thought says the population drain can be replaced by the importation of paranoid maniacs from other states, but as recent events have indicated, this may not be an entirely satisfactory solution to the problem of population loss. Increased demand for services and increased opportunity as a result of tourism should stop the population drain.

It will not be necessary to fence the towns and ranch houses to keep out Bison and other wild animals as the towns and homes will be based on the Mandan Indian plan of semi-subterranean structures with beam and earth roofs strong enough to support a buffalo or two. Light and a sweeping view can be provided with a primarily glass south facing wall. Of course, it is assumed that the folks living in the Preserve will be as conservative as the Mandans and want structures that are easy to heat, easy to cool, and eliminate the effects of the low, moaning wind that so grated on the nerves of the early settlers. The housing will blend into the hills in a way the mass produced, jerry built wooden shacks put up by the railroads and gullible homesteaders around the turn of the century never did.

It is true that towns may take on a more worldly, international air due to tourism. For example, the Stockman's Cafe will no longer serve greasy ham and eggs and soggy hash browns for breakfast, those having been replaced on the menu by quiche and New York deli. (Those who prefer spicier fare can step across the street to the Bangkok Cafe.)

"Who would run this Lewis & Clark Preserve? Some unfeeling, remote federal bureaucracy like the National Park Service?" you ask.

Actually, no. It would be run by Montana's Department of Parks & Recreation as their rather awesome flagship park (and would probably end up on the UN's Biosphere Reserve list).

"But they don't have the money!"

They will have the money after the Lewis & Clark Preserve takes off. It should not only be self-supporting, but should make a profit.

"But why not the National Park Service?" you ask.

Mainly, because of the hunting. We want to get everyone possible on board for this project, including all of America's hunters and their organizations and publications. Hunting, particularly bow and arrow and blackpowder of the Lewis & Clark period, will be encouraged. The former cattle ranchers and grain farmers would be wildlife ranchers and would share in the proceeds from the hunting of wildlife, as well as leading horse pack trips into the Preserve, and providing bed and breakfast to (gasp!) tourists. Tourism is now the world's largest cash industry and the people of north-central Montana would be foolish not to take advantage of such a renewable industry as meeting and greeting people from other parts of the world. I am not saying that the former cattle and wheat ranchers will have to shovel money out of the driveway in order to get into town, but it will be a respectable living. The current take home pay of the average rancher after expenses is about \$27,000 (which is less pay than for anybody else in the middle class excepting, of course, US park rangers). Yes, I am aware of the arguments that mass tourism corrupts the gentle sensitive natives and erodes their quaint customs and picturesque life styles. However, in light of recent events, it would seem

that the average Montanan will be sufficiently resistant to erosion by tourism.

Now what would *you* as, say, a non-hunting Jack Taxpayer, get out of all of this? Well neighbor, access to land that rolls into infinity like the ocean and a place to ride a horse across country into that infinity without opening gates or asking permission. It's been a long time since anyone could do that on the plains of North America and that ought to be worth a lot.

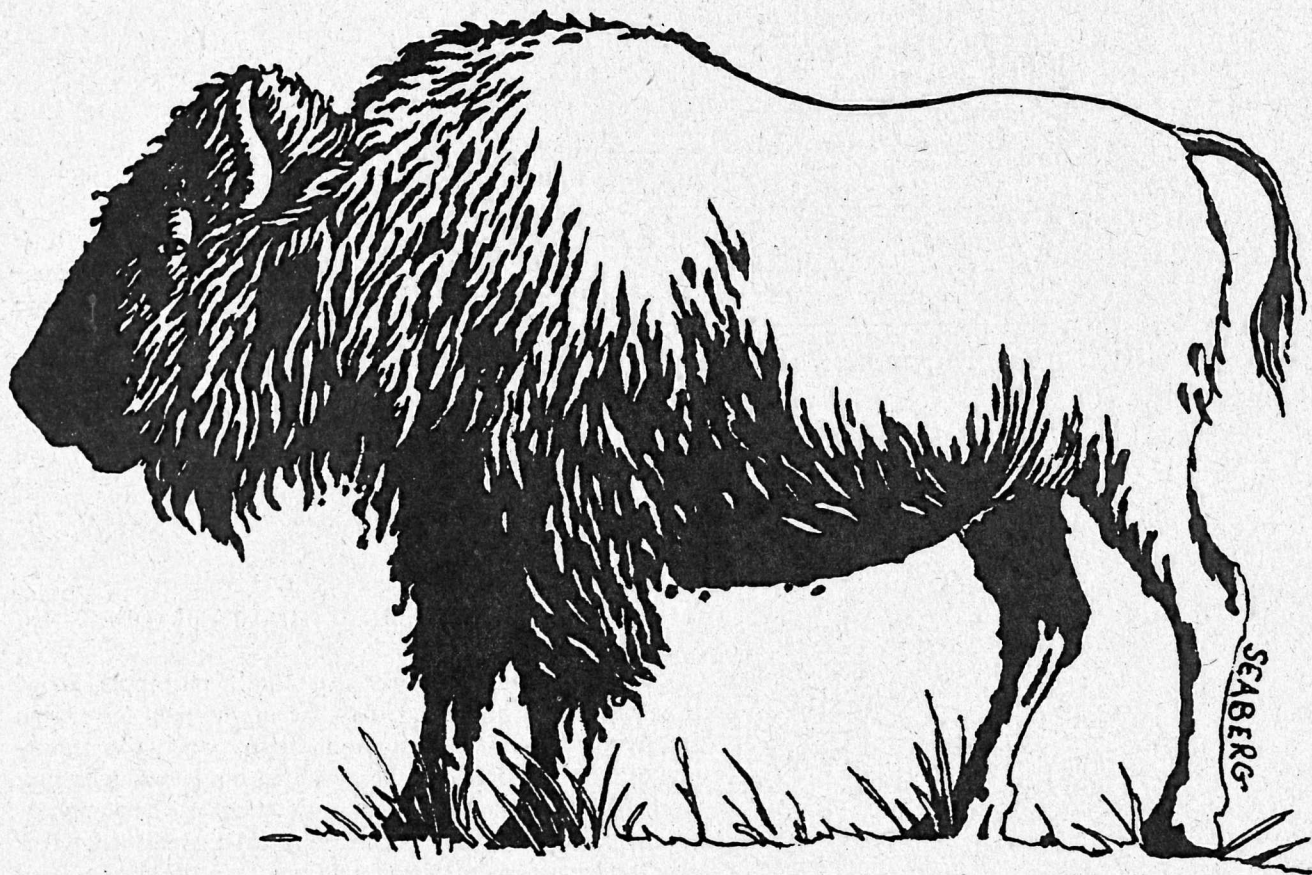
But what of the poor Bureau of Land Management people? Have we thought of them? Will they be driven off their land in the Lewis & Clark Preserve? Will they be forced to move to the last BLM strongholds in Nevada and Alaska; a sort of bureaucratic trail of tears, trundling their file cabinets behind them? Not at all! The BLM people will remain exactly where they are. They may even increase slightly in number (but we won't tell Newt!). They will continue to administer their Missouri Wild & Scenic River, which will be one of the chief attractions of the Lewis & Clark Preserve; but the rest of their tasks will become much, much more interesting, as they shift from wrangling with cattlemen on fencing, grazing, and water rights, and trying to adapt British cows to a hostile environment, and move into wildlife and ecosystem management (REALLY massive ecosystem management): seeing that a representative swatch of America's largest ecosystem is restored to something approaching the time of Lewis & Clark AND that the local people remain on their land and enjoy a decent and profitable lifestyle.

"But who is REALLY behind this Lewis & Clark Preserve Plot?" you ask suspiciously, thinking of UN troops and black helicopters. "Who is that mysterious 'we' that you keep referring to, the mysterious person or persons who put you up to this nefarious plan?"

Well, buckaroos, I have to admit that it wasn't my idea. It was first proposed about 150 years ago by an artist named George Catlin who painted in the upper Missouri country not long after the passage of Lewis & Clark. Mr. Catlin suggested that *A national park be established that would preserve the environment and native cultures of the high plains* (or words to that effect). Readers will note that while this was written 150 years ago, Mr. Catlin came up with the very modern, politically correct idea that the local peoples as well as the environment be preserved.

Since the Lewis & Clark Preserve will adjoin or enclose three Indian reservations, the tribes may consider taking down their fences and joining the Preserve and letting Bison run free on their land, making for an even larger preserve.

We had considered naming the Preserve after its idea man, George Catlin, but we have a PR problem. Nobody has heard of George Catlin, whereas everyone has heard of Lewis & Clark. There is the prototype American adventure story. Not too many kids want to play George Washington; most would rather play Lewis & Clark or some other



member of the expedition. The expedition was an all American event, including the brave and stalwart Black man, York, and the stubborn, opinionated proto-feminist Sacajawea. Lewis & Clark were the first Americans to hold an election west of the Rockies, and York and Sacajawea were the first Black and female Americans to vote. Since the expedition was a watershed in American history, it is fitting that the Preserve be named in the Expedition's honor.

"You're begging the question! Who is this mysterious 'we' that thought up this Communist plot? Tell us or we'll call out the Montana militia!" you say explosively.

Well, neighbors, actually it was this feller called Adam Smith, the father of what we call Capitalism, who put me up to it. In his *Wealth of Nations* (1776), he boosted free trade and the "Invisible Hand of the Marketplace," which means no permanent monopolies and no government subsidies. Mr. Smith is a sort of British precursor to our very own Newt Gingrich who wants to see an end to ALL government welfare and subsidies, which he believes has distorted the market. As we have noted, subsidies, both hidden and right up front, have caused cattle and wheat to be grown in areas where under a market demand economy, it would be financial suicide. Now Newt is a pistol, buckaroos! As the Blackfeet would say, he is a medicine bundle you'd better not unwrap! He and his colleagues have come up with a plan to end ALL farm subsidies within 7 years. This means

that folks in north-central Montana will be on their own. Can you make a living on unsubsidized wheat or grazing land in north-central Montana (and I mean without the hidden subsidies)? Well, yes. Depending on your outlook, you can enter into a pact with Satan, or, if you're on God's side, you can work out a deal with St. Jude, Patron of Hopeless Cases; otherwise, it's going to be mighty difficult, partner.

This means that some airy-fairy environmental idea like the Lewis & Clark Preserve may be worth discussing if we want to restore a high plains ecosystem and keep the locals, cranky as they are, on their land. What strange bedfellows might look favorably on this project? Well, we might be able to put together a really wild coalition of the Sierra Club, Newt Gingrich, The National Rifle Association, three Indian tribes, Bruce Babbitt, the Governor of Montana, Robert Redford, Dave Foreman, the Farm Bureau, and Earth First, to push the Lewis & Clark Preserve Project through! You have to admit it would be a colorful organization! ■

PJ Ryan works for the National Park Service and publishes "the oldest alternative newsletter in the federal government" (Thunderbear, POB 2341, Silverspring, MD 20915, \$13.50 per year). The article above is expanded from the April 1996 issue (#186).

Wild Child

Why the environmental movement needs parents and children

by Ken Wright



Her womb is the first landscape we inhabit.

—Terry Tempest Williams

TO BREED OR NOT TO BREED, THAT IS THE QUESTION.

That is the question, at least, that haunts some people I know. It haunts those who defend wild places, who fight for a clean and living world, who resist our insatiable society's consumption of resources. It haunts those who see our late-20th century world as a still-filling cup already brimming with humanity.

In periodicals, at conferences, in casual conversations wherever I encounter environmental activists around my age—breeding age—the question hangs in the air like a guillotine blade whenever the subject of child bearing and rearing comes up. To breed or not to breed? Can people fighting to keep the world from turning into one big LA justify having children themselves?

I've pondered this. And while I was pondering, my wife and I... well... had a kid. And after a year of thinking with this little person in my life, I have an answer for all you thoughtful and ecologically ethical people who question the righteousness of environmentalists bringing more people into the world. Yes, I answer that quandary, some of us in the environmental movement should, even must, bring children into the world.

Let me explain.

I don't think I'm a slacker. I have worked to defend wilderness and wilderness, and some of these actions can be considered radical. I have educated myself about issues and natural science and strategies of activism, and I have applied and shared and taught what I have learned. I have been a college instructor, a wilderness guide, a park service ranger. I have walked and boated and lived in a tent. I have written letters and news stories, blockaded stores and offices, been on TV and broken the law. I have dedicated my life to experiencing wilderness, and to seeking a perspective on and acting on what it means to be a human who is part of the web of life.

Then Webb came to life. A son, deliberately added to my home and to my world, our planet. And after a year with this child by my side, I can now say that becoming a parent is the wildest and most radical thing I have ever done.

Population Problems

I have witnessed my boy's little curled, gasping, blue body emerge from the core of my wife's body. I have watched him nourish himself and grow on what he can suck from her breasts. I have seen him caress his own hands, opening and closing them like hinges while he stared at them big-eyed, mouth agape. I have observed him at a month old pick out birds in flight with his eyes, at seven months point to birds at a window feeder, and at a year calmly state "dee" when a red finch landed on a branch over him while he sat in the grass.

What do these and hundreds of other first-year-of-human-life events tell me? *I am a mammal*. I knew that before, rationally, thoughtfully, but until now, until I watched this growing, learning, scurrying little critter, this little animal borne of my self and my wife, I never really *felt* it. I thought I had, but now I am aware on a deeply physical, beyond-the-rational level. I, Webb, you, we are all earth-borne animals, from the deepest corner of our kidneys to the roof of our psyches, and through the stratosphere of our spirits. Giving birth, producing milk and offering food, sheltering and protecting through infant helplessness, nurturing and sharing and expanding the world for an evolving awareness. Mammalian life, reproducing and eating and learning and growing and living on this earth like all other animals. That is all we are. That is more than enough.

Against this awareness, all the rest—politics and culture and economics—suddenly stands starkly contrived, made up, artificial, fictitious. Pulled by a tiny hand, I have been led down a new trail to new terrain where I am more bonded and committed, a more dedicated and hopeful and determined defender of a wild Earth than I ever dreamed possible. I have found a source of energy and vision that stretches beyond what I can see or even conceive of, reaching into both our genetic past and our generational future. I am still immersed in politics and culture and economics, strategically, but I now live richly aware of the *real* world of our animal humanity.

Our clasped hands, mine and this little person's, are a link in a genetic chain, a multi-millennia-long line tying together hunters and gatherers with the seventh generation to come. We are all the same; we are insepa-

rable. With Webb as my guide, I draw on the awareness of the former as I work for a world of the latter with wilderness, wild creatures, wild rivers and wild country where wild people live wild lifestyles.

