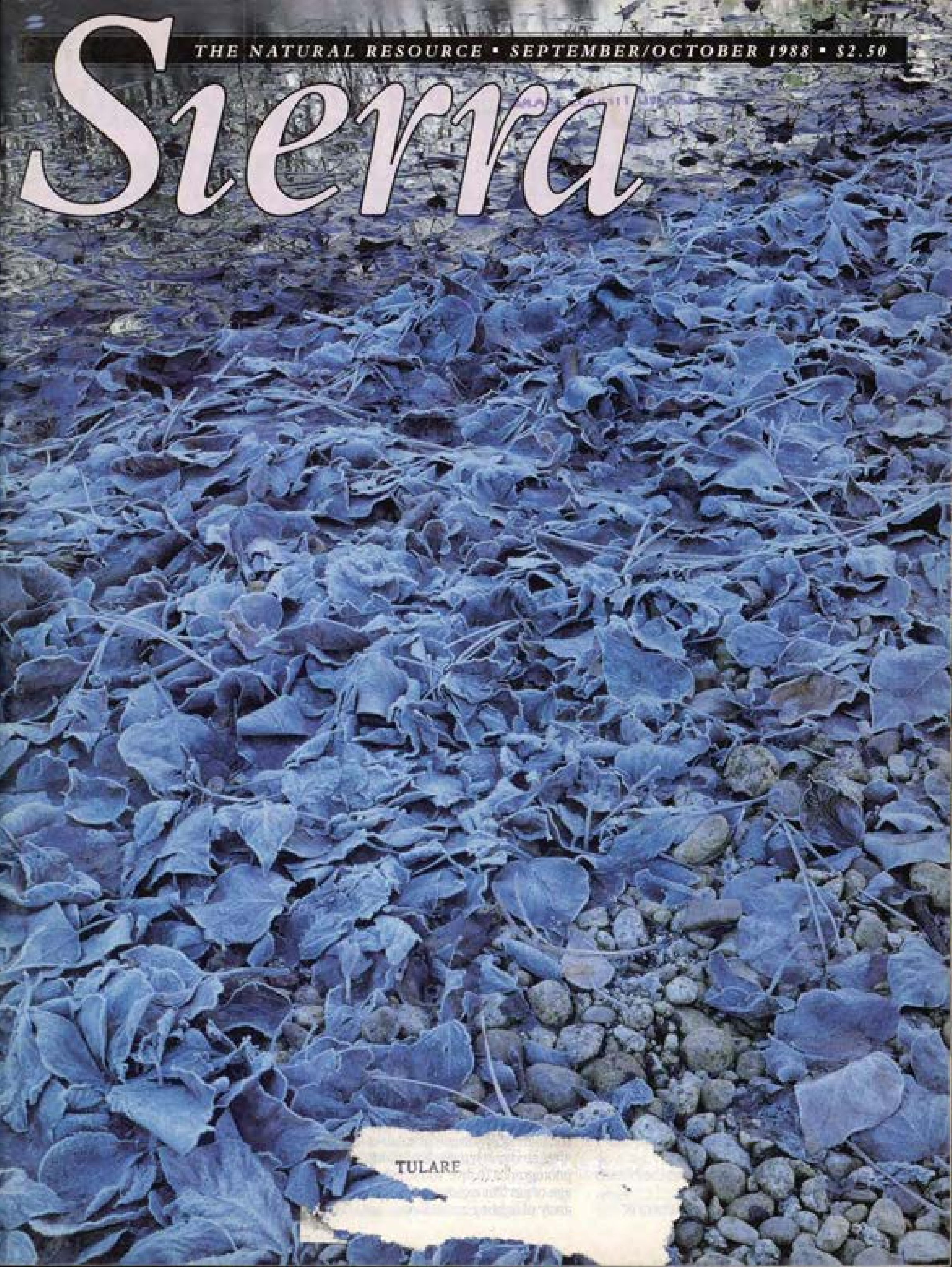
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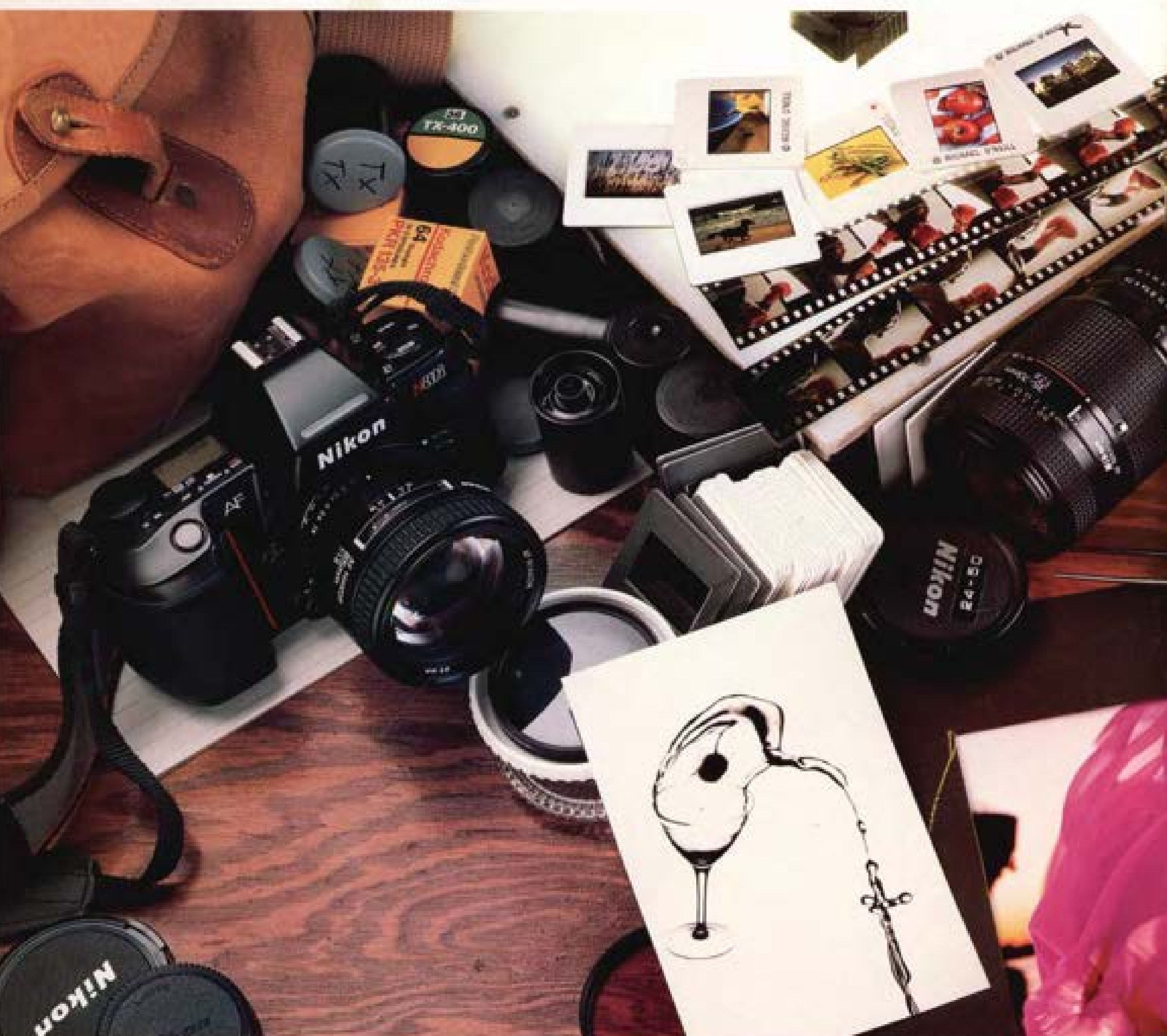

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Sierra

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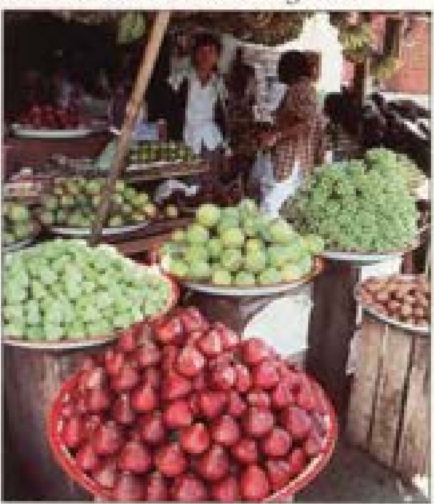

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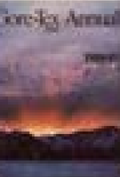

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LETTERS

SITE SPECIFICS

In "The Wasting of Nevada" (July/August 1988), Joseph A. Davis was true to the popular understanding of what Congress did late last year in response to the political crisis stemming from its effort to site the first geologic repository for high-level nuclear waste. This widely accepted interpretation of events begins with the Department of Energy's betrayal of the Nuclear Waste Policy Act of 1982 and ends with Congress taking advantage of Nevada's political weakness by eliminating all candidate sites except the one at Yucca Mountain, on the edge of the Nevada Test Site.

This view of the matter obscures the essential reality of what went wrong. Through hindsight it is clear that the national siting effort mandated by Congress in 1982 was sure to fail. The Energy Department's expedient behavior was predictable once it was clear that what Congress expected of it was beyond reach, politically and technically.

Politically, the prescribed siting effort was to generate overwhelming opposition. Technically, comparing many sites in an effort to find the best ones was to be an unconvincing and increasingly controversial exercise. Geohydrologic data are invariably subject to conflicting opinion among experts, especially when limited and incomplete; yet screening decisions must be made despite this lack of technical consensus.

For the siting effort to continue, Congress had no choice but to simplify that effort politically, technically, and procedurally. Refocusing the search on a remote desert site that is relatively free of environmental and land-use conflicts was, in my view, a good way to begin.

True, Yucca Mountain presents uncertainties that could disqualify the site unless resolved or convincingly hedged against; but this is likely to be true of any site. A unique advantage at Yucca is that the depth to the water table is so great (about 2,000 feet) that the repository could be built well above it.

As I see it, the best strategy for environmentalists would be to accept Yucca Mountain as the preferred candidate site, but with conditions. The latter should include vigorous independent peer review of containment (with a new emphasis on long-lived waste canisters); generous benefits for Nevada as the host state; and an offer of incentives that would help obtain another site for study as a backup, in Nevada or elsewhere in the Great Basin.

Luther J. Carter
Washington, D.C.

Carter is author of Imperatives and Public Trust: Dealing With Radioactive Waste *(Resources for the Future, 1987).*

The Yucca Mountain nuclear dump is actually part of a huge military/industrial breakout of the Nevada Test Site and the Nellis Air Force Base Range. Originally, the Energy Department asked the U.S. Bureau of Land Management (BLM) for 4,800 acres for a repository that would cover 800 acres. This has now exploded to a proposed 72,000-acre withdrawal that encompasses one third of the fragile Amargosa Desert. It now menaces Death Valley National Monument, the Amargosa River (prime pupfish habitat), and a vital area at Big Dune, home to nine endemic invertebrate species. And this is just the tip of the iceberg.

We've tried in vain for years to inform antinuclear groups at the Nevada Test Site about this breakout. While they've been getting themselves arrested at the gates over underground nuclear tests, the Air Force has seized 89,600 BLM acres in the Groom Range (in violation of the 1958 Engle Act), and Aerojet General Corporation (a two-time Superfund polluter) has privatized 28,000 acres of critical desert-tortoise habitat. At present, the ongoing breakout threatens a dozen outstanding wilderness areas.

Charles S. Watson, Jr., Director
Nevada Outdoor Recreation Association
National Public Lands Task Force
Carson City, Nevada

Joseph Davis ignored one important aspect of the Yucca Mountain story: the impact of U.S. nuclear policies on the

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indigenous people of Nevada. The Yucca Mountain site lies within the ancient homelands of the Western Shoshone Nation, which continues to claim title to the mountain and to much of Nevada, as recognized by the U.S. government in the 1863 Treaty of Ruby Valley. Currently the Indians are seeking international recognition of their plight (perhaps a hearing before the World Court) since the Treaty of Ruby Valley remains a valid agreement between two nations.

For too long environmentalists have said nothing about the racism that underlies U.S. nuclear policies and the injustice of placing the burden of mainstream America's addiction to destructive and poisonous technologies on indigenous peoples. Securing a land-base free from ionizing radiation and free for future generations is essential to the preservation of Shoshone cultural, social, and spiritual life. For more information, contact the Western Shoshone National Council (P.O. Box 68, Duckwater, NV 89314).

Marilyn Strasser
Mankato, Minnesota

THE FUR'S STILL FLYING

Thanks for publishing Michael Kantor's "Fur Flies in Pelt Dispute" (July/August 1988) on the animal-rightists' campaign to end trapping in Canada. If animal-rights activists seem unable to perceive that hunting and trapping enable wildland (whether arctic wilderness or a farmer's woodlot) to pay its way and thereby stave off development, it is because they either do not care about conservation or do not understand it.

Landon Lockett
Austin, Texas

What is a "humane" means of hunting? What constitutes proper hunting etiquette? Each culture should be respected and allowed to follow its own traditions in this matter. To dictate to other groups how they should live is pretentious and abusive.

Jonathan Parad
Santa Monica, California

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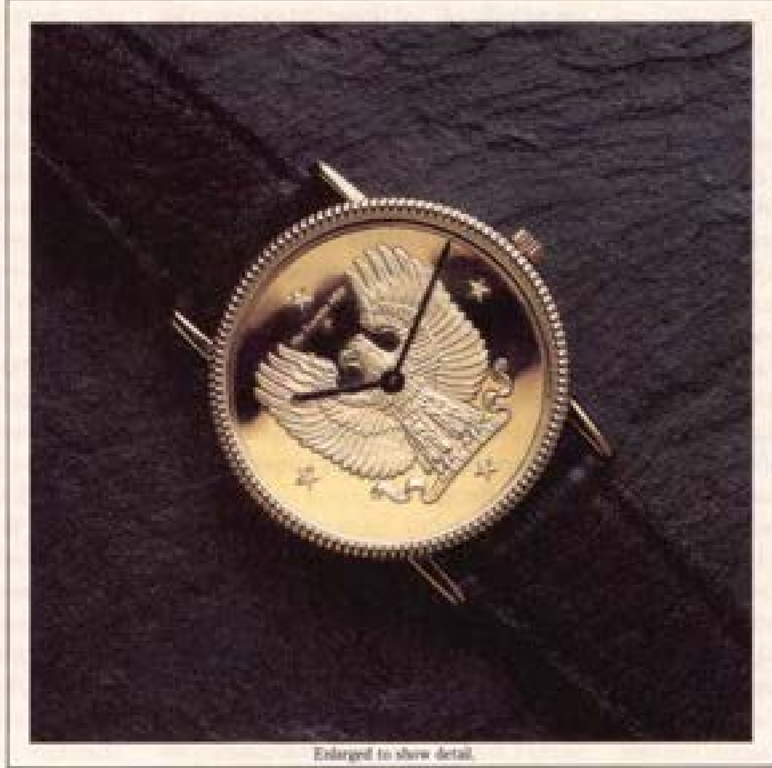

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to hunt and trap for their own subsistence, that's their prerogative, but if a market dries up because of lack of demand for products that cause pain, suffering, and death to animals, then let it be. I say: Let's dry it up!
Gail Spies
Elk City, Oklahoma

I was appalled by the comments of the anti-trapping groups. Since the discovery of the so-called New World, Indians have always been in the way, and white people have always known what is "best" for them. Now some "conservationists" claim that Indian and Eskimo people are a deterrent to "saving" wildlife, and the best thing is to give them a choice to leave the bush and assimilate into the economy. None of these conservationists shows any concern for problems real people face—how to keep land and people, how to make a living.

The environmental movement (and the Sierra Club) continue to regard Indians as either noble savages or fallen angels. As a result, conflicts have developed with such groups as the Havasupai, Acoma Pueblo, Sandia Pueblo, and others. However, when environmentalists *have* taken Indian concerns—and even guidance—into account, considerable progress has been made, as with the proposed Zuni National Monument here in New Mexico, the Navaho Nation, the joint (albeit unsuccessful) struggle to oppose the G-O Road in California, and others.
Gordon Bronitsky
Albuquerque, New Mexico

A FAILING GRADE?

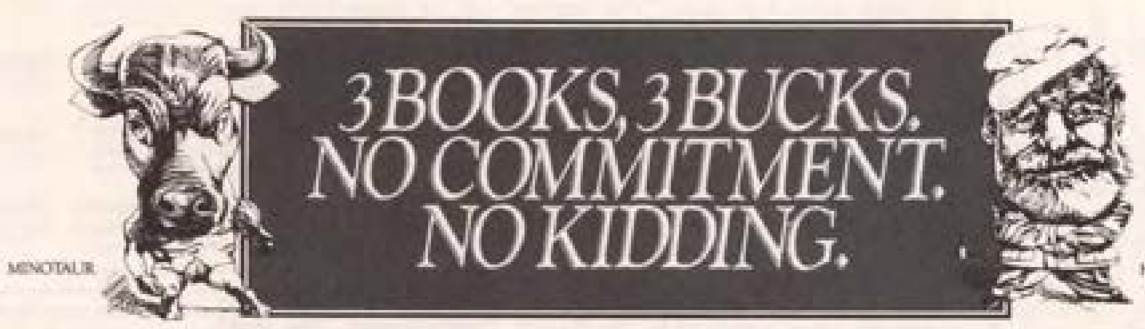
Artistically speaking, *Sierra* deserves a very high rating. Environmentally speaking, it flunks. Glossy magazine paper is not recyclable. If the magazine of a supposedly environmentally committed public-interest organization does not use recyclable paper, why would anyone else be expected to?
Jennifer Hyde
Washington, D.C.