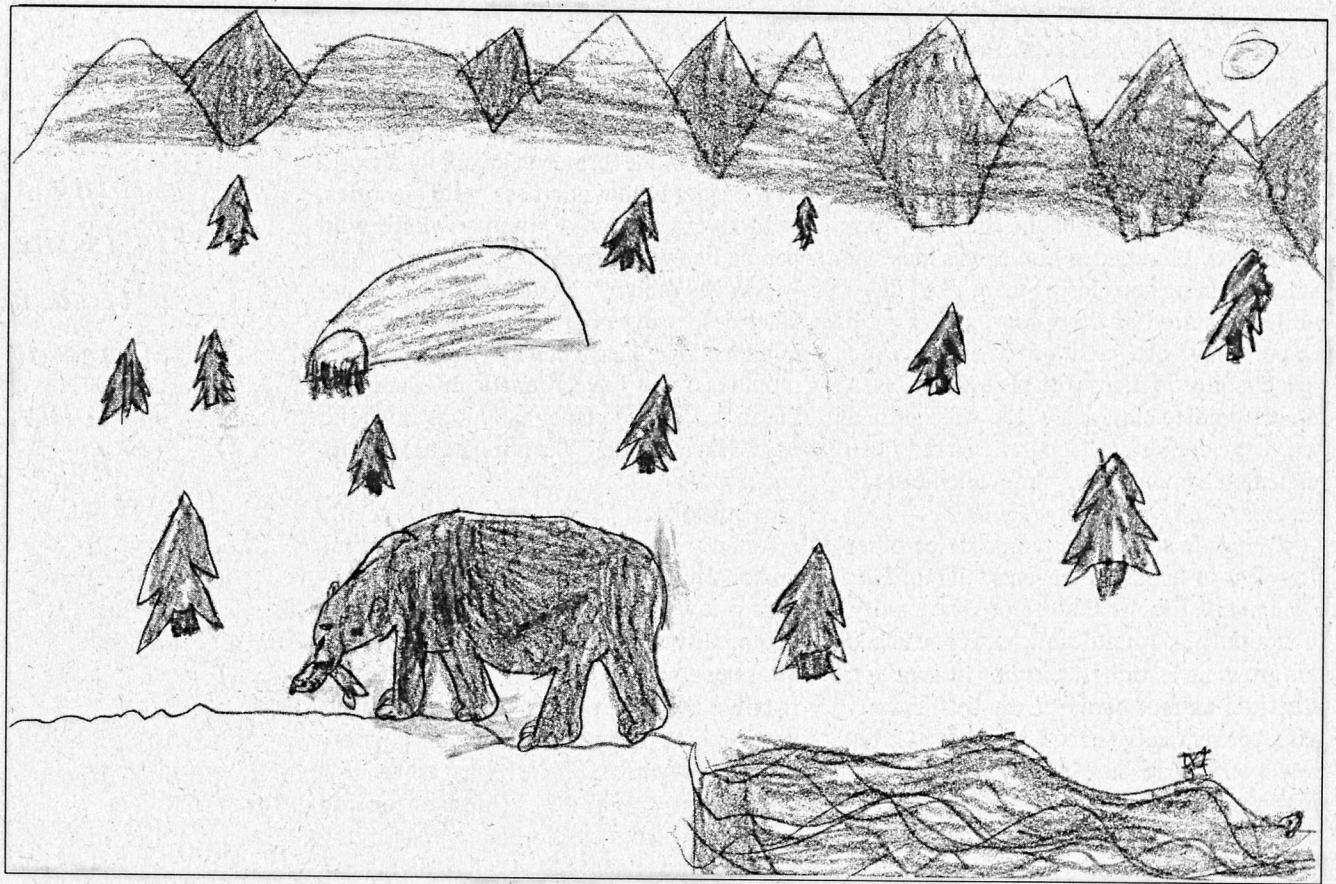
With Webb by my side, I can never consider despairing in or writing off the future of humankind. I have put my genes where my mouth is; I now have a genetic investment in the future, in the planet and humanity's life on it. Having a kid is the ultimate act of faith and hope.

But so what? So having a kid has deeply affected *me*. As good as it might be for me personally, this would still be mere selfishness if it weren't good for my place and my community as a whole, and if it weren't a vital step toward long-term change. I believe it is both. I believe that environmentalists who become parents regenerate the environmental movement. I believe that if we all—parenting and non-parenting activists—recognize the value of bringing children into our fold, if we all participate in their educations and their experiences, if we all feel a part of their families and include them in our communities, our networks, our tribes, then the environmental movement can transform from a mere movement to something more lasting, more effective, more real.

I hope Webb will join the ranks of a generation of children born appreciating, celebrating, and defending the wild world. Backed by their natural upbringing and wilderness experience, this next generation will stand as the vanguard, form the bedrock of whatever the movement builds in future decades. I could be wrong about this, for I am constantly reminded that raising children is an inexact science; but that is the risk we take.

We—both parenting *and* non-parenting environmentalists—must together raise this next generation. They must be seeded, grown, and nurtured from the soil of today's activists. Unfortunately, I don't see this happening. Instead, today I see the eco-warriors who live their strategic, lean, light lives piling guilt on the family people who are just as committed, but also are just-as-strategically settled and nested; and I hear the community-based activists laughing and pointing at the free-roaming, self-exiled outside agitators and alternative life-stylers. Where is this headed? Division, distrust, and distraction. We must

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be diversified in our strategies, but specialization of strategies into isolated islands of dogma leads to a fractured movement that is easily divided and conquered. And in the future, as this generation of environmentalists ages and dies off, I see a movement—or several smaller spun-off movements—that must rely on conversion of outsiders to carry on the work.

There is another way, though. What if we bring together environmentalist parents and their kids with those who for reasons of conscience or strategy decide not to have children? What if all of us moving the movement combine our efforts to nurture an enlightened generation rich in experience and ideals? If we do, we will begin to evolve more than a mere movement; we will form community. More than that: we will create a new *society*, a natural congregation of people encompassing the full spectrum of the human experience, people filling their best-suited roles—warriors and philosophers and parents and community builders—teaching and learning and working and fighting together.

Not everyone should have kids. Parenting is the best path for some; good parenting is their skill, their predilection. These people, if they decide to have a child or children, should do it deliberately, carefully, well. But those who choose not to procreate still must understand the value of kids, and they need to support those in the environmental movement who do have kids.

I don't mean we should pump these children with propaganda, but the full range of the environmental movement's members can offer youngsters a spectrum of involvement, experience, example, education and learning as principles and skills; can show openness and awareness of the world; can provide diversity, community, ritual and celebration. I also don't mean to indoctrinate or force participation on kids, but we can offer them a sense of belonging and membership in active environmentalism.

Backed by the variety of experience the full movement can offer, these kids will one day make their own choices, create their own movement. Or perhaps they will forge something more. A movement is a product of milieu, a reaction to immediate circumstances, but enter the children and you transcend the present time and reach forward, to the future, and become a lasting, resilient, adapting, evolving society.

That is what we need to do to survive, to effect real, long-term change, to turn ideals into reality.

We need the kids. ■

Ken Wright is the author of A Wilder Life: Essays from Home (Kivaki Press, 1995), from which this essay is adapted, and is co-founder of the San Juan Almanac, a bioregional journal for the San Juan River Basin (POB 116, Durango, CO 81301). He lives, writes, and plays with his family on the southwestern flank of the San Juan Mountains.

Humans as Cancer

by A. Kent MacDougall

A cancerous tumor continues to grow even as its expropriation of nutrients and disruption of vital functions cause its host to waste away. Similarly, human societies undermine their own long-term viability by depleting and fouling the environment. With civilization as with cancer, initial success begets self-defeating excess.

When a spot on a person's skin changes color, becomes tough or rough and elevated or ulcerated, bleeds, scales, scabs over and fails to heal, it's time to consult a doctor. For these are early signs of skin cancer.

As seen by astronauts and photographed from space by satellites, millions of man-made patterns on the land surface of Earth resemble nothing so much as the skin conditions of cancer patients. The transformation of the natural contours of the land into the geometric patterns of farm fields, the straightening of meandering rivers into canal-like channels, and the logging of forests into checkerboard clearcuts all have their counterparts in the loss of normal skin markings in cancer victims. Green forests logged into brown scrub and overgrazed grasslands bleached into white wasteland are among the changes in Earth's color. Highways, streets, parking lots and other paved surfaces have toughened Earth's surface, while cities have roughened it. Slag heaps and garbage dumps can be compared to raised skin lesions. Open-pit mines, quarries and bomb craters, including the 30 million left by US forces in Indo-China, resemble skin ulcerations. Saline seeps in inappropriately irrigated farm fields look like scaly, festering sores. Signs of bleeding include the discharge of human sewage, factory effluents and acid mine drainage into adjacent waterways, and the erosion of topsoil from deforested hillsides to turn rivers, lakes and coastal waters yellow, brown and red. The red ring around much of Madagascar that is visible from space strikes some observers as a symptom that the island is bleeding to death.

If skin cancer were all that ailed Earth, the planet's eventual recovery would be less in doubt. For with the exception of malignant melanoma, skin cancer is usually curable. But the parallels between the way cancer progresses in the human body and humans' progressively malignant impact on Earth are more than skin-deep. Consider:

Cancer cells proliferate rapidly and uncontrollably in the body; humans continue to proliferate rapidly and uncontrollably in the world. Crowded cancer cells harden into tumors; humans crowd into cities. Cancer cells infiltrate and destroy adjacent normal tissues; urban sprawl devours open land. Malignant tumors shed cells that migrate to distant parts of the body and set up secondary tumors; humans have colonized just about every habitable part of the globe. Cancer cells lose their natural appearance and distinctive functions; humans homogenize diverse natural ecosystems into artificial monocultures. Malignant tumors excrete enzymes and other chemicals that adversely affect remote parts of the body; humans' motor vehicles, power plants, factories and farms emit toxins that pollute environments far from the point of origin.

A cancerous tumor continues to grow even as its expropriation of nutrients and disruption of vital functions cause its host to waste away. Similarly, human societies undermine their own long-term viability by depleting and fouling the environment. With civilization as with cancer, initial success begets self-defeating excess.

It's easy to dismiss the link between cancer the disease in humans and humans as a disease on the planet as both preposterous and repulsive—or as a mere metaphor rather than the unifying hypothesis its leading proponent claims for it. Only a handful of limited-circulation periodicals, including this one (see Forencich 1992/93), have granted the concept a respectful hearing.

Accepting the humans-as-cancer concept comes easier if one also accepts the Gaia hypothesis that the planet functions as a single living organism. To be sure, the Earth is mostly inanimate. Its rocky, watery surface supports only a relatively thin layer of plants, animals and other living organisms. But so, too, is a mature tree mostly dead wood and bark, with only its thin cambium layer and its leaves, flowers and seeds actually alive. Yet the tree is a living organism. Earth behaves like a living organism to the extent that the chemical composition of its rocky crust, oceans and atmosphere has both supported and been influenced by the biological processes of living organisms over several billion years. These self-sustaining, self-regulating processes have kept the Earth's surface temperature,

its concentrations of salt in the oceans and oxygen in the atmosphere, and other conditions favorable for life.

James Lovelock, who propounded the Gaia hypothesis in 1979, initially rejected humans' cancer-like impacts as a corollary, declaring flatly: "People are not in any way like a tumor" (Lovelock 1988, p. 177). But before long he modified this view, observing: "Humans on the Earth behave in some ways like a pathogenic micro-organism, or like the cells of a tumor or neoplasm" (Lovelock 1991, p. 153).

Others have stated the connection more strongly. "If you picture Earth and its inhabitants as a single self-sustaining organism, along the lines of the popular Gaia concept, then we humans might ourselves be seen as pathogenic," Jerold M. Lowenstein, professor of medicine at the University of California, San Francisco, has written. "We are infecting the planet, growing recklessly as cancer cells do, destroying Gaia's other specialized cells (that is, extinguishing other species), and poisoning our air supply... From a Gaian perspective... the main disease to be eliminated is us" (Lowenstein 1992).

Dr. Lowenstein isn't the first physician to examine the planet as a patient and find it afflicted with humanoid cancer. Alan Gregg pioneered the diagnosis. As a long-time official of the Rockefeller Foundation, responsible for recommending financial grants to improve public health and medical education, Dr. Gregg traveled widely in the years following World War II and observed the worldwide population boom. By 1954 he had seen enough. In a brief paper delivered at a symposium and subsequently published in *Science*, Gregg (1955) compared the world to a living organism and the explosion in human numbers to a proliferation of cancer cells. He sketched other parallels between cancer in humans and humans' cancer-like impact on the world. And he expressed hope—unrealized to this day—that "this somewhat bizarre comment on the population problem may point to a new concept of human self-restraint."

It has fallen to a physician who is also an epidemiologist to flesh out and fill in Gregg's sketchily drawn analysis. Warren M. Hern wrote his Ph.D. dissertation on how the intrusion of Western civilization has increased birth rates among Peruvian Amazon Indians. He does his bit to keep the US birth rate down by operating an abortion clinic in Boulder, Colorado. Hern (1990) published a major article that laid out in detail, and buttressed with anthropological, ecological and historical evidence, the ways in which the human species constitutes a "malignant eco-tumor." He proposed renaming us *Homo ecophagus* (for "the man who devours the ecosystem"). Illustrations accompanying the article included aerial photographs of US cities juxtaposed with look-alike photos of brain and lung tumors.

Dr. Hern has delivered papers on the hypothesis at symposia organized by the Population Association of America, the American Association for the Advancement of Science, and the American Public Health Association. Two papers have subsequently been published (Hern 1993a, 1993b). But in general the scientific community doesn't take his hypothesis seriously, preferring to see it as a mere metaphor or analogy. Indeed, it has evoked hostility in some quarters. When Hern presented the hypothesis at the International Conference on Population and Development in Cairo in 1994, listeners reacted angrily, with one threatening, "Are you ready to die?" A Denver radio talk show host called Dr. Hern an "ecoquack" and a "fellow-in-good-standing of the Sky-Is-Falling School."



Population Problems

Such disparagement can be seen as yet another parallel between cancer the scourge in humans and humans as a carcinogenic scourge on the world. For just as Warren Hern encounters indifference, denial and downright hostility to his views, until recently American doctors routinely kept their cancer patients in the dark about the nature of their illness. The aim was to spare patients the shock, fear, anger and depression that the bad news commonly evokes. Families were reluctant to admit that a relative had died of cancer, and newspaper obituaries referred euphemistically to the cause of a death from cancer as "a long illness." In Japan, cancer remains a taboo topic. Public opinion polls indicate that people would rather not know if they have cancer and doctors would rather not tell them. When Emperor Hirohito was dying of cancer of the duodenum, his doctors lied, telling both him and the public that he had "chronic pancreatitis" (Sanger 1989).