Since at least 1939, when Ansel Adams hand-carried a portfolio of his finest Kings Canyon photographs to Congress to promote national park status for that wonderland, the Sierra Club has made a point of educating the public about the nation's—indeed, the world's—scenic natural areas through the medium of high-quality photography. The current state of the magazine printer's art requires that Sierra, *a recognized showcase for modern conservation photography, print on high-grade coated paper stock to attain an appropriate level of quality. Also to be considered are the national advertisers who help support the magazine, for they have demanding reproduction standards as well.*

Progress is being made toward developing recycling programs for coated paper, however; for a status report, see this issue's "Questions & Answers" on page 118.

SUPERFUND: NOT SO FAST . . .

One of the interesting consequences of being an employee in public service is seeing your name in print accompanied by quotes that in context (and often in content) do not resemble words that you have spoken. In the interests of pursuing a more accurate dialogue regarding the pros and cons of the Environmental Protection Agency's Superfund program, I would like to address several points raised in Susan Stranahan's "Broken Promises" (May/June 1988).



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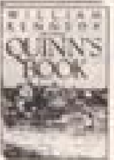
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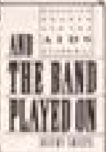
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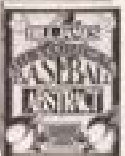
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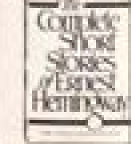
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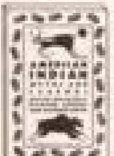
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The article is fraught with historical and technical errors regarding the EPA's approach to the problems imposed on the environment—and especially on the citizens of Pitman, New Jersey—by the disposal of hazardous wastes at the Lipari Landfill.

The EPA adopted a "phased" approach to remediation of the problems at the landfill. Short-term relief was achieved through the construction of a 360-degree slurry wall that surrounds the site and is keyed in to a continuous clay layer beneath it. Then the area was capped, graded, and seeded. The clay formation is not fractured, as reported by *Sierra*.

The second phase of the cleanup is to remove contamination from within the landfill. Prior to selection of the Phase II remedy, an investigation into the extent of "off-site" contamination (Phase III) had already begun. The off-site study investigated areas where contaminants had migrated away from the site prior to construction of the slurry wall and cap. This was not the result of prodding a recalcitrant EPA to do the job Congress ordered it to do; it was one step in a sequence of steps mapped out in an orderly process to address all areas impacted by contamination from the Lipari Landfill. In this respect, the EPA's approach is significantly different than the proposal tended by the Rohm & Haas Company. The more expensive, proven "cleanup" technology alluded to in the *Sierra* article is nothing more than an upgradient groundwater diversion system that would dry out the area, leaving on-site as well as off-site contaminants in place. The EPA has found the approach of letting nature then take care of the problems at Lipari untenable.

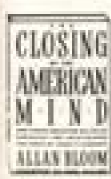
I would suggest that you talk to the citizens of Pitman on the topic of working together to solve problems. As community organizer Doug Stuart put it, they feel that they are now part of the process. This means that, in addition to having their concerns fully aired, they now understand more of the process from the EPA's end.

Kevin J. Oates, Project Manager
Southern New Jersey
Remedial Action Section
U.S. Environmental Protection Agency
New York, New York

Susan Stranahan responds: *I asked Kevin Oates if he wanted to speak to me on or off the record, and he agreed to speak for publication. I must admit to being surprised at the time by his candor, and I now realize that he probably has been criticized within the EPA for being (1) readily available to the media and the public, (2) unstinting in his time to discuss Lipari, and (3) frank and forthright. Oates is highly regarded in Pitman for precisely these qualities, and I duly attempted to note that in my article.*

I do not, however, believe he has substantiated his assertion that the article is "fraught with historical and technical errors." Oates cites only one specific "error," my report that the clay formation beneath Lipari is fractured. The source of that information was a 1985 feasibility study prepared by an EPA consultant; that study found that 1,700 gallons of contaminated water per day were leaking through the clay floor.

Oates' recital of the length of time required to draft a cleanup plan for Lipari only confirms the point of the article: that Congress and the EPA held Superfund out to the American people as a speedy way to rid the nation of hazardous wastes, but that the program has proven to be otherwise.



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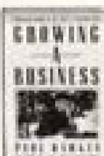

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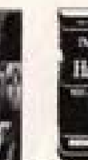

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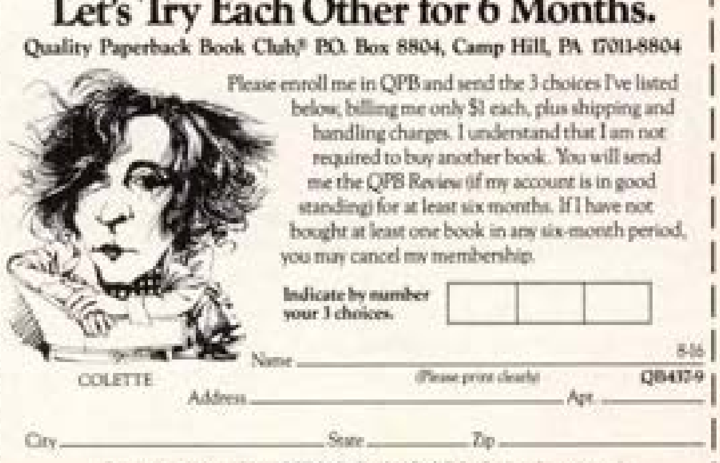

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J. OTTO SEIBOLD

It's a Small World After All

The science of closed ecosystems began two decades ago when ecologists scooped up handfuls of muck from the bottoms of bays and lakes, sealed them in glass vessels, perched them on windowsills, and sat back to see what happened. Though cut off from everything except sunlight, the microbial life inside the jars throve.

In early 1990, scientists will begin observing a human-scale version of those small glass worlds. Near Oracle, Arizona, eight men and women will enter Biosphere II, a two-acre greenhouse-like structure. The doors will be closed and sealed, and if all goes as planned, the human volunteers won't come out again for at least two years. Only sunlight will enter. The humans' biological livelihood will depend on harmony with the small biomes that will be part of their new domain: a tropical rainforest, a desert, a savanna, an ocean, a marsh, and an area for intensive agriculture.

The humans will monitor the food chain, the balance of oxygen and carbon dioxide, the movement of air and water, and the temperature. Their diet will be mostly dome-grown vegetables, produced with the aid of ladybugs and compost rather than pesticides and fertilizers. No one will clearcut the forest here.

Biosphere II (named after Biosphere I, our Earth) is a privately funded project based in part on years of work at the University of Arizona's Environmental Research Laboratory. Among its missions is preparation for future colonies on the moon or Mars, but the understanding it generates will have immediate application on Earth as well. Carl Hodges, director of the Environmental Research Laboratory, has high hopes. "If this project gets the people of Biosphere I to look inward at the planet and outward to the infinite possibilities of the universe," he says, "then it will be one of the most significant scientific projects of all time."

—Mark Holman Turner

RADIOACTIVE RESERVATION

Observing that scientists have gained "a unique laboratory," the Soviet government has announced that it will designate the area within a ten-kilometer radius of the Chernobyl nuclear power plant as an ecological reserve. Scientists will set up several labs from which to study the long-term effects on plants and animals of the radiation emitted by the reactor. As one Soviet radiologist put it, "It would not be possible to reproduce by experiment the ecological situation that has been created in the Chernobyl area."

A MAN OF THE NORTHERN WILDS

With a fine hawk nose, long, dark tresses bound into braids, and weather-worn skin, he looked every bit a Native North American. He called himself Wa-Sha-Quon-Asin, or "Grey Owl," and in his 50-year lifetime he became one of Canada's leading naturalists.

Grey Owl was in fact Archie Belaney, born in Hastings, England, in 1888 without a trace of Indian blood. This fact was not widely known until after his death in 1938, when newspaper headlines declared Grey Owl a fraud. Yet by then he had written of his experiences in wild Canada and published them in numerous articles and four books, and the falsehood did not tarnish his reputation as a protector of animals.

From his early childhood, Belaney was fascinated by the Native American way of life. He built a tepee in his back garden and filled his sketchbooks with drawings of "redskins."

Belaney left England for Canada in 1906, where he first began telling people that he had been born in Mexico and was part Indian—and there he became Grey Owl. Like his naturalist counterpart in the United States, John Muir, he immersed himself in the wilderness. After years as a fur trapper he grew to despise what he felt was a cruel disregard for animals and became a champion of wildlife, rescuing injured animals from traps. Wildlife roamed in and around the wooden cabin where he lived with his Iroquois wife and their child.

KARSH OF OTTAWA/WOODFIN CAMP & ASSOCIATES

In the depressed world of the 1930s, Grey Owl's romantic image drew hundreds of people throughout Great Britain, Canada, and the United States to his many lectures, which he accompanied with films of his alternative life-style in the unspoiled regions of Canada.

"The intensity with which he always felt the things that touched him closely and the genuinely great gift he had for observing the behaviour of animals . . . made him the most famous and certainly the most admired field naturalist of his day," wrote his biographer, Lovat Dickson.

This year marks the 100th anniversary of the birth of Grey Owl. "We don't have many legendary heroes of the wilderness in Canada," says Peter McAllister, chair of the Sierra Club of Western Canada. "We should all know more about Grey Owl, for he is one of those few." —*Susan Peters*

FLASHBACK

PARSON'S COLLECTION/WILLIAM E. COLBY MEMORIAL LIBRARY

Lunch along Bubb's Creek Trail, 1902. The young Sierra Club's second High Trip—a month-long excursion into the Kings Canyon backcountry—was notable for (among other things) an ascent of Mt. Brewer by 49 flatlanders, including 17 "ladies" who climbed in bloomers and knickerbockers.

FOUR YEARS . . . AND COUNTING

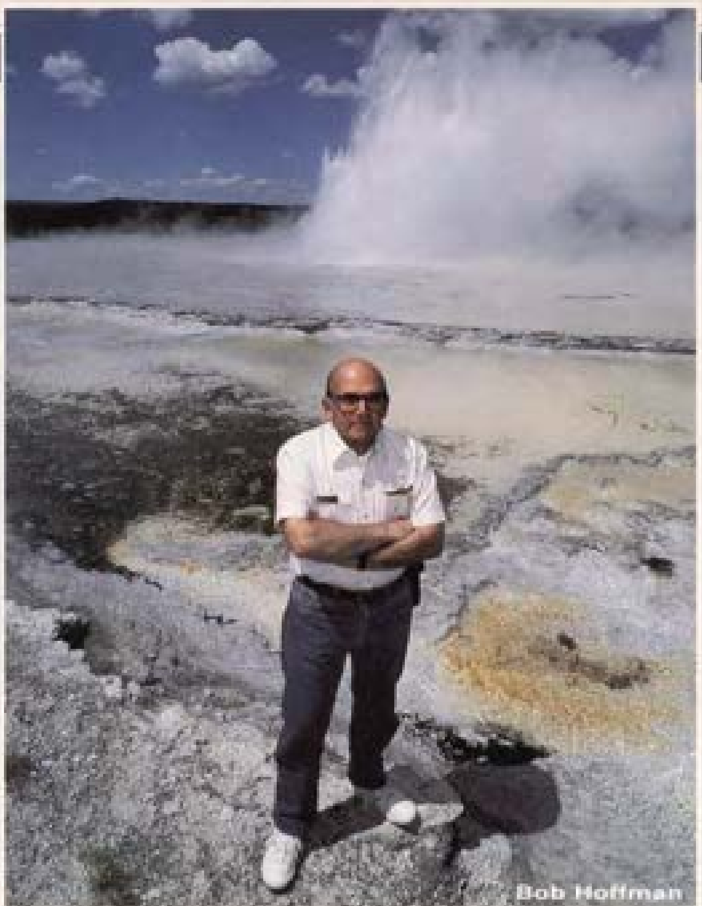
Almost four years after the gas leak at Union Carbide's plant in Bhopal, India, government officials now say that some 3,000 people died as a result of that tragedy. Estimating the accident's future toll for the first time, they predict that another 1,700 people will die prematurely over the next seven years.

SCORECARD

- Senate Majority Leader Robert Byrd (D-W.Va.) and House Speaker Jim Wright (D-Texas) have agreed that Congress will not enact any legislation this year that would open the **Arctic National Wildlife Refuge** to oil development.

- On July 7, Sen. Pete Wilson (R-Calif.) announced that he would not support Sen. Alan Cranston's (D-Calif.) legislation to protect the **California Desert**. Wilson's decision delays action until next year; he feels the bill puts too many restrictions on off-road vehicles.

- In a landmark decision that will protect the habitat of the **endangered red-cockaded woodpecker**, U.S. District Court Judge Robert M. Parker issued a permanent injunction against clearcutting on 200,000 acres of national forest land in Texas. The June 17 opinion ends a Sierra Club lawsuit filed against the U.S. Forest Service in 1985.



Bob Hoffman

Those Old, Faithful Geyser-Gazers

On the mountainous plateau in Yellowstone National Park called the Upper Geyser Basin, the landscape is in constant flux. Mineral-rich water rises to the surface at temperatures easily surpassing the boiling point, and everywhere sulfuric clouds of mist send a malodorous scent across the incandescent plain.

The caretakers of this vast thermal mosaic of bubbling cauldrons, mud volcanoes, and tempestuous fumaroles are a small cadre of senior citizens. Called "geyser-gazers" by Yellowstone's chief geologist, Rick Hutchinson, the volunteers are the only private citizens granted permission to study the strange geothermal phenomena in the United States' oldest national park.

The gazers keep watch over nearly a dozen geysers and predict their next eruptions for the 2 million visitors who come to the park each year. In the anxious moments before an eruption, the gazers spin endless yarns of geyser folklore. "Their enthusiasm is infectious," says Hutchinson. "They get people cheering."

The patriarch of the bunch, 88-year-old Herb Warren, got hooked on geyser-gazing when he first came to Yellowstone, 60 years ago. Since enlisting as an official thermal observer in 1972, Warren has loaded his car every spring and driven the 400 miles from his home in Denver. "I plan to keep coming back as long as they'll have me," he says.

Recent cuts in the National Park Service budget have caused Hutchinson's own geothermal studies to suffer. If not for the geyser-gazers, he says, data currently being supplied to researchers worldwide would not exist. "There's no way on Earth the Park Service could afford to pay these people," Hutchinson says. "They keep track of thermal activity seven days a week, around the clock."

Amidst a sea of Winnebagos, 61-year-old Bob Hoffman keeps watch over a geyser known as Great Fountain. "Eruptions are like snowflakes," says Hoffman, who has witnessed nearly 2,100 eruptions at Great Fountain during the last decade. "They are never the same."

—Todd Wilkinson

IN WHICH POOH'S HOME IS SAVED

Winnie the Pooh, Piglet, Eeyore, and the other inhabitants of the Hundred Acre Wood barely survived 1987, a year when the winds of change blew through the storybook characters' timeless home deep in England's Ashdown Forest.

The trouble began in June when British Petroleum approached the East Sussex County Council with a request to conduct exploratory drilling at Gill's Lap, the highest point in the forest made famous by the stories of A. A. Milne.

Officials from the Department of the Environment had deemed the project "unlikely to cause serious harm." However, the county council disagreed, recognizing that the forest's 6,400 acres provide the last British refuge for several species of rare birds, plants, and butterflies, and that it is the largest area of accessible undeveloped countryside within a 60-mile radius of London. In September the council rejected the oil company's application.

Soon thereafter another crisis loomed. The Earl de la Warr, whose family has owned the forest since 1605, decided to sell it.

De la Warr offered first option to the county, which allocated $800,000 toward the purchase price of $1.9 million. Other private and governmental organizations pledged money, but not enough to close the gap. In October the forest's Board of Conservators joined Christopher Milne, the son of Pooh's creator and the original Christopher Robin, in a public appeal to raise the rest.

The response was tremendous. The goal had been to raise $80,000, but Pooh enthusiasts from around the world sent in $283,000.

Although Lord de la Warr died before he could complete the sale to the county council, the new earl is expected to carry out his father's wishes. If all goes well, the ancient trees and hallowed heaths of Ashdown Forest will continue to comfort the bodies and spirits of children and bears for generations to come.

—*Caroline B.D. Smith*

. . . they came to an enchanted place on the very top of the forest . . .

A DISARMING TASK: THE U.S. BEGINS MAKING PEACE

The papers are signed, the proposal ratified, the history made. Under the Intermediate-Range Nuclear Forces (INF) Treaty, the United States and the Soviet Union have agreed to dismantle 2,695 nuclear missiles. But now that the diplomats have moved on, what will happen to the weapons? What does it mean to take apart a bomb? Allan Krass, a professor of physics and science policy at Hampshire College in Amherst, Massachusetts, provides the following explanation. It is adapted from a longer description that appeared in *Nucleus*, a publication of the Union of Concerned Scientists, for which Krass is a senior arms analyst.