In the United States, even some environmentally enlightened analysts remain in denial when it comes to the humans-as-a-planetary-cancer hypothesis. Christopher D. Stone, a law professor at the University of Southern California and son of the late leftist journalist I. F. Stone, authored an influential essay on environmental law, *Should Trees Have Standing? Toward Legal Rights for Natural Objects*. But in his latest book Stone (1993, p. 4) casts doubt on the proposition that "the earth has cancer, and the cancer is man." "The interdependency of the earth's parts does not amount to the interdependency of organs within a true organism," he notes. "The earth as a whole, including its life web, is not as fragile... the Gaian relationships are not so finely, so precariously, tuned."

Even deep ecologists acknowledge that Earth is qualitatively different from a true organism, that its legitimate status as a superecosystem falls short of qualifying it as a superorganism. Frank Forencich, who argued in "Homo Carcinomicus: A Look at Planetary Oncology" (Forencich 1992/93) that "the parallels between neoplastic growth and human population are astonishing," concedes that even a nuclear winter wouldn't completely destroy the living biosphere, much less the inanimate lithosphere, hydrosphere and atmosphere. "We can't kill the host," he says. "Civilization will break up before the biosphere goes" (Forencich 1993).

Still another objection is that any generalization about cancer is suspect because cancer is not a single disease, but rather a group of more than 100 diseases that differ as to cause and characteristics. Some cancers—breast cancer, for instance—typically grow rapidly and spread aggressively. Others, such as cancers of the small intestine, usually grow slowly. Prostate cancer often grows so slowly that it causes no problem. "It's completely possible for an organism to have cancer cells for its entire lifetime and suffer no ill effects" (Garrett 1988, p. 43).

The lack of a perfect correspondence between cancer the disease in humans and humans' cancer-like effects on the Earth invalidates the humans-as-cancer concept for some observers. But Warren Hern insists humans-as-cancer is a hypothesis be-

cause it is subject to verification or refutation and because it is useful as a basis for further investigation. Frank Forencich, in contrast, is content to consider the concept a metaphor. "That humans are like cancer is indisputable," he says. "But humans are not cancer itself."

Whether as metaphor or hypothesis, the proposition that humans have been acting like malignant cancer cells deserves to be taken seriously. The proposition offers a unifying interpretation of such seemingly unconnected phenomena as the destruction of ecosystems, the decay of inner cities and the globalization of Western commodity culture. It provides a valuable macrocosmic perspective on human impacts, as well as a revealing historic perspective in tracing humans' carcinogenic propensities back to the earliest times.

The progenitors of modern humans exhibited one of cancer cells' most significant characteristics, loss of adhesion, one to two million years ago. Because cancer cells are attached more loosely to one another than normal cells are, they separate easily, move randomly and invade tissues beyond those from which they were derived. Our direct ancestors, *Homo erectus*, demonstrated this trait in migrating out of Africa. Living in small mobile groups, these foragers/scavengers/hunters spread across Asia and Europe. The next hominid species in the evolutionary line, *Homo sapiens*, extended the dispersal into previously uninhabitable northern forests and tundra. Their successors, anatomically modern *Homo sapiens sapiens*, have spread to every continent and major ice-free island. With the aid of clothing, shelter, technology and imported supplies, they now occupy forests, wetlands, deserts, tundra and other areas formerly considered too wet, too dry, too cold, or too remote for human habitation. Humans now occupy, or have altered and exploited, two-thirds to nine-tenths (estimates vary) of the planet's land surface. It seems only a matter of time before they take over all the remaining "empty" spaces.

Humans' ongoing expropriation of the planet has proceeded apace with the eruption of human



The massing of humans into cities is all too similar to the way crowded cancer cells harden into tumors.

numbers; and the eruption of human numbers has features in common with the proliferation of cancer cells. In a healthy body, genetic controls enable a large number of individual cells to live together harmoniously as a single organism. Genetic switches signal normal cells when it is time to divide and multiply, and when it is time to break apart and be absorbed by neighboring cells. When the genetic switches are damaged, as by chemicals, radiation, or viruses, they can get locked in the "on" position. This turns normal cells into malignant cells that divide and multiply in disregard of the health of the entire organism.

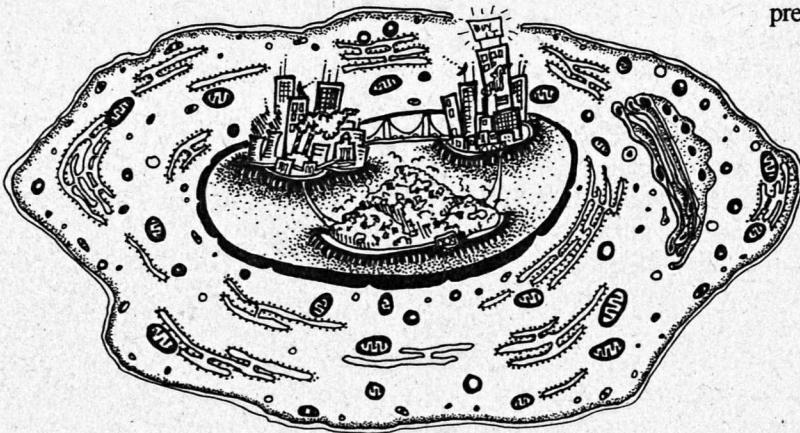
When humans lived in semi-nomadic bands in harmony with an environment they did not dominate, they limited their numbers so as not to exceed the supply of food they could gather, scavenge, and hunt. Nor did they produce more young than they could carry between seasonal camps. Their contraceptive measures included coitus interruptus (withdrawal), pessaries, and prolonged breastfeeding to depress the hormones that trigger ovulation. When these methods failed, they resorted to abortion and infanticide. Like normal cells in a healthy body, hunter-gatherers seemed to know when to stop growing.

However, technological and cultural contaminants upset this delicate natural balance, permitting humans to multiply beyond numbers compatible with the harmonious health of the global ecosystem. The first and still the foremost contaminant was fire. By 400,000 years ago—perhaps even earlier—hunter-gatherers had learned to control and use fire. Thus began the transformation of humans from just another large mammal in competition with other fierce predators into the undisputed overlord of all species, plant and animal. Addiction to combustion has defined human existence ever since, and has escalated into the current orgy of fossil-fuel burning with the potential of overheating Gaia and jeopardizing the existence of all her inhabitants.

Fire was generally benign when used by hunter-gatherers to thin dense forests into more open and park-like landscapes supporting more game. But the increase in food supply that more effective hunting and the cooking of tough meat and fibrous vegetable matter made possible swelled hunter-gatherer populations. As humans proliferated and spread out, overhunted and overgathered, large game and suitable wild foods became less abundant. This made hunting and gathering less efficient, leaving horticulture, which previously hadn't been worth the extra effort, as the only viable alternative.

Clearing forests to farm began some 10,000 years ago in Asia Minor. About 2000 years later, shifting horticulturists began slashing and burning their way northwestward across Europe. They overwhelmed and pushed aside less numerous hunter-gatherers before giving way in turn to agriculturalists whose plow cultivation of permanent fields permitted more intensive food production and denser populations.

Agriculture condemned peasants to a short, harsh life of monotonous toil, an inadequate diet,



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the constant threat of crop failure and starvation, and exposure to virulent contagious diseases. It fostered social stratification and sexual inequality, cruel treatment of animals, despotism and warfare. And it encouraged further cancer-like encroachment on wilderness to feed increased populations and to replace fields and pastures eroded and depleted of soil fertility by overcropping and overgrazing. The elites that came to dominate sedentary agrarian societies caused still more woodland to be cleared and marshland to be drained to maximize production they could expropriate for their own use. This economic surplus, in turn, helped support an increasing concentration of people in river valleys, along seacoasts, and in cities.

The massing of humans into cities is all too similar to the way crowded cancer cells harden into tumors. Whereas normal cells in a tissue culture stop reproducing when they come in contact with other cells, cancer cells continue to divide and pile up on top of one another, forming clumps. Normal cells display contact inhibition, growing only to the limits of their defined space and then stopping. Cancer cells never know when to quit.

Likewise, human populations grow even under extremely crowded conditions. The very essence of civilization is the concentration of people in cities. As scattered farming villages evolved into towns, and some towns became trading, manufacturing, ceremonial and administrative centers, the city was born. Fed by grain grown in the provinces and served by slaves seized there, the administrative centers of empires grew large; Rome may have reached one million people at its height in 100 C.E. Yet not until industrialization and the extensive exploitation of distant resources after 1800 did cities really begin getting out of hand; and in 1900, still only one in ten people lived in cities. Half will in 2000, with 20 metropolitan areas expected to have 10 million or more people each.

The propensity of modern cities to spread out over the countryside—absorbing villages, destroying farm fields, filling in open land, and creating vast new agglomerations—was noted early in this century by the Scottish garden-city planner Patrick Geddes. Geddes (1915) identified half a dozen such “conurbations” in the making in Britain, and he foresaw the approach of a 500-mile megalopolis along the northeastern Atlantic seaboard in the United States. Geddes compared urban sprawl to an amoeba, but it fell to his American protege Lewis Mumford to liken disorderly, shapeless, uncoordinated urban expansion to a malignant tumor, observing that “the city continues to grow inorganically, indeed cancerously, by a continuous breaking down of old tissues, and an overgrowth of formless new tissue” (Mumford 1961, p. 543).

A malignant tumor develops its own blood vessels as it grows. Similarly, cities vascularize with aqueducts, electric power lines, highways, railroads, canals and other conduits. A tumor uses its circulation network to pirate nutrients from the body. Similarly, cities parasitically tap the countryside and beyond to bring in food, fuel, water, and other supplies. However, just as a tumor eventually outgrows its blood supply, caus-

ing a part of it, often at the center, to die, inner city neighborhoods and even older suburbs often atrophy. Alan Gregg (1955) noted this parallel 40 years ago, observing “how nearly the slums of our great cities resemble the necrosis of tumors.”

Humans are increasingly concentrated along seacoasts. Sixty percent of the world's people now live within 100 kilometers of a seacoast. In Australia, one of the world's most highly urbanized nations, nine of every ten people live along the coast. The boom in international trade, from which coastal areas receive a disproportionate share of the benefits, helps explain the worldwide trend; but the pattern goes back thousands of years and parallels yet another carcinogenic process: metastasis.

In metastasis, a tumor sheds cancer cells that then migrate to distant sites of the body and set up secondary growths. The medium for the migration of the cells is the blood and lymphatic systems. In the ancient world of the Mediterranean, another fluid—water—facilitated the migration of people and goods. The Phoenicians, Greeks, Carthaginians and Romans all took advantage of the relative ease of travel and transport by water to establish colonies all around the Mediterranean. At the height of the Roman Empire, no fewer than 500 settlements flourished along the African coast from Morocco to Egypt.

Just as secondary tumors in the human body destroy the tissues and organs they invade, colonizers of the ancient Mediterranean devastated the fertile but fragile ecosystems of the coastal regions they colonized. They logged coastal forests for ship timbers and building materials, to provide charcoal to fire bricks and pottery and smelt mineral ores, and to create farm fields and pastures. Overcropping, fires, sheep and goats prevented regeneration. Intense winter rains washed the thin, easily eroded soil down hillsides into coastal plains to smother farm fields, choke the mouths of rivers, create malarial marshes, bury port cities and strand many of them miles from the sea. The slopes, left barren, have not recovered to this day.

The voraciousness of secondary tumors as they invade and consume tissues and organs has its counterpart in the orgies of destruction that states and especially empires have engaged in for 5000 years. In many cases, the destruction has exceeded what was in the destroyer's own self-interest. Many invaders routinely obliterated the cities they conquered, massacred their inhabitants, and destroyed their fields and flocks instead of just taking them over. Carpet bombing of cities and the mass slaughter of their civilian noncombatant populations during World War II constitute the modern equivalent. Ancient Romans ransacked their empire for bears, lions, leopards, elephants, rhinos, hippos and other live animals to be tormented and killed in public arenas until there were no more to be found. European invaders of North America and Siberia did in the fur trade from which they so hugely profited by the self-defeating overkill of fur-bearing animals.

Human destruction of ecosystems has increased relentlessly since industrialization. The annihilation of 60 million bison on the North American Great Plains was made possible

Just as a fast-growing tumor steals nutrients from healthy parts of the body to meet its high energy demands, industrial civilization usurps the resources of healthy ecosystems that their natural plant and animal inhabitants depend on for survival.

by the intrusion of railroads and the invention of the repeating rifle. The reckless exploitation of whales was speeded by the invention of the explosive harpoon, cannon-winch and engine-driven ship. Enormous nets towed by today's factory trawlers permit oceans to be strip-mined for fish—and any other creature unlucky enough to become ensnared in these curtains of death. Tractors and other modern farm machinery alternately compact and pulverize topsoil, increasing its vulnerability to erosive winds and rains. Chain saws and bulldozers level forests faster than axes and hand saws ever could. Dynamite and drag line excavators permit strip mining on a scale hitherto unimaginable, decapitating mountains, turning landscapes into moon craters, and rendering islands such as phosphate-rich Nauru in the South Pacific all but uninhabitable. Boring holes in the earth to get at minerals, of course, resembles the way cancer bores holes in muscle and bone. As Peter Russell (1983, p. 33) has observed, "Technological civilization really does look like a rampant malignant growth blindly devouring its own ancestral host in a selfish act of consumption."

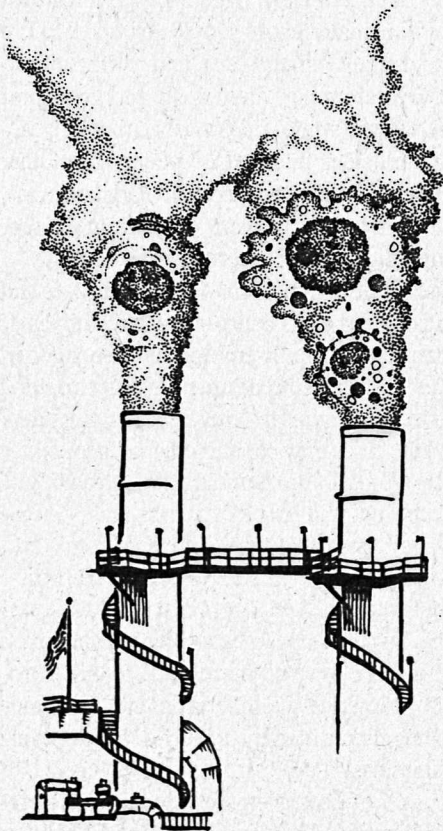
Just as a fast-growing tumor steals nutrients from healthy parts of the body to meet its high energy demands, industrial civilization usurps the resources of healthy ecosystems that their natural plant and animal inhabitants depend on for survival. In 1850, humans and their livestock accounted for 5 percent of the total weight of all terrestrial animal life. Today, that portion exceeds 20 percent, and by the year 2030 it could reach 40 percent (Westing 1990, pp. 110-111).

"Never before in the history of the earth has a single species been so widely distributed and monopolized such a large fraction of the energetic resources. An ever-diminishing remainder of these limited resources is now being divided among millions of other species. The consequences are predictable: contraction of geographic ranges, reduction of population sizes, and increased probability of extinction for most wild species; expansion of ranges and increased populations of the few species that benefit from human activity; and loss of biological diversity at all scales from local to global" (Brown and Maurer 1989).

Decline in diversity is common to both cancer and civilization. In both cases, heterogeneity gives way to homogeneity, complexity to simplification. Malignant cells fail to develop into specialized cells of the tissues from which they derive. Instead, "undifferentiated, highly malignant cells tend to resemble one another and fetal tissues more than their adult normal counterpart cells" (Ruddon 1987, p. 230).

De-differentiation in human societies is at least as old as agriculture and animal husbandry. Farmers have been replacing diverse species of native plants with pure stands of domesticated crops for thousands of years. Instead of the thousands of kinds of plants that pre-agricultural peoples gathered for food, just seven staples—wheat, rice, maize, potatoes, barley, sweet potato and cassava—now supply three-quarters of the caloric content of all the world's food crops. The world's astonishing abundance and variety of wildlife is going fast, with many species soon to be seen only in zoos and game parks, their places taken by cattle, sheep, goats, pigs and other domesticated livestock.

Despite their value in providing wildlife habitat, modulating flood waters and filtering out pollutants, more than half of the world's swamps, marshes, bogs, seasonal flood plains and other wetlands have been drained, dredged, filled in, built on or otherwise destroyed. Temperate forests dominated by trees of many species and of all ages are giving way to single-species, same-aged conifer plantations supporting far fewer birds and other



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wildlife. And the tropical forests that harbor more than half of all species on Earth are being mowed down faster than their bewildering biodiversity can be identified, leading some experts to warn that we are causing the greatest mass extinction since the disappearance of the dinosaurs 65 million years ago.

The tendency of civilizations to homogenize and impoverish ecosystems is nowhere clearer than in urban areas. Major cities are becoming indistinguishable from one another in appearance and undifferentiated in function. Central business districts so resemble one another that travelers can be forgiven for forgetting whether they are in Boston, Brussels or Bombay. Shanty cities in poor countries look alike, as do suburbs in rich countries.

As Lewis Mumford pointed out more than 30 years ago, the archetypal suburban refuge in the United States consists of "a multitude of uniform, unidentifiable houses, lined up inflexibly, at uniform distances, on uniform roads, in a treeless communal waste, inhabited by people of the same class, the same income, the same age group, witnessing the same television performances, eating the same tasteless pre-fabricated foods, from the same freezers, conforming in every outward and inward respect to a common mold, manufactured in the central metropolis. Thus the ultimate effect of the suburban escape in our time is, ironically, a low-grade uniform environment from which escape is impossible" (Mumford 1961, p. 486).

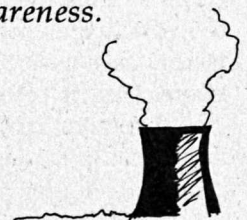
Globalization of the economy is enclosing the entire world in a single market for machine-made goods that are increasingly standardized whatever their country of origin. Western material values and capitalist commodity culture, led by American television, movies, music, street fashions and fast food, are dominant internationally. Local and regional individuality, along with indigenous cultures, languages and world views, are fading fast.

The decline of natural and cultural diversity is as threatening to the planet as undifferentiated cells are to the cancer patient. Whereas a well-differentiated prostate cancer tends to grow slowly, remain localized and cause no symptoms, a poorly differentiated one often spreads aggressively. Similarly, traditional farmers who keep weeds, pests and plant diseases in check by rotating crops, fertilizing naturally, and maintaining the tilth of the soil don't threaten Earth's health the way single-crop plantations relying on pesticides, synthetic fertilizers and heavy machinery do. Unfortunately, monocultural agriculture is becoming the norm on every continent.

Hemorrhaging is still another symptom of the carcinogenic process. The first sign of cancer is often spontaneous bleeding from a body orifice, discharge from a nipple, or an oozing sore. Vomiting can warn of a brain tumor or leukemia. Signs that Earth, too, has cancer abound. Cities vomit human sewage and industrial wastes into adjacent waterways. Mines and slag heaps ooze mercury, arsenic, cyanide and sulfuric acid. Wells gush, pipelines leak and tankers spill oil. Farm fields discharge topsoil, fertilizers, pesticides and salts to silt up and poison rivers and estuaries. Cattle feedlots add manure. Most serious of all, deforested, eroded hillsides hemorrhage floods of mud.

Fever is another symptom of cancer in both humans and the planet. Cancer patients become fevered because of increased susceptibility to infection caused by a depressed immune system. Chemotherapy and irradiation can also cause fever, as can temperature-elevating substances released by a malignant tumor. Global warming is the planetary counterpart. Waste products released by industry and motor vehicles, deforestation and other feverish human activities pump inordinate quantities of carbon dioxide, nitrous oxide, methane, chlorofluorocarbons and other greenhouse gases into the atmosphere where they trap heat and raise temperatures.

Cancer cells can't know the full extent of the harm they're doing to the organism of which they are a part, whereas humans have the capacity for planetary awareness.



Wasting, or cachexia, is still another sign of advanced cancer. A cancer patient becomes fatigued and weak, losing both appetite and weight as the tumor releases toxic hormones and makes metabolic demands on the body. "Many cancer patients die not of cancer itself, but of progressive malnutrition" (Rosenbaum 1988, p. 264). The planetary counterpart includes loss of forests, fisheries, biodiversity, soil, groundwater and biomass.

It's not in a tumor's self-interest to steal nutrients to the point where the host starves to death, for this kills the tumor as well. Yet tumors commonly continue growing until the victim wastes away. A malignant tumor usually goes undetected until the number of cells in it has doubled at least 30 times from a single cell. The number of humans on Earth has already doubled 32 times, reaching that mark in 1978 when world population passed 4.3 billion. Thirty-seven to 40 doublings, at which point a tumor weighs about one kilogram, are usually fatal (Tannock 1992, pp. 157, 175).

Like a smoker who exaggerates the pain of withdrawal and persists because the carcinogenic consequences of his bad habit don't show up for 20 or 30 years, governments generally avoid the painful adjustments needed to prevent social, economic and environmental disasters in the making. "Governments with limited tenure, in the developing as well as in the developed countries, generally respond to immediate political priorities; they tend to defer addressing the longer term issues, preferring instead to provide subsidies, initiate studies, or make piecemeal modifications of policy" (Hillel 1991, p. 273). So it usually takes a crisis, often a catastrophe, before even the most commonsensical action is taken—and then it is often too late to avoid irreversible ecological damage.

Is the prognosis for the planet as grim as it is for a patient with advanced cancer? Or will infinitely clever but infrequently wise *Homo sapiens* alter geocidal behaviors in time to avoid global ruin? Even the most pessimistic doomsayers concede that humans have the capacity to arrest Gaia's deteriorating condition. Cancer cells can't think, but humans can. Cancer cells can't know the full extent of the harm they're doing to the organism of which they are a part, whereas humans have the capacity for planetary awareness. Cancer cells can't consciously modify their behavior to spare their host's life and prolong their own, whereas humans can adjust, adapt, innovate, pull back, change course.

Gaia's future, and humans' with it, depends on their doing so. ■

Wild Earth will cosponsor World Population Awareness Week, 27 October to 2 November 1996. WPAW is a commemorative week created to foster awareness of the environmental, economic, political, and social consequences of rapid worldwide human population growth. For more information contact The Population Institute, 107 Second St., NE, Washington, DC 20002; (202) 544-3300.

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Wildlands Recovery in Pennsylvania

A Preliminary Assessment

by Thomas P. Rooney

INTRODUCTION

This paper will briefly assess the physical and biological features of Pennsylvania, identify threats to Pennsylvania's biodiversity, and identify priority areas for vision mapping. It does not constitute a wilderness proposal per se, but does provide a conceptual framework for wildlands recovery in Pennsylvania. It complements the Pennsylvania Ecological Reserve Network proposal drafted by Scott Thiele (unpublished report; see references).

PHYSICAL GRADIENTS

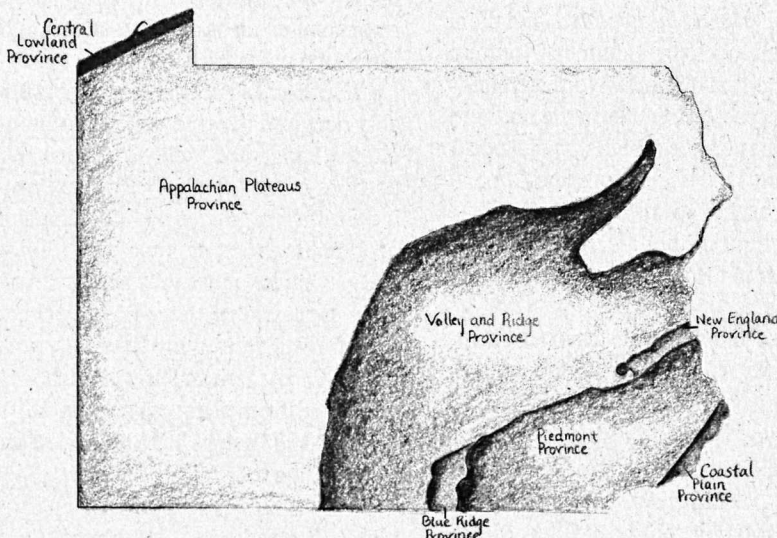


Figure 1. *physiographic provinces of Pennsylvania*

Physiographic Provinces

The physical landscape can be divided into distinct provinces based on geomorphic history. These physiographic provinces are generated by tectonic and leveling forces, processes that operate on time scales of millions of years. Physiographic provinces influence the distribution of soils and hydrology, which in turn influence climate. Pennsylvania overlaps 7 of these provinces (Fig. 1).

The *Atlantic Coastal Plain* is characterized by shallow valleys formed by the erosion and transportation of sand and gravel off the Appalachian Mountains. This province contains many freshwater and brackish marshes and intertidal mud flats. The *Piedmont* contains rolling hills, formed by the weathering of the Appalachian Mountains. This province dates back to the Precambrian, and contains some of the oldest rock in North

America, as well as many "barrens." The *New England Province* is a series of disjunct rounded hills and ridges. This province has some of the richest soils in Pennsylvania. The *Blue Ridge* is characterized by high ridges and deep valleys. This province extends north from the Southern Appalachians through Virginia and Maryland, and terminates in south-central Pennsylvania. The *Ridge and Valley Province* is characterized by long, high, and narrow ridges separated by broad valleys. Rocky talus slopes are abundant in this province. The *Appalachian Plateau* extends over the western and northern half of the state, and is characterized by rolling uplands cut by steep stream valleys. Pennsylvania's limestone caves and natural lakes are in this province. The *Central Lowland Province* forms a narrow band along Lake Erie. It is comprised of former lake deposits. Many unique species and communities are found in this province.

These physiographic provinces exert a strong influence on soil types, climate, and ultimately, species distributions. For example, the Marsh Rice Rat (*Oryzomys palustris*) is confined to the Atlantic Coastal Plain in Pennsylvania, where there is a high degree of connectivity between wetlands (Merritt 1987). Raptors follow the Kittatinny-Shawangunk Range, a part of the Ridge and Valley Province, during annual fall migrations (Heintzelman 1993). The topography of the Ridge and Valley influences wind patterns and creates the thermals necessary for raptor migration. These provinces also contain a wide range of elevational gradients, which in turn influence the distribution of vegetative communities (Hunter et al. 1988; Noss 1992). Many plants in Pennsylvania are confined to a single physiographic province (Keener and Park 1986).

Climate

Pennsylvania has a humid climate characterized by hot summers and cold winters. Since the state is topographically diverse and situated between polar and tropical air masses, local weather patterns can exhibit great variations. Lands south and east of the Appalachians have a milder climate and a longer growing season than areas north and west, where arctic fronts produce harsh weather. The mean annual temperature in the state is 10° C, and ranges from -40° C to 33° C. Annual precipitation ranges from 70-130 cm.

BIOLOGICAL DIVERSITY

Community Types

Forests were the most widespread terrestrial community types before European settlement, and formed the primary habitat linkage throughout the landscape (Fig. 2). The northern extent of the *Mixed Mesophytic* association, the most diverse forest type in the eastern United States, terminates in southwestern Pennsylvania. The northern limit of the *Oak-Hickory-Pine* association also terminates in southern Pennsylvania.

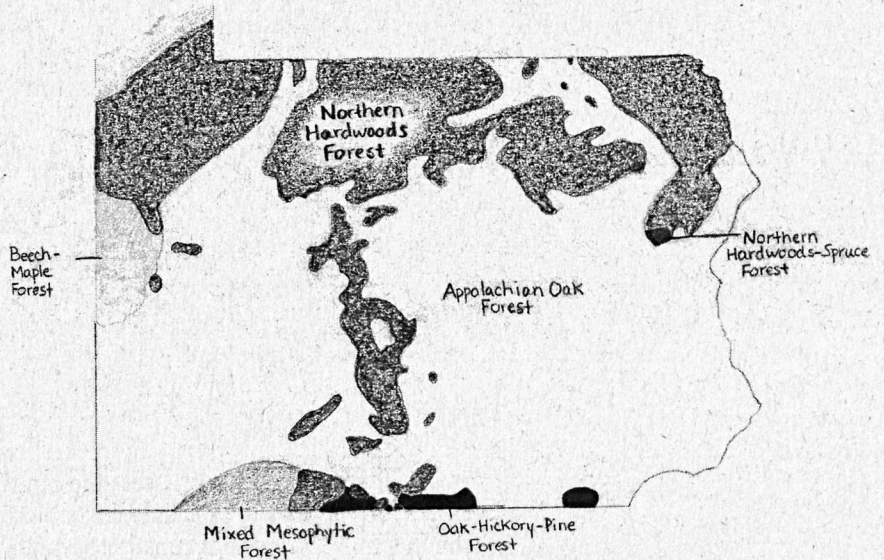


Figure 2. potential natural vegetation of Pennsylvania

The *Appalachian Oak* association is the most widespread forest type in the state. This vegetation type follows the Appalachian Mountains from New York to Georgia. The contiguous southern limit of the *Northern Hardwoods* association, which includes the Hemlock-Northern Hardwoods and Spruce-Northern Hardwoods types, terminates in the northern part of the state, although disjunct pockets of this type occur along the Appalachians as far south as Georgia. The eastern limit of the *Beech-Maple* association is in the northwestern portion of the state.