Attached to the treaty is a Protocol on Elimination, which specifies the permissible means of destroying the missiles, almost half of which are deployed and carry a total of 2,096 nuclear warheads. For example, the front sections of Pershing missiles, minus warheads and guidance elements, "shall be crushed or flattened." Launchers will be cut "at locations that are not assembly joints into two pieces of approximately equal size."

The U.S. Air Force will use similar procedures to eliminate ground-launched cruise missiles. After the fuel tanks have been drained and the engines removed, technicians will use circular saws to slice the airframes lengthwise down the middle. Wings and tail sections will be severed at places that are not assembly joints, and the front sections, minus nuclear warheads and guidance systems, will be crushed or flattened. Cruise missile launchers will suffer the same fate as their Pershing counterparts.

The Army will handle elimination of the Pershing IA and II ballistic missiles, both of which use solid fuel. It is easier and safer to burn the fuel in the rocket stages before they are crushed, a procedure that will take place at Army depots in Marshall, Texas, and Pueblo, Colorado.

Warheads and guidance systems will be treated with considerably more respect. Both contain expensive and militarily useful materials and technology, and both will be preserved or recycled for possible use in other weapon systems, at least until far more significant arms reductions are agreed upon.

Warheads to be dismantled will be shipped to the Pantex plant near Amarillo, Texas, where all U.S. nuclear weapons are assembled and disassembled. At Pantex, the warheads will be taken apart in blastproof chambers buried under 20 feet of gravel. The high explosives in the trigger mechanisms must be carefully removed and burned in incinerators.

A typical nuclear warhead contains valuable materials, including substantial amounts of gold and silver, which can be recycled. The plutonium and beryllium will be returned to the Rocky Flats plant near Denver. The uranium and lithium-deuteride will go to Oak Ridge, Tennessee. Tritium, used to boost the yield of the trigger mechanism, will deteriorate over time and must be returned to a facility in Dayton, Ohio, for repurification. Because all of these materials are either radioactive, chemically reactive, or toxic (some are all three), they must be handled with care.

The task of destroying all this hardware will take three years and will be subject throughout that time and for ten years thereafter to the most rigorous and intrusive on-site inspection ever attempted under an arms-control agreement.

The Intermediate-Range Nuclear Forces Treaty is a relatively small step down a very long road. But it is an important step, one that has already established useful precedents and that will demonstrate much about safely and expeditiously eliminating large numbers of nuclear weapons.

BOMBS AWAY

The Soviet Union intends to convert several facilities recently used to produce intermediate-range nuclear weapons to "peace production." One former bomb factory will

make baby carriages, another bicycles, and a third washing machines. Under the terms of the treaty, U.S. inspectors will watch over the transformed factories for three to five years.

WOLFGANG KAEHLER

RAIDERS OF THE LAST FRONTIER

The ice is thousands of feet thick, the temperature often a hundred degrees below zero, and a flowering plant a source of wonder. Indeed, the makers of the 1959 treaty that governs Antarctica as an international research base never dreamed that one day they might need to manage exploitation of the continent's resources. That day has arrived: On June 2, representatives of 33 nations announced that they had reached an agreement on how to tap Antarctica's frozen wealth.

The riches, scientists think, include uranium, copper, nickel, iron, coal, and oil; however, the cost of recovering resources that lie beneath a mile and a half of ice makes all but oil extraction unlikely. And even offshore, oil explorers would face a climate that could shake the most sturdy of rigs: One bay on the continent is the windiest place on Earth.

Some corporations will doubtless rise to the challenge. Under the new accord, if a company wants to begin exploration, it must be sponsored by its home country and receive permission from an international regulatory committee. Responsibility for environmental repair—should it be necessary—falls first to the developer, then to the sponsoring nation.

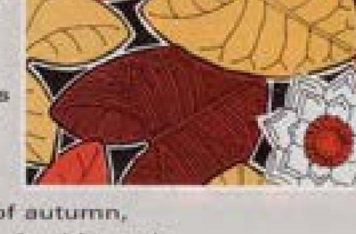
The new agreement will go into effect as soon as it is signed by 16 nations, including the United States, the Soviet Union, and the seven countries that hold territorial claims on the continent.

Chief among the proposal's opponents are environmentalists, who have a different vision for the frozen continent. They will lobby against ratification of the agreement and continue working to designate Antarctica a world park.

—Annie Stine

FIELD NOTES

Fall, I would rather call it, as in dying fall or the fall of man. I think it was September when Adam and Eve left the garden, struggling as they walked on rough footing, the first time anyone did, uphill into the compromised world. Outside Eden the live pulsing green, thick flesh of leaf and stem, showed red wounds for the first time, withered beige and gray stalk, the bruised russet and yellow of dying vegetation. Against the uniform green of continual Summer advanced the complexities of autumn, Fall's multivalent messages of decay in color and shape, death's mothering sigh. A leaf falls, the year falls, men and women fall. And, *felix culpa*, Fall is the most beautiful season—at least in New Hampshire.



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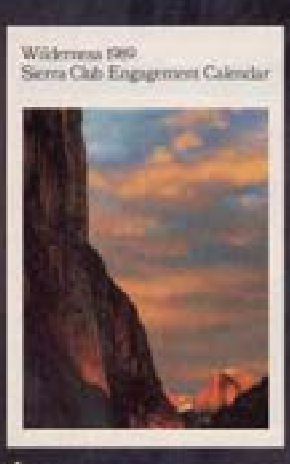

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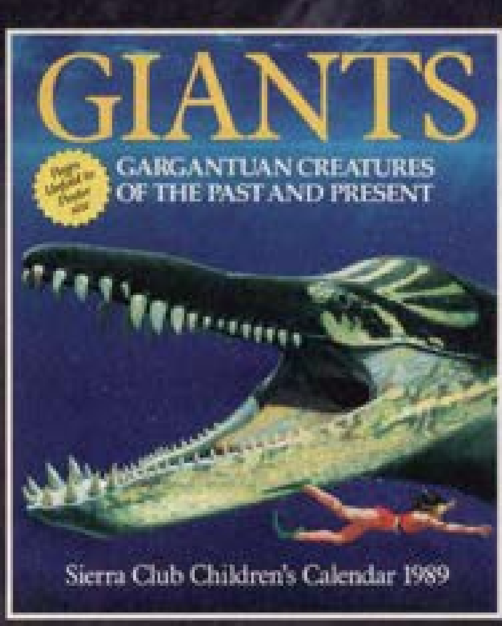

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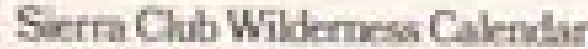

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TOXICS

Susan Peters

The ABCs of Asbestos Cleanup

Despite reform attempts, asbestos still plagues the nation's schools. Will we soon be asking ourselves why Johnny can't breathe?

JAMES STAGG

THE HALLWAY ceiling is scarred by scratch marks and crudely gouged initials. The students who left their graffiti on the school probably didn't notice the faint powder that fell to the floor as they scraped their messages. Ironically, that powder, a fibrous mineral called asbestos, may have left an indelible mark on them. As another academic year begins, the question again arises: Is it safe to send our children to school?

Fireproof and durable, asbestos once seemed a perfect material for construction and insulation. During this century about 30 million tons of the mineral have been used to insulate heaters and pipes as well as to fireproof, soundproof, and decorate walls and ceilings.

Today it is clear that a deep breath of asbestos can stay with a person forever. Like small, sharp pins, the fibers can pierce the lungs and remain there for 40 years before they are noticed. Over time they can cause lung cancer; mesothelioma, a cancer of the lung and abdominal membranes; or asbestosis, a chronic lung disease that eventually makes breathing nearly impossible.