Less than 1% of Pennsylvania's virgin forests remain. The Northern Hardwoods association is the best represented forest type with 40 original sites totaling 4895 hectares (Smith 1989). Appalachian Oak old growth is represented in 8 sites totaling 520 ha, Mixed Mesophytic in 10 sites totaling 320 ha, and Beech-Maple in 4 sites totaling only 46 ha (Smith 1989). Pennsylvania no longer has any known examples of old-growth Oak-Hickory-Pine.

While forests covered most of the state, many discontinuous ecological communities occurred as well. These communities harbored numerous rare species.

Wetlands, which include swamps, marshes, bogs, fens and seeps, cover 160,000 ha. Of all state-listed endan-

gered and threatened plant species, 59% are dependent on wetlands.

Barrens are sparsely vegetated, generally xeric habitats. Pennsylvania has numerous barren types, including shale, serpentine, scrub oak, rocky summit, and limestone glade barrens.

Grasslands and oak savannas probably occurred in some valleys throughout the Ridge and Valley Province and portions of the Allegheny Plateau Province, but their species composition and geographic extent are unknown (Smith 1989). Oak savannas may have been an early-successional state of Appalachian Oak forests following fires (Abrams 1992). The American Bison, which was extirpated from Pennsylvania in 1801 (Merritt 1987), may have depended on oak savanna habitat.

Cave habitats and their faunas are largely unstudied, even though they greatly enrich Pennsylvania's diversity.

Species Diversity

Pennsylvania lies in a transition zone between the Canadian and Austral Life Zones (Genoways and Brenner 1985). Representative species from both life zones coexist in Pennsylvania. The state provides habitat for 71 native species of mammals, 379 birds, 73 amphibians and reptiles, 159 fish, 2076 vascular plants, 625 nonvascular plants, 230 identified fungi, and an estimated 10,000-

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20,000 invertebrates (PADER 1994). Some of these are recognized as globally significant; 2 mammals, 2 reptiles, 10 fish, 46 invertebrates, and 36 plants native to PA are ranked G1 through G3 (globally imperiled, imperiled, or rare throughout range).

Genetic Diversity

Because baseline information is lacking, the genetic diversity of Pennsylvania's wildlife cannot be assessed directly. However, some ecological patterns may reflect genetic variation. For example, species at the limit of their geographical range and disjunct populations tend to be genetically differentiated from the main body of their distribution (Hoffmann and Blows 1994). (Rhoads, 1986, reviews plant species at the southern or northern extent of their ranges; PADER, 1994, gives examples of range limit species and disjunct populations in the state.)

THREATS TO BIODIVERSITY

Habitat Destruction

Pennsylvania has a human population of 12 million, 70% of which live in metropolitan areas. Most overt habitat destruction has taken place over the last 300 years. The Atlantic Coastal Plain and Piedmont in particular have been heavily damaged by urban development and industrialization. The low elevation forests of the Ridge and Valley have been cleared for farmlands. Sprawling suburbs and resorts, road building, landfill construction and surface mining are destroying remaining habitat throughout the state. Housing developments are widespread in the southeastern and northeastern portions of the state, while landfills and surface mines are common throughout western Pennsylvania. Wetlands are among the most affected habitats.

Habitat Modification

The effects of habitat modification are well known: communities and populations become fragmented. Fragmentation is recognized as one of the greatest

threats to biodiversity worldwide (Noss and Cooperrider 1994). Commercial logging is the most common form of habitat modification in Pennsylvania, with an average of 1 billion board feet cut annually. Pennsylvania has 1055 sawmills. About 80% handle under a million board feet a year. The remaining 200 mills process over 75% of the wood logged in Pennsylvania.

Pennsylvania has 10 hydroelectric dams, 5 of which are on the lower Susquehanna River. Hundreds of additional dams have been constructed on smaller waterways to create artificial lakes for recreation and municipal water. The fragmentation of riverine systems degrades ecological communities in many predictable and unpredictable ways (Noss and Cooperrider 1994).

Exotic Species

Exotic species have had and continue to have a major impact on native species. Currently, Pennsylvania has at least 2 exotic mammal species, 5 exotic birds, 77 exotic fish, 1227 exotic vascular plants, and 2 exotic nonvascular plants (PADER 1994). The number of exotic invertebrates is currently unknown, although the list includes the zebra mussel and gypsy moth. Exotic species often displace native ones, which in some cases has led to extinction. Exotics may hybridize with native species, thereby reducing native genetic diversity. Exotic species have also been responsible for introducing new diseases into native populations (Noss and Cooperrider 1994). Exotics can alter properties of entire ecosystems, such as productivity, nutrient cycling, and hydrology (Vitousek 1990).

Overabundance of Opportunistic Native Species

Just as exotic species threaten biodiversity, overabundant (relative to pre-settlement levels) native species can pose threats to species less tolerant of humanized landscapes (Garrott et al. 1993). White-tailed Deer are simplifying ecological communities throughout most of the state. Likewise, Hay-scented

Fern has spread throughout forest communities because of logging, deer browsing, and canopy defoliation. Cattail and Phragmites have become monodominant in many degraded wetlands. Raccoons, Brown-headed Cowbirds, and American Crows are reducing nesting success of songbirds.



Air Pollution

Air pollution may be the greatest threat to the long-term health of Pennsylvania's forests. Acid rain, which results from the burning of fossil fuels, affects both terrestrial and aquatic systems. Pennsylvania receives more acid deposition than any other state because it is the third largest producer of such emissions and it is downwind from the highest concentration of air pollution emissions in the United States. Rain averages pH 4.0 to 4.1 throughout the state. Nitrogen deposition associated with acid rain can lead to nitrogen saturation, and ultimately forest decline (Aber et al. 1989). Acid rain affects aquatic systems by reducing species richness of aquatic insects and fish (Herlihy et al. 1993).

Ground-level ozone, generated by auto emissions and common throughout the state, increases plant stress. The Cinnamon Fern (*Osmunda cinnamomea*) develops orange and brown spots in response to ozone, and is considered to be an excellent bioindicator of ozone levels (J. Pickering, pers. comm.).

Water Pollution

Acidic runoff from abandoned mines is the greatest source of water pollution in the state. This mine drainage—which increases the acidity, turbidity, and heavy metal concentration of affected streams and rivers—is widespread throughout western Pennsylvania. Raw sewage is a serious problem in heavily-populated areas, such as Pittsburgh and Philadelphia. Sewage pollution can lead to algal blooms and reduce the dissolved oxygen content of water bodies. Agricultural runoff, which increases nutrients and turbidity, accounts for 10% of all pollution in Pennsylvania. Industrial pollution accounts for 7% of pollution. Heavy metals, organic solvents, and other biocides are released into waters by industries.

Climate Change

Stratospheric ozone depletion and global warming are serious threats to biological diversity worldwide. To maximize the effectiveness of reserves, wildland recovery areas should encompass all physical gradients throughout the state (Peters and Darling 1985; Hunter et al. 1988). In addition, populations at the northern or southern limit of their species' ranges should receive additional consideration (Furlow 1995; Rooney 1995a). These populations are often genetically distinct from more central populations, and may be pre-adapted for stressful conditions (Hoffmann and Blows 1994).

CONSERVATION PRIORITIES

Noss (1992) lists ecosystem representation, maintenance of viable populations and ecosystem processes, and allowing for change as necessary goals for any wildlands recovery project. These goals may be accomplished by establishing vast—millions of hectares—wilderness recovery areas (Noss 1992). Unfortunately, few immediate opportunities exist in the eastern US for conservation on this scale. Only 25% of Pennsylvania is in public ownership. A well-designed and implemented system of linked reserves, however, may partially compensate for the lack of huge blocks of unaltered habitat (Noss 1987). Large core wild areas linked by corridors and surrounded by buffer zones should be implemented in Pennsylvania.

The best single chance for wilderness recovery in Pennsylvania is the north-central part of the state, where a 1 million ha reserve could be implemented almost entirely on existing state and National Forest lands (West Branch Bioregional Project 1992; Thiele unpub. rep.). While some core areas could exceed 25,000 ha (Thiele), most would be less than 5000 ha. With appropriate buffer zones, corridors, and multiple-use zoning, this area could eventually meet all of The Wildlands Project goals (Noss 1992). Restoration management will be necessary throughout this region (Rooney 1995b).

A second large (1 million ha) reserve could encompass the mountains in the Appalachian Range stretching from West Virginia and Maryland into north-eastern Pennsylvania, northwestern New Jersey, and southeastern New York. This mountain range is 80-110 km wide, and spans the entire state. Ownership in this region is a highly fragmented mix of public and private land, which would make reserve implementation difficult. However, this region contains more unique community types than the north-central region, such as ridge-top dwarf tree

forests, sand barrens, shale barrens, acidic deciduous swamps, conifer swamps, oligotrophic kettle hole bogs, and mesic oak-heath-pine barrens (Smith 1991). In areas where the rugged topography has effectively limited development and resource extraction, core areas would exceed 10,000 ha. Opportunities for buffer zones will be limited since the valleys contain towns and agricultural fields.

To represent all native ecosystem types and physical gradients, smaller reserves, too, need to be identified and protected (Noss 1987; 1992). The Nature Conservancy and other land trust groups already own and protect many representatives of the rare community types; however, gap analysis needs to be conducted to determine which rare types need further protection. Unrepresented physical and biological features could be represented in smaller (1000-10,000 ha) interconnected reserves throughout the state. Greenways may help accomplish Wildlands goals in urban and agricultural landscapes.

CONCLUSIONS

Almost 10 years ago, Sayen (1987) set forth the Preserve Appalachian Wilderness vision of continuous wilderness from Maine to Georgia. Proposals have been offered for the Central and Southern Appalachians (Mueller 1991, 1992; Newman et al. 1992). Additionally, a regional forest wilderness reserve system has been proposed for Maine, New Hampshire, and Vermont (Sayen 1995). The design and implementation of wildland recovery areas in Pennsylvania to link the north and south is a vital step in the North American Wilderness Recovery Strategy. ■

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ALCHEMY

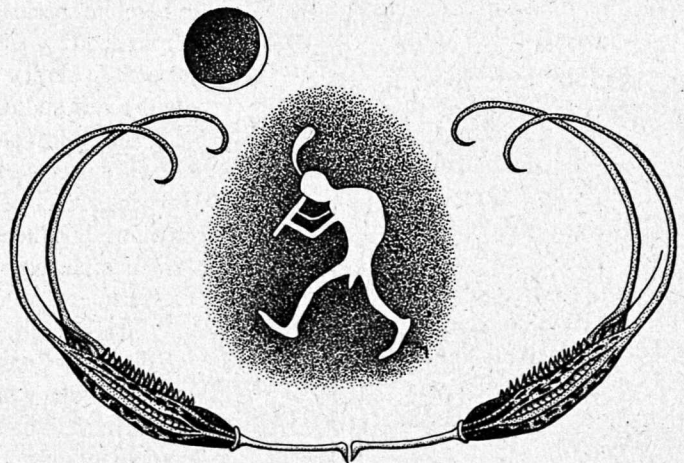
*Stars die in the Milky Way,
their gaseous ashes collapsing
into the chemistry of Earth,
the recycling atoms of our flesh.*

*Comets, asteroids,
stellar debris fertilize
an embryo. The fire
of a nearby star stirs
amniotic fluids, and gravity
heaves oceans.*

*A stone heated
in the fire, then carried
close to the body for warmth,
the Earth absorbs, gives back
wind, lightning, clouds,
atmosphere.*

Whose body?

—Penny Harter



Book Reviews

In this issue:

Flight of the Red Knot

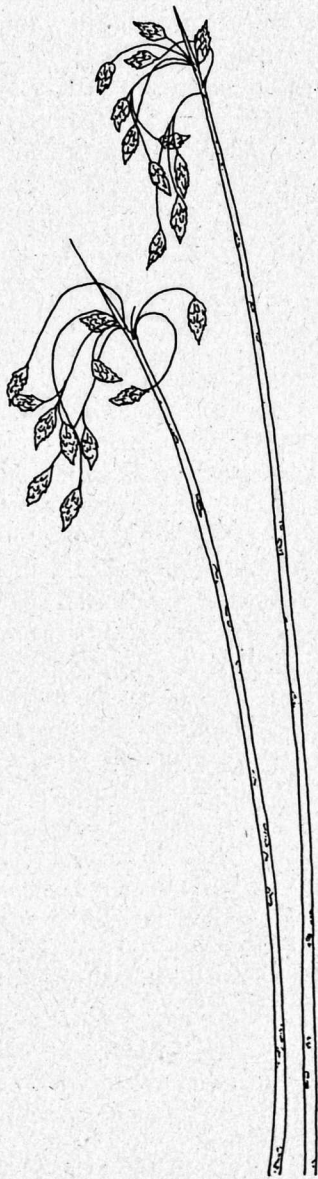
Last of the Curlews

Mama Poc

The Spell of the Sensuous

Troubled Waters

The Dying of the Trees



THE FLIGHT OF THE RED KNOT

by Brian Harrington with Charles Flowers; W.W. Norton and Co. (500 Fifth Avenue, New York, NY 10110); 1996; \$29.95; 192 p. 47 illus., appendix, notes.

Two startling facts related in this book should be enough to make every natural history and conservation reader want to snatch up the handsome volume. One is the fastest flight known in the shorebird world, by a Semipalmated Sandpiper which left Maine in the fall and two days later was found in Guyana, South America. That means half-a-million wing beats and a speed of 40-plus mph without stop! The second is the telling of by-gone market hunting days when John James Audubon witnessed some French gunners near New Orleans kill 48,000 Golden Plovers in one day, 21 March 1821. Reportedly 7000 of the birds were shipped by the barrel-full to Boston for meat and millinery trade.

Far more than these facts is the account of one small bird's annual migration from the tip of South America to the Arctic Circle and back, with all its precarious stop-overs. It has to be one of the most spectacular travel sagas in the wildlife world. Although dozens of species of shorebirds—sandpipers, dowitchers, plovers, and knots—perform extensive migrations, the Red Knot flies over 18,000 miles annually at speeds of 30 to 40 mph. Eighty percent of the 177 shorebird species on Earth, which range from sparrow-size to crow-size, hopscotch in similar fashion along routes with a few traditional feeding and resting sites. Most are bound to breed and nest in the remote Arctic tundra, and then to winter south of our border. They lead a captivating life in perpetual spring and summer, always a few steps ahead of fall and winter.