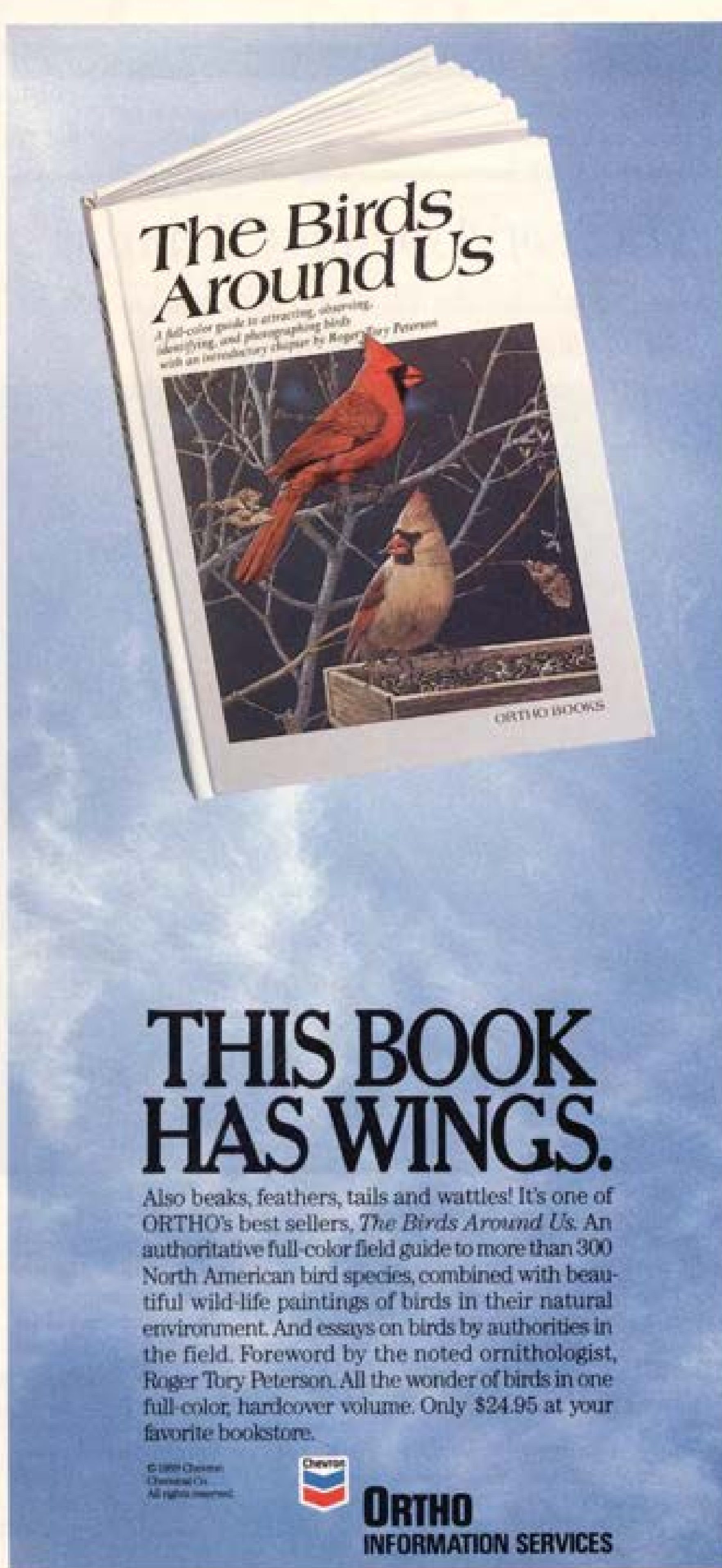
From 1945 until 1978 asbestos was used extensively in schools. Over the years some of the asbestos-containing material has worn down, becoming easily crushable, or "friable." Any disturbance sends microscopic fibers into the air to be inhaled by those in the buildings.

Children are especially vulnerable to the dangers of asbestos, says Dr. Leon Gottlieb, medical adviser to Asbestos Victims of America. They breathe more rapidly than adults and tend to take air in through their mouths rather than their noses, which would filter out some of the fibers. And because children are smaller, they are more likely to come in contact with asbestos dust gathered on the floor.

According to surveys conducted by the Environmental Protection Agency (EPA), some 44,000 public and private schools, 733,000 public buildings, and many homes throughout the country contain friable asbestos. Many more buildings contain nonfriable asbestos that may deteriorate in the future.

Although medical reports linked asbestos with cancer as far back as the 1930s, it wasn't until 1973 that the EPA barred use of the substance for insulation and fireproofing. In 1978 the agency banned it in construction. Since then, critics believe, little has been done to rid buildings of this carcinogenic material.

"The EPA has basically dragged its



feet all along," says Joel Packer, legislative specialist for the National Education Association, which has been pushing for tighter asbestos regulations.

In 1982 the EPA required that schools inspect for asbestos, notify parents of its existence, and post warning signs. A later EPA survey of 2,600 schools revealed that only 34 percent had complied with the rules.

In an effort to help tackle the problem, Congress passed the Asbestos School Hazard Abatement Act in 1984, thereby authorizing $600 million in grants and no-interest loans to help "financially needy" schools or schools with "severe" asbestos problems defray the costs of inspection, management, and removal.

After stories of mismanaged removal operations—in one notorious incident New Jersey contractors stuffed asbestos down a toilet—Congress passed the Asbestos Hazard Emergency Response Act (AHERA) in 1986. That law strengthened the EPA's regulations by requiring that accredited investigators conduct inspections and that schools be inspected for nonfriable as well as friable asbestos. It was to be enforced beginning in 1987.

Last year the EPA established October 12, 1988, as the deadline for all schools to be checked for asbestos, to have its friability evaluated, and to submit plans for control or removal.

Michael Chambers of California's School Facilities Planning Division isn't optimistic about his state's chances of meeting that deadline. "I'd say we'll be lucky if we get half of the 1,027 schools to comply," he says.

This skepticism is shared by observers elsewhere. Kate Herber, legislative counsel for the National School Boards Association, estimates that 40 percent of the nation's school districts will fail to meet the October deadline.

One obstacle is funding. When AHERA went into effect in November 1987, says Herber, schools had already determined their budgets, not necessarily including funds for asbestos control. According to EPA estimates, inspection alone could cost each school from $5,000 to $15,000—and these figures may be conservative.

Even schools that qualify for loans or that have budgeted for asbestos work

may not be able to find trained inspectors to do the job. So far the EPA has approved 10,000 inspectors, planners, and managers, "but that doesn't mean everyone who needs an accredited person will be able to find one," according to the agency's Kling. Inspectors may not be available in some states or small towns, Herber says, or they may be tied up with private jobs.

Another potential problem is that the term "accredited" does not guarantee that the inspector will do the job correctly. Trainees are required only to have high school degrees, Herber says; they may not necessarily be able to read blueprints or understand engineering. During past spot checks the EPA found asbestos in schools where "qualified" inspectors had said there was none.

Even assuming schools do find able inspectors and design workable plans, the law requires that they immediately implement only those plans involving severely damaged friable asbestos; other plans need not be implemented until next July.

A proposal by the National School Boards Association to extend the October deadline met opposition from groups like the National Education Association, the Parent-Teachers Association, and some environmental organizations, including the Sierra Club.

The result, a compromise proposal that just passed Congress, extends the October deadline to May 9, 1989, for schools that prove that it is impossible for them to comply. Schools are still bound to the July deadline for beginning implementation of all plans.

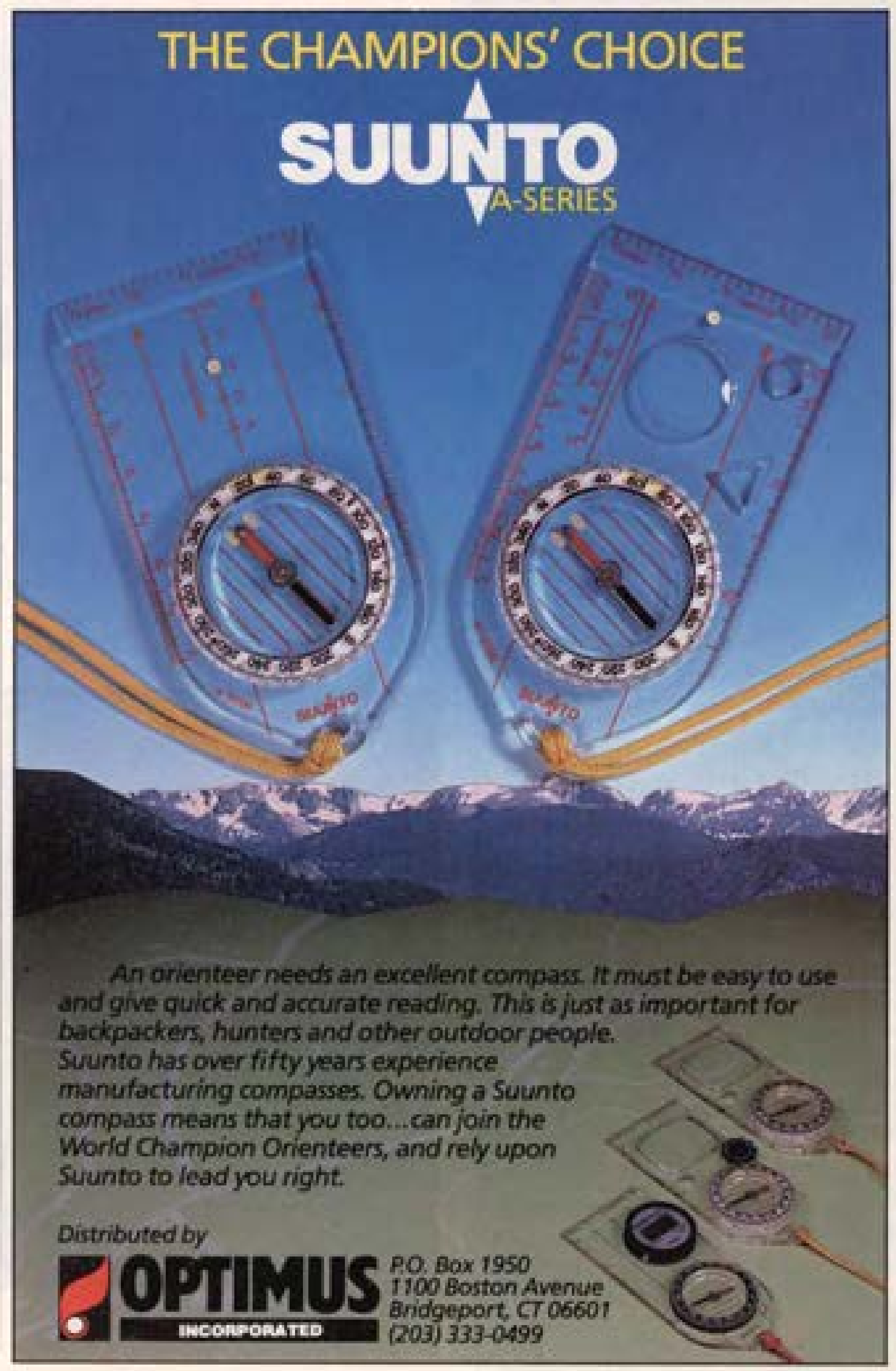
Despite the proven dangers, no one knows for certain what the overall impact of asbestos in schools will be. No statistical studies have yet linked lung disease and cancer specifically to exposure in schools, because the source of exposure is difficult to trace, says Carolyn Breedlove of the National Education Association. Also, doctors do not readily associate lung cancer with asbestos exposure—particularly when exposure may have occurred as many as 40 years earlier.

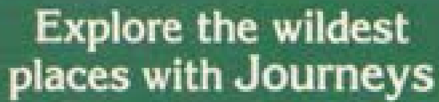
As James Fite, executive director of the White Lung Association, explains, "If you shoot someone, they fall down soon after the bullet hits, and you can see a smoking gun. In the case of asbestos, it's a tiny, invisible fiber that disrupts the cell, which in turn could potentially disrupt the DNA—and that takes years to trace."

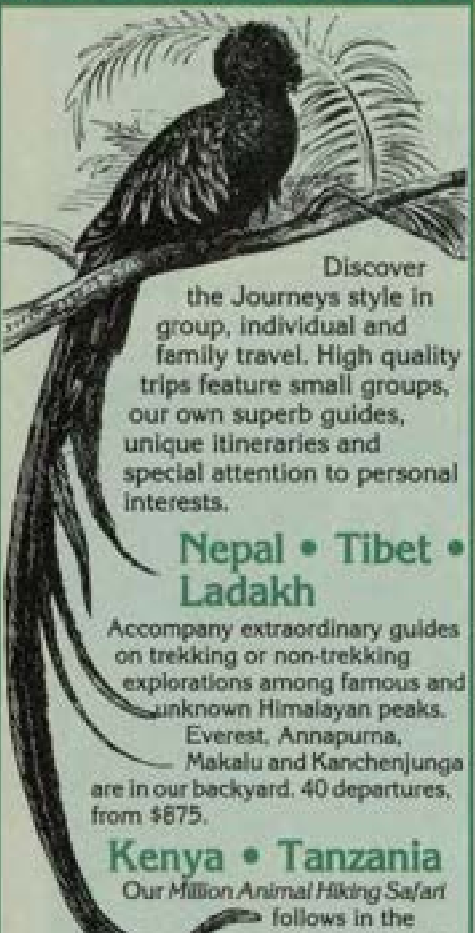
Now the latency period is nearly over for the first of those who were exposed to asbestos as schoolchildren or employees. Custodians have developed lung disease from asbestos exposure, and in 1987 a 41-year-old doctor from New York died of mesothelioma traced to asbestos exposure during high school.

To date, most cases of mesothelioma have struck industrial workers who have had intense exposure to asbestos. But some fear that the slow progress of asbestos control in the nation's schools may be chipping away at the health of children as surely as the children's scratching chipped away the asbestos-ridden ceilings. There's one big difference between the two processes, however: The students didn't know what they were doing.

SUSAN PETERS *is a freelance writer and a former* Sierra *editorial intern.*







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A Timber Takeover's High Toll

What do corporate raiders and junk bonds have to do with how fast U.S. forests are logged? More than you might think.

Jane Easter Bahls

Champion International borrows heavily to purchase St. Regis Paper. Crown Zellerbach yields to a loan-financed buyout by British raider Sir James Goldsmith. Potlatch Corporation avoids a Canadian's takeover attempt by borrowing money to buy back its own stock.

These recent timber-company transactions have resulted in huge, high-interest debts and heavy financial pressures on the companies that owe the money.

"If you've made a leveraged [largely loan-financed] buyout, you have debt pressing on you," says John E. Maack, Jr., vice-president of the brokerage firm of S.G. Warburg and Company. "You don't just sit there and let it grow."

Instead, firms sell assets to pay off those high-interest debts. In the timber business, that can mean clearcutting the forest as quickly as possible.

In one of the most controversial recent takeovers, Texas raider Charles Hurwitz and his holding company, Maxxam Group, descended on Northern California's family-run Pacific Lumber Company. Because Maxxam financed its 1985 purchase of the firm with "junk bonds" (high-interest, high-risk securities backed by minimal assets), the company planned to pay off its debt as quickly as possible by liquidating the virgin redwood forests on its newly acquired property.

Pacific Lumber's $680-million debt now drives the harvest. "If the cutting were purely market-driven, it's unlikely that techniques quite this damaging would be used," says California state Sen. Barry Keene (D).

Maxxam's takeover is especially devastating news to conservationists because Pacific Lumber owns 189,000 acres, containing roughly three quarters of California's—and therefore the world's—native coast redwoods, excluding those protected by park designations. The company had planned to cut its enormous old-growth redwoods over a period of at least 40 years, never taking more timber than the forest produced in any one year. Now the new owners intend to double the rate of har-

DAVID CROSS; MARK E. GIBSON (INSET)

A redwood forest on Pacific Lumber property—and the mill (inset) that may consume it.

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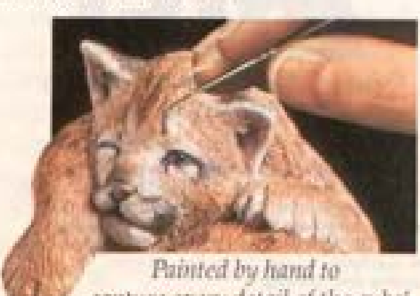

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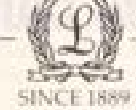

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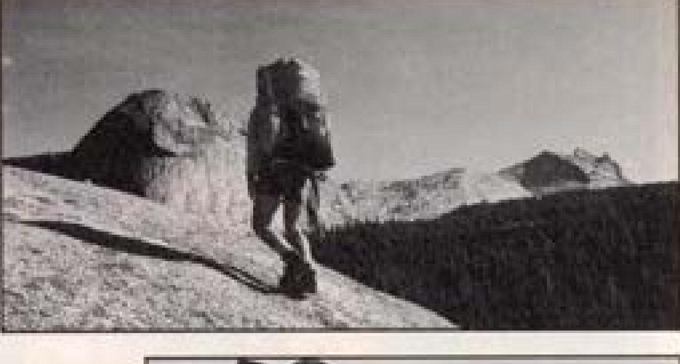

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vest, cutting the forest in 20 years or less.

David Galitz, public relations director for Pacific Lumber, agrees that the accelerated logging is attributable to the company's debt burden. He maintains, though, that Pacific Lumber had been contemplating a return to clearcutting before the takeover bid, especially in areas not visible to the public.

Greg King of Earth First! is furious about the switch. "Spineless money-gluttons in Sacramento and Houston have taken action to further ensure the immediate destruction of some of the finest and most spectacular old growth left on Earth," he says. Members of his group have been tree-sitting in redwood groves to block logging activity.

On May 26 the company managed to defuse some of the criticism it has aroused by promising to stop clearcutting old-growth redwoods. In exchange, California Assemblyman Byron Sher (D) dropped a bill that would have limited cutting of virgin redwoods. Most environmentalists, however, are unimpressed by the promise.