It is also a life style perilously close to the edge. Certainly bad weather and predators along flight routes play a part; however, it is mainly humans, with their proclivity of producing environmental problems, that threaten our shorebirds. Oil spills, huge hydroelectric projects, mass agriculture, real estate develop-

ment, global warming, and a host of pollutants cannot be escaped through flight. Any and all are capable of wiping out these plucky peripatetic birds. Thus, the most valuable and shocking message of this book is that endangered species do *not* have to be measured in the smallest of numbers. They can exist in the hundreds of thousands or even millions, yet swiftly plummet to levels as low as the California Condor or Peregrine Falcon.

Migrating shorebirds can move quickly and well from one end of the Earth to another *provided* they can find three critical necessities. One is semi-firm feeding places; two is abundant rich food; three is safe resting places.

Certain wild wetlands, coastal beaches, and intertidal mud flats provide the right "refueling areas" along ancient migration routes. The mud, sand, or marshland has to be soft enough to probe a bill into and extract high protein tid-bits. Such areas are few and far between. They have the highest biological productivity of any ecosystem. They can feed 2000 birds per acre for two weeks, or enable 100,000 birds on one small beach to double their weight in two weeks.

The food items sought by shorebirds differ, of course, by species, and each has its most abundant season. The Red Knot dining place and plan follows this incredible trajectory:

October-February: Patagonia—packed sediments called "restinga"—mussel young known as "spat."

March-April: Lagoa de Peixe, Brazil (1750 mile flight)—soft sand, small donax clams; also possibly at Amazon mouth—mud, clams.

May-June: Delaware Bay (7000 mile flight)—sand, mud, Horseshoe Crab eggs.

July-August: Arctic Islands, beaches north of Hudson Bay (1000 mile flight)—insects, grasses, larvae, seeds.

August-October: James Bay (500 mile flight)—salt marsh, mud, Macoma clams; also Cape Cod, MA (600 mile flight)—sodbanks—mussel spat, beach fleas.

October: Guiana, South America (2000 mile flight)—tidal mud, shrimp-like crustaceans; also possibly Amazon delta—mud, clams. Patagonia as above.

The third vital necessity for shorebirds is safe resting places near to their feeding stations. After a long day of gorging during low tides, the birds *must* find beaches and flats far enough above high tide so they won't be inundated while sleeping. It's not so easy when thousands of the same and other species wish to seek shelter together.

These three crucial elements can all be taken away in a flash. The authors mention the oil spill from the "Exxon Valdez" in Alaska. They describe plans to turn James Bay into a fresh-water reservoir with dikes and canals diverting water to the Canadian west and arid US which would destroy ecosystems on both sides of the continent, and gigantic dams across the Bay of Fundy which would change tide levels as far south as Massachusetts. They enumerate the shoreline threats along Delaware Bay—pollutants, real estate development (such as at Cape May, a traditional refueling area), ATVs riding the beaches, motor boats cruising too near shores, radio-controlled model airplanes panicking thousands of shorebirds into terrified flight, cars and bathers packed onto beaches, or even just a lone jogger and a dog passing by which birds exhausted from a 5000 mile flight need sleep. Massive draining of prairies for agriculture has eliminated many inland sloughs and prairie ponds where other species of shorebirds stop for food and shelter. Global warming, over time, may disrupt the precise timing and synchrony of these birds' arrivals and the peak abundance of marine organisms on which they depend.

The conclusion is that shorebirds can in no way change their ancient routes, traditional refueling stations, phases of the moon, the seasonal imperative to double weight so as to fuel their flights. No way! That means they can be annihilated in our lifetimes if those precious few pin-points of protected places are spoiled or poisoned.

The other conclusion is that it's not the *birds* that need to be managed; it's *humans*. We must change *our* ways, our habits, our treatment of the planet, in order to save shorebirds. We tend to be disruptive and predatory in our dealings with animals and plants. Let's practice human management, not wildlife management.

There is hope from the dozens of small state and private conservation groups trying to save bits of beach and wetlands. And there is hope from the Western Hemisphere Shorebird Reserve Network. It has already protected a chain of sites (designated and voluntarily protected) for 30 million shorebirds...with the promise that the protein-rich stepping-stones used by the Red Knot and other migrants will be there in all the years to come.

A gorgeous, heavy paper, small coffee table book with stunning descriptions of Red Knot behavior. One will feel proud to own this volume. ●

—Reviewed by Dr. Anne LaBastille, author of *Woodswoman*, *Women in the Wilderness*, *Mama Poc*, and other works of natural history

LAST OF THE CURLEWS

by Fred Bodsworth; Counterpoint (1627 I St. NW, Suite 850, DC 20006); 1995; \$15 cloth; 192p.

MAMA POC

by Anne LaBastille; WW Norton (500 Fifth Ave., NYC 10110); 1990; \$10.95 paper; 315p.

Conservationists are belatedly recognizing the power of stories. Most of us in the American conservation movement are only now beginning to understand that people are much more likely to be moved by stories than by cold hard facts. We are also beginning to realize, however, that solid facts can be incorporated into stories: science and story-telling can be melded.

A small number of prescient writers and ecologists sensed all this before the larger environmental community did. *WE* readers know well some of these foresightful writers—luminaries like Gary Snyder, Terry Tempest Williams, Gary Nabhan, and Stephanie Mills—but may have missed the two extolled here.

The earlier of the two stories I recommend here, *Last of the Curlews*, has recently been republished by Counterpoint. Heir apparent to the much missed North Point Press, Counterpoint has already issued several titles that wildlife advocates will surely want, including Gary Snyder's *A Place in Space*, Wendell Berry's *Another Turn of the Crank*, and this forty-year-old classic by Fred Bodsworth.

Last of the Curlews brings us into the lonely life of one of the last members of a species, Eskimo Curlew, that numbered in uncountable millions until Euro-Americans began slaughtering them. The story reminds us that extinction doesn't just mean loss of biodiversity—it means death, sometimes after unspeakable suffering, for thinking, feeling individuals. Bodsworth's book, especially in this handsomely bound and illustrated edition, will serve well those who would awaken their peers to the extinction crisis through literature.

In contrast to Fred Bodsworth's story, whose protagonist is the imagined, or hypothetical, last male of one of Earth's longest distance annual migrants (from the high Arctic to southern South America, then back), Anne LaBastille's is a non-fictional account of the last few decades of one of Earth's most narrowly endemic birds, the Giant Grebe of Guatemala's Atitlan Lake. Through a quarter century of seasonal studies—conducted in between building log cabins,

conducting ecological research, writing wilderness books, and serving as a park commissioner at home in New York's Adirondacks—Anne LaBastille earned the truly tragic honor of being the first scientist to literally document the process of extinction. Equally important, *Mama Poc* documents the valiant efforts made to save the grebe, which efforts ultimately proved insufficient for the bird but helped educate Guatemalans about their rich natural heritage. Retroactively, these efforts now provide lessons for ecologists attempting to save other imperiled birds.

Readers of *Wild Earth* and *Conservation Biology* won't be surprised to read that habitat destruction, overkill, and introduction of exotics precipitated and fueled the demise of the larger cousin of the more common grebes. In this case, alien introduction (particularly of bass, which ate the grebes' food and likely their young, too) seems to have been primary, with habitat destruction secondary and overkill tertiary, as causes of the fowl's decline. Environmental stochasticity played a big role, too, when an earthquake enlarged the crevices through which lake water drained, resulting in declining lake levels.

Let I seem to paint it as a scientific treatise, let me reiterate that *Mama Poc* is an enthralling story, replete with adventure, romance (avian and human), violence (including civil war), beauty, wisdom, engaging narrative, appealing characters, and ethical teachings. I especially recommend *Mama Poc* for reading groups and science classes of all ages. I especially recommend *Last of the Curlews* for families who read together and for literature classes of all ages. Really, though, everyone who reads English, likes birds, and opposes anthropogenic extinction should read both of these beautiful bird books. ●

—Reviewed by John Davis

THE SPELL OF THE SENSUOUS: HUMAN PERCEPTION IN A MORE-THAN-HUMAN WORLD

by David Abram: Pantheon (201 E. 50th St., NYC 10022); 1996; \$25; 274p.

Modern letters and sciences develop like fault lines: pressing against one another, intersecting, giving way here and there, until suddenly some earthquake of discovery strikes and all the pressure points realign. David Abram's book, *The Spell of the Sensuous*, represents just such an intellectual tremor. Brilliant in its own field of environmental philosophy, it is destined to change the way we think about linguistics, literature, anthropology, and comparative religion, as well as the living landscape around us.



illustration by Peter Brauer

That in the preceding paragraph I could use the word 'letters' to denote the human sciences highlights the powerful theme Abram develops. Abram argues that the rise of written language has created the fiction that human knowledge exists in a timeless, disembodied realm, separate from the animate landscape in which we dwell. In particular, the advent of a phonetic alphabet, which unlike earlier forms of writing lost all overt references to the non-human world, has played a central role in our estrangement from and disregard for nature. Truth for us resides in books, not in our sensuous participation in the world.

Other thinkers—Jack Goody, Ivan Illich, for instance—have linked the rise of literacy to some of the pathologies of modern culture. Phenomenologists such as Heidegger and Merleau-Ponty have explored the ecstatic nature of human perception, seeing it as embedded in a larger life-world. But Abram is the first to relate the technology of writing to the violent divorce between thinking and our earthly dwelling in place that has marked Western civilization over the last two millennia. He shows, as no scholar has before, how intimately human thinking, even the most refined abstract reasoning, depends on the more-than-human world of birdsong, waterfalls, the very air that embodies our words. Reading Abram's interpretation of Plato's *Phaedrus*, we hear the rasp of cicadas and smell the sycamore trees that encompassed, informed, and ultimately explain Socrates' open-air dialogue, a sensuous, meaningful physicality that two thousand years of scholarship has somehow overlooked. Or rather, as the book suggests, was doomed to miss in its exaltation of texts over living context.

Abram's rigorous attention to the living world surrounding and supporting discourse makes *The Spell of the Sensuous* a uniquely powerful work of scholarship. He enacts what he explores, drawing on his experiences in the landscapes of Southeast Asia, especially among shamans and native healers

(Abram is a professional magician who studied indigenous healing practices for his doctorate), to feather out his arguments from the particulars of rainstorms and spider webs. Rather than giving a rational description of animism, he has turned the issue on its head, and in his words, "presented an animistic or participatory account of rationality."

The book contrasts our present abstracted way of knowing the world with what Abram calls "storied" knowledge, a way of understanding that underlies the literate intellect and enunciates, through narratives, the infinitely complex ways we relate to the sensuous world around us. But Abram is no anti-intellectual clamoring for the end of letters. On the contrary, he concludes that we must reanimate literate culture by rediscovering its dwelling in more-than-human landscapes:

By acknowledging such links between the inner, psychological world and the perceptual terrain that surrounds us, we begin to turn inside-out, loosening the psyche from its confinement within a strictly human sphere, freeing sentience to return to the sensible world that contains us. Intelligence is no longer ours alone but is a property of the earth; we are in it, of it, immersed in its depth. And indeed each terrain, each ecology, seems to have its own particular intelligence, its unique vernacular of soil and leaf and sky....Each place its own psyche. Each sky its own blue.

While pursuing its ambitious task, *The Spell of the Sensuous*, like all truly great books, leads us down unexpected side paths to intriguing insights. Abram illuminates the role of ants in Balinese culture, the relationship between literacy and the theme of exile in the Bible, how the alphabet contributed to the conquest

of the Aztec empire by a handful of Spaniards. The book makes you want to reread *Phaedrus* and examine the wings of a dragonfly afresh.

Finally, the writing is beautiful, precise, and thoroughly original. Just listen to Abram recount an incident from his sojourn to Bali when a monsoon downpour forced him to hole up in a grotto and spiders began weaving webs over the cave opening:

I sat stunned and mesmerized before the ever-compexifying expanse of living patterns upon patterns, my gaze drawn like a breath out into open space, then drawn down into another convergence. The curtain of water had become utterly silent—I tried at one point to hear it, but could not. My senses were entranced....I had the distinct impression that I was watching the universe being born, galaxy upon galaxy.

Such lyrical precision and imagination are not the usual stuff of philosophy. But this underscores Abram's point. A disembodied philosophy lacks "truth" insofar as it ignores the senses that make truth meaningful and rooted. Abram constantly grounds his arguments about the history of ideas in the sensible landscape on which he stands. Although this is his first book, no other writer I know comes close to him in combining sweep of scholarship with the tangible perceptions of place.

Beautifully written, elegantly argued, immensely original, *The Spell of the Sensuous* is the kind of book that comes along once in a generation. Like Carson's *Silent Spring*, it will become the touchstone for environmental literacy in the years to come; and hopefully, if Abram's vision blossoms, beyond literacy toward a rediscovered grammar of place. ●

—Reviewed by Christopher Manès, author of *Green Rage: Radical Environmentalism and the Unmaking of Civilization*

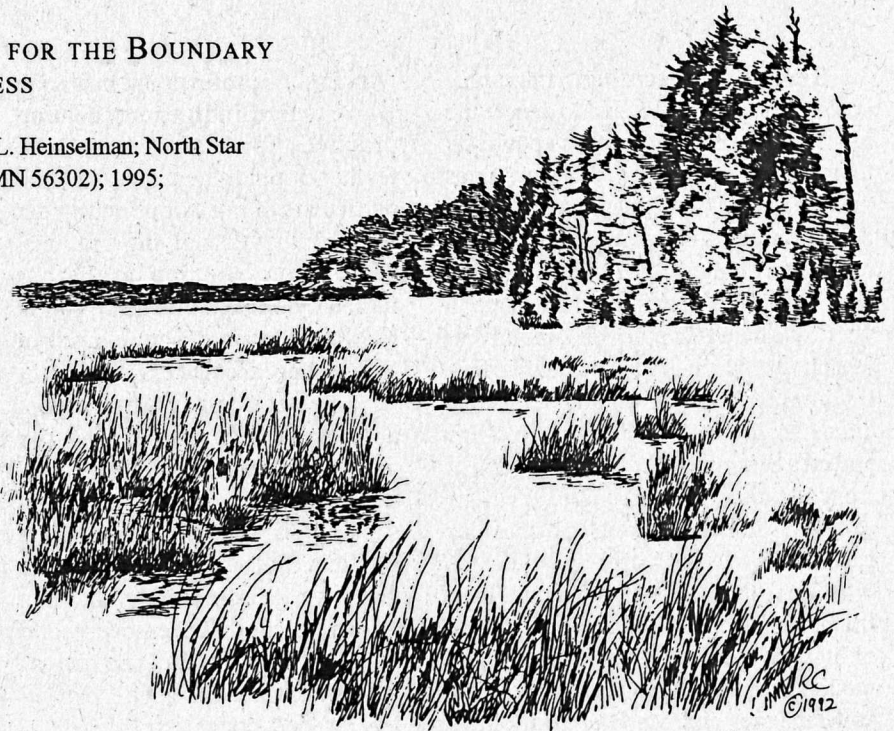
TROUBLED WATERS: THE FIGHT FOR THE BOUNDARY WATERS CANOE AREA WILDERNESS

by Kevin Proescholdt, Rip Rapson and Miron L. Heinselman; North Star Press of St. Cloud, Inc. (POB 451, St. Cloud, MN 56302); 1995; \$19.95; 352pp.

Troubled Waters: The Fight for the Boundary Waters Canoe Area Wilderness is the definitive account of the campaign for the United States' only federally protected lakes Wilderness. The book's primary author, Kevin Proescholdt, has meticulously reconstructed the events surrounding what was arguably the most vicious wilderness campaign ever fought in the US. The road to victory was long and rough, and it was wrought with compromise and confrontation. Yet, the effort led by Friends of the Boundary Waters Wilderness (FBW) resulted in the largest Wilderness Area east of the Rockies.

The battle for the Boundary Waters Canoe Area (BWCA) began nearly a century ago when 500,000 acres in northern Minnesota were withdrawn from sale to the public. In 1909, these lands were used as the core of the fledgling Superior National Forest. Logging, mining, resorts, and motorized access, however, continued to be the dominant activities in the region. Over the next 55 years, conservationists would battle proponents of these industries for this lake country.

In 1964, after a series of independent efforts that increased protection for the BWCA, Congress passed the Wilderness Act. Though it included the BWCA, the act allowed continuation of so-called traditional uses such as logging and motorized vehicles. Shortly after its passage, a movement was begun to protect the BWCA in a manner consistent with the wording of the Wilderness Act. Sigurd Olson, largely responsible for the BWCA's inclusion in the Act, and Miron "Bud" Heinselman formed the lifeblood of this revitalized fight to protect Minnesota's Northwoods. The entrancing essays of Sigurd Olson, Heinselman's eloquent discourse on the ecology of the region, and the tireless work of countless others would provide the basis of the 1978 Boundary Waters Canoe Area Wilderness (BWCAW) Act (PL45-495). Today, Kevin and FBW continue the fight to protect the sanctity of this area.



Unfortunately, the BWCAW is under almost daily threat from anti-wilderness politicians, over-use by the public, and wise-use advocates who wish to open it up for all-out motorized recreation. As we approach the end of the twentieth century, a new generation of wilderness advocates must arise and sound a renewed effort to not only protect but increase the Boundary Waters Wilderness. We must work for a wildlands network using the BWCAW as its core.

A little over a year ago in *Wild Earth*, Dave Foreman extolled the tactics of fights gone by and urged conservationists to get back to basics. I believe Dave is right. Hard work, persistence, and truth must be at the core of all we do—Kevin has shown us why in *Troubled Waters*. This book's greatest virtue is as a lesson in waging a successful battle—from building constituent support, structuring legislation, gaining access to the political process, and surviving skirmishes and defeats—for the protection of wildlands.

Troubled Waters is a concise, readable account of what successful conservationists must ultimately endure for even a bittersweet victory such as this. I urge everyone to get a copy. Learn what it has to teach about ensuring the integrity of Earth's ecosystems. The trail will be long and often treacherous, but if wild nature is to persevere into the next millennium, it's up to the citizens of America to assure that places such as the BWCAW are troubled no more. ●

—Reviewed by Mike Biltonen, Minnesota Ecosystems Recovery Project, POB 293, Red Wing, MN 55066; (612) 385-7512

THE DYING OF THE TREES: THE PANDEMIC IN AMERICA'S FORESTS

by Charles E. Little; Viking (375 Hudson St., New York, NY 10014); 1995; \$22.95 hardcover; 304 pp.

Few books in my quarter of a century of environmental work have moved me as much as *The Dying of the Trees*. Charles Little's work ranks on par with Rachel Carson's *Silent Spring* and Ralph Nader's *Unsafe at Any Speed* as a prophetic call to action. Little invites us to travel to various parts of the country and observe with him our forests. What he discovers is a frightening pattern of unhealthy trees of a wide variety of species. As a careful reporter, he interviews numerous naturalists and scientific researchers, and confirms his own observations on similar weakening forest conditions throughout the country, though with different diseases occurring in different regions.

Little has traveled and lived in many parts of this land and has come to experience it as one vast ecosystem. He returns to his favorite places, beginning with the Catoctin woods in Maryland, now ravaged by a dogwood anthracnose that apparently cannot be checked. In the next chapters he proceeds to Camel's Hump in Vermont, thence to Mount Mitchell in North Carolina, on to talk about the killer of the Ponderosa Pine in his youthful California haunts. He recrosses the Continental Divide to his schoolboy Colorado areas near Gunnison and discusses altered forest fire regimes. He then takes us to Michigan and the front lines of gypsy-moth defoliation. The seventh chapter finds us in the Northwest facing the devastation of the old-growth forests and associated health problems. Finally, in chapter eight, he travels to Appalachia and the Lucy Braun Mixed Mesophytic Forest, where significant die-back is being detected in West Virginia and neighboring states.

In chapter nine Little discloses what may be common threads and causes. He argues that we are in a classic case of denial about the existence of any such widespread tree problems—and this failure to face a grim reality extends to government forest agency people and even some environmentalists, who consider such an admission of poor health as tantamount to justifying salvage cutting. Environmentalists' reticence on this subject is particularly unfortunate insofar as harvesters are unable to prove that the so-called salvage operations can in any way improve forest health.

The author calls himself an "alarmist" and says that all should have been alarmed about this pandemic years ago. Perhaps here he opens himself for critics to take pot shots at one or other piece of information; but throughout the country, the thesis is holding true: our forests are in deep trouble. Little warns, "Forests beget trees... We are less sure that the reverse is true. When we destroy forests,

we can, as we have seen, destroy not only the trees that had occupied the landscape, but possible future trees as well..." (p. 124).

After such a painful and dire assessment, the reader feels limp. As a kind and realistic prophet, Little tries to revive us. His chapter on the tree savers partly succeeds, even though he omits the radical environmental movement. He ends on a note of hope "to stay firm in the belief that nature never did betray the heart that loved her." The ending leaves one wanting to hear, or better, to say more and that's what makes *Dying* worth reading. It's up to us to make forest health a national priority issue, and Charles Little has helped us get started. ●

—Reviewed by Al Fritsch, S.J., Director of Appalachia—Science in the Public Interest (50 Lair Street, Mount Vernon, KY 40456), author of numerous environmental books and reports, including *ECO-CHURCH* (Resource Publications, San Jose, 1992)



Announcements

Designing Ecological Reserve Systems

The protection and restoration of the natural fabric of life can best be achieved by creating ecological reserve systems that allow Nature to operate in its own way, in its own space and time. *How to Design An Ecological Reserve System*, by Stephen C. Trombulak, Ph.D., the first in a series of special papers from *Wild Earth*, walks you through this process.

From establishing goals and defining terms, through providing resources and describing how to use those resources, Trombulak provides the information needed to design an ecological reserve. A professor of biology and environmental studies at Middlebury College in Vermont, Trombulak is also the regional science director for The Wildlands Project in the Greater Laurentian Region of North America. *How to Design an Ecological Reserve System* is available from *Wild Earth* for \$5.

Nantahala-Pisgah National Forests Old Growth Survey: Citizen Involvement in Old Growth Protection

Western North Carolina Alliance's Seeking Older Forests Campaign has identified over 244 potential old-growth forest areas in the Nantahala and Pisgah National Forests. The project evolved as a model and means for empowering individuals to nominate forests that may have old growth. Twelve of the citizen-identified sites were sampled for more intense professional verification of old-growth characteristics. These sites are summarized in a non-technical guide for locating old-growth forest remnants in the Nantahala and Pisgah National Forests, available from Western North Carolina Alliance, 70 Woodfin Place Suite 03, Asheville, NC 28801.

New York River Otter Project

The New York River Otter Project is a partnership between New York's private sector and the New York State Department of Environmental Conservation with a focus on returning River Otters to central and western New York, where they have been missing for about 100 years. The goal is to return 270 otters to nine carefully selected locations. In 1995, 21 River Otters were released in central New York, in the Northern

Montezuma Wetlands Complex. In 1996, 50 to 60 more otters will be released near Whitney Point and the Allegany State Park. The \$300,000 project is primarily funded by private donations. Please send your tax deductible contribution to New York River Otter Project, POB 39512, Rochester, NY 14604.

Adopt-A-Finback Whale

Adopt-A-Finback Whale is an educational outreach program offered by Allied Whale, the marine mammal laboratory at Maine's College of the Atlantic. Since 1972, Allied Whale has conducted long-term field research on cetacean behavior and development of photographic identification techniques for Humpback and Finback Whales. This work has permitted researchers to study the life histories, behavior, and ecology of the great whales in a harmless way. The Adopt-A-Finback Whale program enables the public to get involved on a personal level with the work of marine mammal conservation. For information, contact Allied Whale, College of the Atlantic, 105 Eden St., Bar Harbor, ME 04609; (207) 288-5644.

Our Ecological Footprint

Our Ecological Footprint: Reducing Human Impact on the Earth is a new book by ecological planners Mathis Wackernagel and William Rees. It cuts through the talk about sustainability and introduces a revolutionary new way to determine humanity's impact on Earth, the Ecological Footprint, which can be used to assess Nature's carrying capacity, from locally to worldwide. The authors argue that the "environmental crisis" is less an environmental and technical problem than it is a behavioral, social, and economic one, and offer suggestions as to how, with ecological footprint analysis, we can reduce our consumption, improve our technology, and change our behavior to achieve sustainability. For information, contact New Society Publishers, 4527 Springfield Ave, Philadelphia, PA 19143; Martin Kelley (215) 382-6543.

The Sierra Club Green Guide

The Sierra Club Green Guide: Everybody's Desk Reference to Environmental Information, by Andrew J. Feldman, features more than 1200 essential resources to help answer any question about environmental issues or green living. References include internet sites, bulletin board systems and electronic databases, as well as government clearinghouses, trade and non-profit organizations, books and periodicals. For more information, contact Sierra Club Books, 730 Polk St., San Francisco, CA 94109.

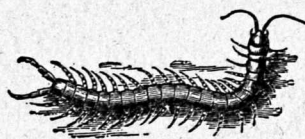
Making Tracks For A Better Future

Founded by Steve Higgs and Philip Higuera, Making Tracks For a Better Future is a fund-raiser aimed to help environmental educators continue and strengthen their programs. Steve and Philip will hike 1000-plus miles on the Pacific Crest Trail as a means to generate funds. Supporters are asked to pledge a certain amount of money for each mile they walk. Their goal is to raise \$30,000. Proceeds will benefit the North American Association for Environmental Education (NAAEE) and the Way of the Mountain Learning Center. To support the project, contact NAAEE/Joan Haley, 1255 23 St., Northwest Suite 400, Washington, DC 20037.

"Radio" Active

Every Living Thing, the one hour short-wave program for the Earth, produced by Web of Life Audio, can be heard weekly on Radio For Peace International. The program is aired Sundays at 2 pm on 15.050 and 10 pm on 7.385, Mondays at 5 am on 7.385. Fiscal sponsorship is provided by The Fund for Wild Nature.

The Earth Day Every Day Radio Station Project, which will establish an environmentally focused radio station in a US metropolitan area, is underway. The initial stage of the project entails raising sufficient funds to make a sizable downpayment on an existing station and to staff the station with qualified, ecologically minded individuals. Financial contributions are tax deductible. Checks may be made out to Earth Communications/The Earth Day Every Day Radio Station Project. To contribute or for more information, contact Traci Hickson, Web of Life Audio, POB 130, Bar Harbor, ME 04609.



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Wild Earth Back Issues

1 • Spring 1991 Ecological Foundations for Wilderness, The Earth First! Wilderness Preservation System, A Native Ecosystems Act. Proposals for Florida, the Klamath Mountains, and Yellowstone. "Is Population Control Genocide?" by Bill McCormick. Dolores LaChapelle uncovers the wild human. Dave Foreman's "Dreaming Big Wilderness," and Howie Wolke's "The Impoverished Landscape."

2 • Summer 1991 The New Conservation Movement, ancient forests on trial, Grizzly hunting in Montana, killing the coasts, what wilderness can do for biodiversity. Ski development in White Mountain National Forest, an Ancient Forest Reserve proposal for the Mendocino National Forest, and exploring Chile's rainforest. Howie Wolke's Wild Rockies, and Part 2 of "Is Population Control Genocide?"

3 • Fall 1991 SOLD OUT.

4 • Winter 1991/92 Devastation in the North: Canadian deforestation, threatened northern rivers, Hydro-Quebec vs. James Bay, natural gas development.... The BLM in Arizona, the Finger Lakes of New York, and the North American Wilderness Recovery Strategy. Saving Yellowstone, tallgrass prairie, and the White Pine. Roderick Nash's vision of an "Island Civilization," and "Biologists, Biophiles, and Warriors" by Reed Noss.

5 • Spring 1992 SOLD OUT.

6 • Summer 1992 Endangered species crisis, Perdido Key Beach Mouse, speleomanders and trogloderps, Eastern Hemlock, and fungus. Civil obedience, the cost of compromise, "wise use" lies, deep ecological practicality, the language of owning, metaphor in science. Japan's beech forest, Shenandoah National Park, Monongahela wildlands.

7 • Fall 1992 Earth Summit, Endangered Species Act, Grandfather Mountain. Radical environmentalism, a wilderness work ethic, the dignity of wild things. Lynx, Woodland Caribou, tarantula, Sugar Maple, woodpecker wilderness, Adirondack old growth. Southern California biodiversity, Texas's Big Bend Ecosystem. Max Oelschlaeger's "Mountains that Walk."

8 • Winter 1992/93 Patriarchal management, Supreme Court setbacks, "natural law" and human population, planetary oncology, grassroots resistance in developing countries. Coral reefs, jellyfish, wild fossils, the Eastern Indigo Snake, and zoos. A Greater Desert Wildlands Ecosystem proposal, Colorado River delta. Howie Wolke's "Bad Science Lacks the Visceral Connection."

• Special Issue #1: The Wildlands Project: Plotting a North American Wilderness Recovery Strategy. TWP Mission Statement, preliminary proposals for the southern Appalachians, northern Rockies, Adirondacks, and Paseo Pantera. "A Vision for the Meantime" by Michael Soulé, "TWP Land Conservation Strategy" by Reed Noss, "Developing a Regional Wilderness Recovery Plan" by Dave Foreman, "Coming In To The Watershed" by Gary Snyder.

9 • Spring 1993 The power of hope, primitivism, avian activism, mitigation scams. Hydro-Quebec, Pacific Rim forest, tropical biodiversity (Part 1). A proposal for a park without fences: Adirondacks, the Ozarks, and the Oregon Coast Range. "In Defense of Wildlife and Open Expression" by Michael Frome. "The Breadth and Limits of the Deep Ecology Movement" by Arne Naess.

10 • Summer 1993 The Zero-Cut solution, ozone depletion, topophilia, organic archeology, immigration. Wildlife contraceptives, predator eradication, bear wisdom. The Greater Salmon/Selway Project, deep ecology in the Former Soviet Union, tropical biodiversity (Part 2). Threats to Southern Appalachia, Alabama proposal, Eastern forest recovery. "Arizona, The Floating Desert" by Gregory McNamee.

11 • Fall 1993 Biodiversity, caves, ecological economics, land management lingo, legal standing in environmental litigation. Atlantic Salmon, imperiled Gorillas, Kittatinny Raptor Corridor. The Selkirk Mountains, Wild and Scenic Rivers, wildland restoration. "The Rhizome Connection" by Dolores LaChapelle and "Crawling" by Gary Snyder.

12 • Winter 1993/94 Overworking the North Woods, the Tuliptree, Sutter Buttes, freedom of information, consensus vs. independent activism. Bats, endangered invertebrates, exotic pests. The evolving Wilderness Area model, Rocky Mountain National Park reserve system proposal, Yellowstone to Yukon proposal, South African population stresses.

13 • Spring 1994 Wilderness Land Trust, Sea Shepherd, environmental education, bonding with the wild, whole-tree logging, ozone depletion, the anatomy of a burn, Spruce-fir Moss Spider. Mohawk Park, Nova Scotia, southern Utah, nuclear dump in the Mohave Desert, Brookhaven irradiated forest, Southern Appalachian National Forest mismanagement, Vermont wilderness. "Saving Aquatic Biodiversity" by Allen Cooper and Reed Noss, and "The Enemy" by Edward Abbey.

14 • Summer 1994 Wilderness Watch, "experimental, non-essential" populations, building a legal file, bioregional mapping, silvicultural fiction, a road-fighting strategy. Hanford's sage-steppe, the impact of logging on songbirds; Bald Eagles, Gila Trout, serpentine rock, hemp. Eastern old growth, butchering the Salmon-Selway, regenerating bush and soul in Australia, Great Plains restoration (Part 1). "A Walk Down Camp Branch" with Wendell Berry, William Catton on carrying capacity.

15 • Fall 1994 Environmental lawyers, biocentric broadcasting, resisting mining, historical records in mapping. Red-cockaded Woodpecker, wombats, seabird restoration, fish stocking. Central Appalachian forests, the Algoma Highlands, old-growth Acadian hardwoods, Pacific Coast wilderness, Thoreau Regional Wilderness Proposal, Great Plains restoration (Part 2). "The Comucopia Scam, Part 1" by Sandy Irvine.

16 • Winter 1994/95 Locking up wildlands, bureaucratic jargon, biophilia vs. technophilia, natural fire, road removal. Urban Peregrine Falcons, snails, cryptogamic soils, the Red Maple. Wisconsin timber law, restoring Lebanon, Great Lakes biodiversity, and "The Comucopia Scam, Part 2." Dave Foreman, Reed Noss, and J. Baird Callicot debate the idea of Wilderness.

17 • **Spring 1995** Grassroots vs. nationals, Free Market Environmentalism, and community-serving economics. Prairie dog ecosystems, wild to domestic animal ratios, wildlife biologist Susan Morse, India's threatened mangroves, Species Requiem Day proposal, vernal pools. Palouse Prairie, Banff, Hoosier forests (Part 1), Minnesota recovery, and "The Cornucopia Scam, Part 3." J. Baird Callicot's retort, and "Wilderness Does Work" by Michael Frome.

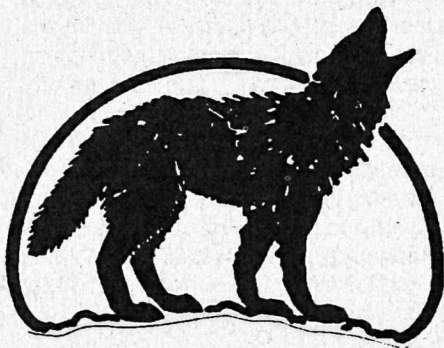
17 • **Summer 1995** Logging and wildfire, great trees of the Great Smokies, wetlands, the environmental consequences of being born in the USA. Gulf Sturgeon, bumblebees, illegal wildlife trade, grazing issues. Utah wilderness, Nevada biodiversity, a conservation plan for the Columbia Mountains, and Hoosier forests (Part 2). "Loss of Place" by Howie Wolke, "Health Implications of Global Warming and the Onslaught of Alien Species," by Michael Soulé, and a journey to Bristol Cliffs Wilderness with John Elder.

18 • **Fall 1995** Sustainable silviculture, SLAPPs, conservation easements, global warming and The Wildlands Project. Cow Cops, Spirit Bears, Buffalo Commons, the Black Birch. Eastside forest restoration, old growth in the Adirondacks and Catskills, Hoosier forests (Part 3), Gila River-Sky Island Region proposal. "Private Property and the Common Wealth," by Wendell Berry and "Scenes on a Round River," by Rick Bass.

19 • **Winter 1995/96 TWP Special Issue #2: The First Thousand Days of the Next Thousand Years: The Wildlands Project at Three** TWP mission statement, preliminary proposals for the Klamath/Siskiyou region, the Northern Forests, Minnesota Biosphere Recovery Strategy. "Wilderness: From Scenery to Nature," by Dave Foreman, "What Should Endangered Ecosystems Mean to The Wildlands Project," by Reed Noss, "Testimony," by Terry Tempest Williams, "Obstacles to Implementing The Wildlands Project Vision," by Steve Trombulak, Reed Noss, and Jim Strittholt.

20 • **Spring 1996** ONRC on Environmental organizing, Biotechnology vs. Biodiversity, Limitations of Conservation Easements, A Deep Photography Ethic. Central Appalachian forest types, the Adirondacks, Torngat National Park. Special Section: Poems for the Wild Earth. "The Leopold's Shack," by Stephanie Mills, "Are Ecosystem Processes Enough?" by Michael Soulé, "Boat of a Million Years," by Gary Snyder. Bill McKibben's thoughts on finding common ground with conservatives.

21 • **Summer 1996** Grazing and Forest Health, The Fish Wars, Private Lands in Ecological Reserve Systems. Alaska's Honker Divide and Arctic Refuge; Northern Chihuahua; Cromer Ridge, Kentucky. Proposals for a Caribou Commons in Manitoba and an inter-hemisphere conservation corridor. "Text, Civility, Conservation, and Community" by Bill McKibben, "The White Ash," by Bob Leverett.



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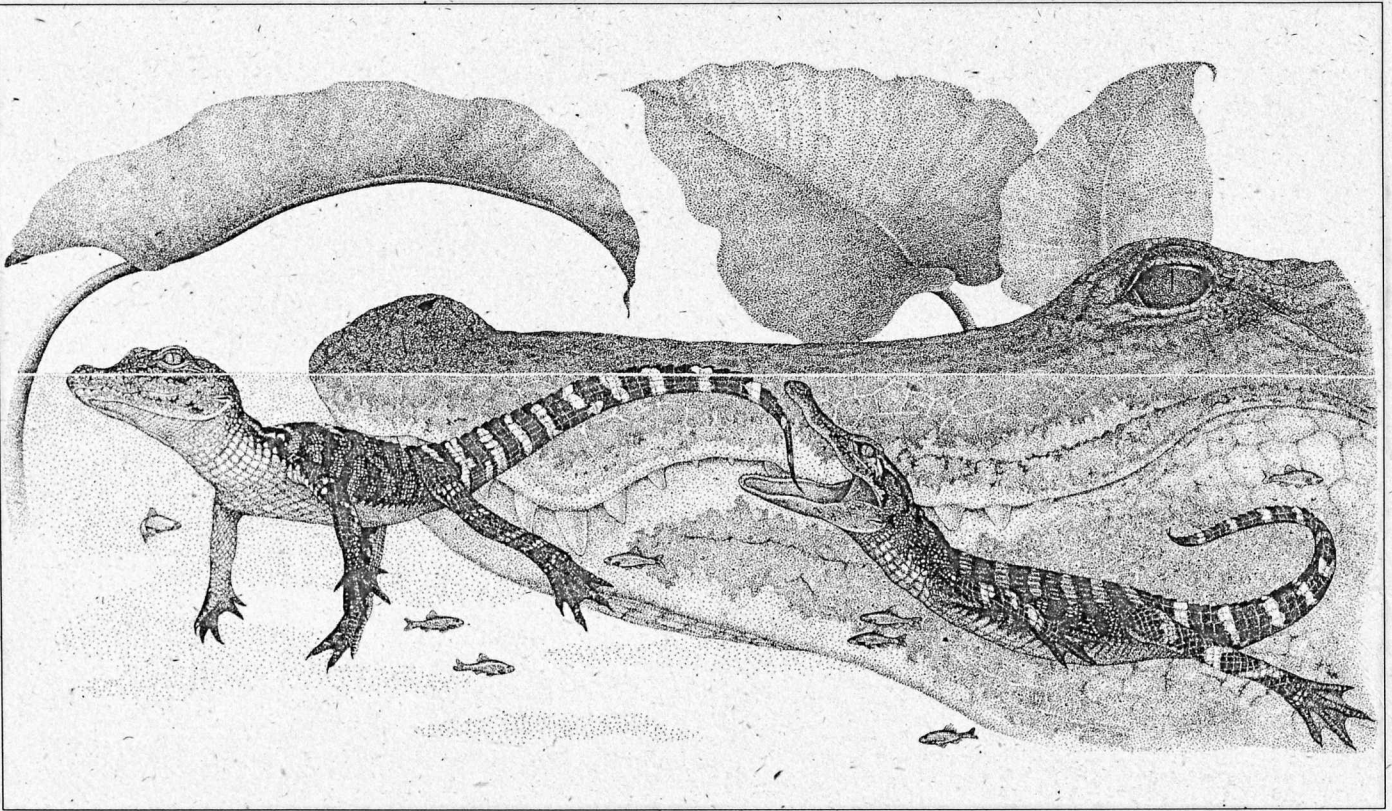
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Alligator Mother & Young

Alligator mississippiensis illustration by D.D. Tyler



Frequently cited by environmentalists as an Endangered Species Act success story, the American Alligator has in recent years rebounded from perilously low numbers to the point that it is returning to many of its old haunts—often only to find golf courses or subdivisions where once were marshes and sloughs. Notwithstanding the occasional pool-side poodles the twelve-foot-long reptiles can catch in these degraded habitats, the American Alligator's recovery could be undone if habitat destruction and pollution continue apace in the deep South. Moreover, with the American Alligator downlisted to Threatened status, gator hunts and commerce in gator skins are increasing—which sinful activities originally precipitated our alligator's decline. Moreover, pollution of wetlands with hormone-disrupting chemicals is adversely affecting reproductive success of alligators and other species. (Read *Our Stolen Future*, by Theo Colburne et al., for the alarming story of alligators with shrunken reproductive organs and similar environmental horror stories pertaining to other animals, including humans.)

Renewed killing of American Alligators is particularly unwise and unfortunate given the major role these ancient reptiles play in Southeast wetlands and water bodies. Alligators are considered by many conservation biologists to be at least a strongly interacting species, if not a keystone species. Many

fish, birds, amphibians, and other animals use—and may depend on—the small pools that alligators excavate during dry periods. Indeed, gator holes may house some of the richest concentrations of biodiversity in Florida's Everglades during the dry season.

Americans can do part of their part to help protect American Alligators and their other family members (including the Chinese Alligator and South American caimans, most of which are endangered) by eschewing products made with alligator or caiman skins. More challenging, tell all your moneyed friends to practice similar discretion, and to write their Congresspeople in favor of a strengthened Endangered Species Act, so that ESA success stories like the American Alligator's will be commonplace and secure.

—John Davis

Maine artist *Diana Dee Tyler* (whose work also appears on page 53 of this issue) is known for the scientific accuracy that informs her artwork. Her many book illustration credits include *Bears in the Wild*, *Keepers of the Animals*, field guides, and children's books (three of which received *Outstanding Science Book* awards). D.D. and Hank Tyler operate *Tyler Publishing* (POB 243, Augusta, ME 04332), which distributes D.D.'s natural history posters, prints, notecards, etc.



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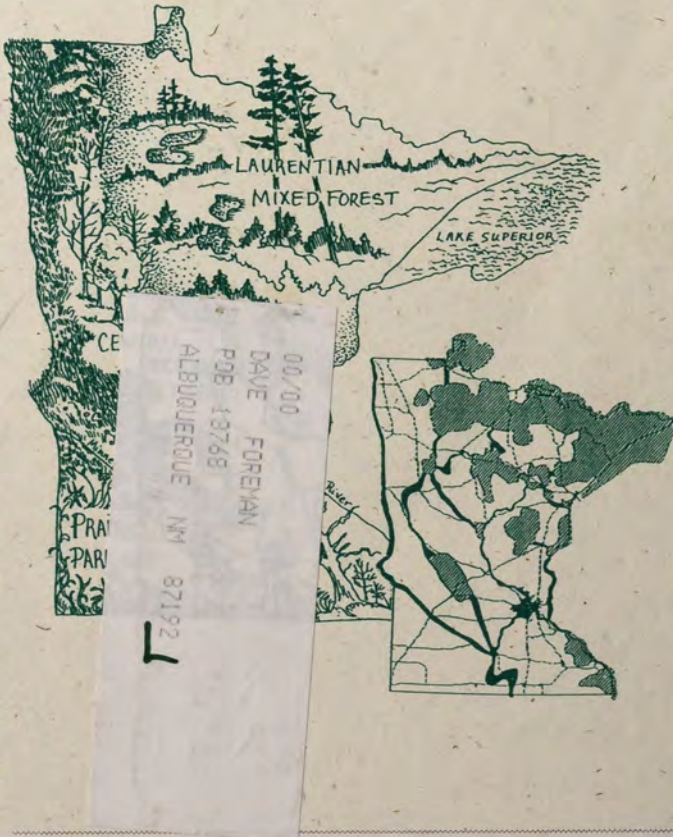
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