"A lot of people misunderstood what Pacific Lumber meant," says Robert Sutherland of the Environmental Protection Information Center (EPIC), a group of activists based in Garberville, California. "The agreement accomplishes zero." Sutherland, who calls himself The Man Who Walks in the Woods, says Pacific Lumber has not changed its plans, only its terminology. The company could avoid "clearcutting" in the strict sense by leaving only one large tree per acre—a practice it defines as "modified select cutting."

"The clearcutting ban is nothing more than a diversionary tactic," says state Sen. Keene. "It just draws attention away from the real issue of liquidating virgin timber to pay off debt."

Opposition to Maxxam's plans has come from other directions, too. Some Pacific Lumber shareholders are arguing that the company's method of purchase was illegal and that its plans violate an old Pacific Lumber policy to consider the social, economic, and environmental effects of business transactions.

William G. Bertain, an attorney for the shareholders, maintains that accelerated cutting will be disastrous for the local economy. The old-growth timber scheduled to be cleared out over the next 17 years could have lasted much longer, he says, providing the community with jobs for 50 to 60 years.

"The employees of Pacific Lumber Company are realizing that their worst fears may be coming true," says Bertain. "The more overtime they put in and the faster and harder they work, the sooner they will be out of jobs."

Though Bertain opposes the clearcutting of Pacific Lumber's old-growth timber, his aim is to slow down—not stop—the logging. "We don't want to have a park or preserve created. We want to keep the jobs and go back to cutting at previous volumes," he says. "This clearcutting is destroying our economy as well as the environment."

According to environmentalists, the forest giants should not be cut at all. "My motivation is to get these trees saved," says Richard Jay Moller, lead attorney for EPIC. "I think it's a crime to cut down a 2,000-year-old tree and make it into picnic tables."

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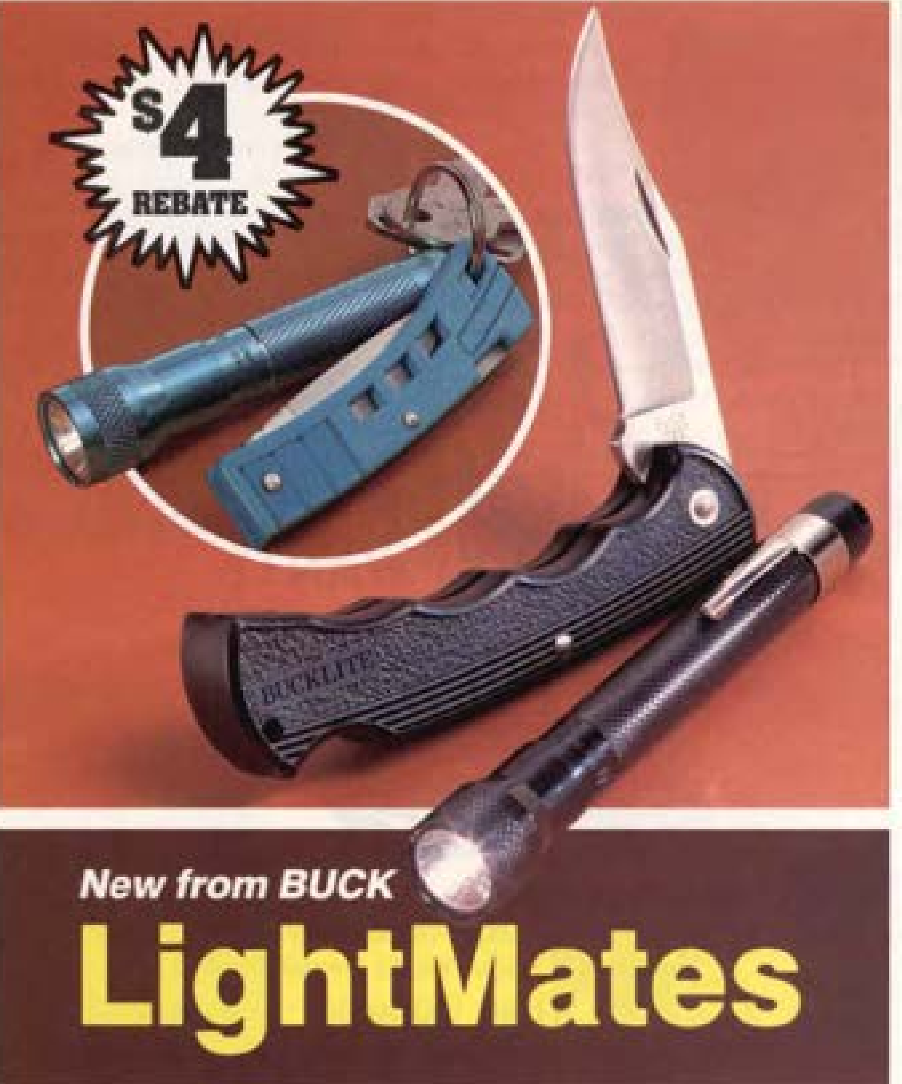

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with some success in blocking Maxxam by forcing scrutiny of the company's timber-harvest plans. In a 1987 suit that EPIC filed to protect 400 acres of trees on Pacific Lumber's property, a judge found that the California State Department of Forestry essentially rubber-stamped the company's plans without examining their impact on wildlife. The judge blocked the plans and later awarded EPIC $66,000 in legal fees. Maxxam has appealed.

With wildlife in mind, the Department of Forestry later denied Pacific Lumber's plans for another 300 acres, but the California State Board of Forestry overturned the agency's decision. A suit filed by EPIC and the Sierra Club has halted the cutting on this land until the case goes to trial later this year.

But these victories could turn out to be mere consolation prizes. "The bottom line is that Pacific Lumber can cut down its trees unless the state steps in and buys the land," EPIC's Moller says. His group is asking state officials for a moratorium on cutting until the public has had a chance to consider the alternatives. Gail Lucas, chair of the State Forest Practices Task Force of the Sierra Club, says her group is pursuing ways to help the state buy and preserve critical old-growth habitat.

Though Maxxam's opposition is divided over what should become of the redwoods, it is united in the belief that, despite the recent agreement, Maxxam's approach is wrong. In 1987, Keene introduced two bills aimed at preventing future takeovers from devastating California's timberlands: One would have encouraged sustained-yield logging; the other would have set a debt limit for timber-company takeovers. After intense lobbying by timber interests, the former was amended beyond recognition and the latter died in committee.

Even without such legislation, companies planning takeovers are being careful to avoid the Maxxam model, with its attendant public scrutiny and lawsuits. Simpson Paper Company consulted with Keene before announcing a recent timber-company purchase, saying that it would not be driven by debt. Sierra Pacific Industries came to Keene with similar reassurances shortly after it had sealed a deal. "[These com-

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panies] are a little gun-shy right now," says Keene.

He predicts that the scenario may be played out again before long, however, both in California and elsewhere. Takeovers are now a fact of life, and the timber industry, like many others, is going through a period of consolidation. Future takeovers may be less dramatic because they will not involve virgin redwoods. But they could easily result in equally serious threats to the environment.

Writing about the Pacific Lumber situation in the spring 1988 issue of *The Amicus Journal*, Wall Street tax attorney and conservationist Robert K. Anderberg summed up conservationists' concerns with a disquieting question: "Are we in danger of becoming a country in which our natural resources will be dismembered in transactions that benefit nobody but the dealmakers?"

JANE EASTER BAHLS *is a freelance writer in Missoula, Montana.*

INTERNATIONAL

Laws of the Jungle

A national campaign to preserve Australia's primordial wet tropics faces local opposition as tough as hardwood.

David G. Knibb

THE BULK OF THE WORLD'S tropical rainforests struggle for survival in Third World countries, where they must vie with poverty and overpopulation for government attention. The rainforests of Australia are the exception. A developed, urban nation that began compiling its environmental record in 1879 by creating the world's second national park, Australia is spared the Hobson's choice between wilderness and development. Its tropical rainforests —3 million acres along the northeastern coast—are descendants of a prehistoric jungle that once covered most of this huge continent. Today they contain the world's oldest wet tropical flora.

But Australia's primeval forests aren't out of the woods: A decision this December by the United Nations Educational, Scientific, and Cultural Organization (UNESCO) to add almost 2 million acres of Australia's wet tropics to its World Heritage List would bring to a climax a decade of fighting between the federal government and the northeastern state of Queensland.

The tropical rainforests of Queensland stretch 420 miles, from Townsville to Cooktown, in a band seldom more than 30 miles wide. They flourish in 4,500-foot-high mountains, bathed by southeast trade winds that bring up to 120 inches of rain each year. Their thick canopies moderate temperatures and maintain humidity to provide the perfect environment for 800 types of trees, almost one fifth of all Australian bird species, and nearly two thirds of the continent's butterfly species—the greatest concentration of rare and endangered animals in Australia.

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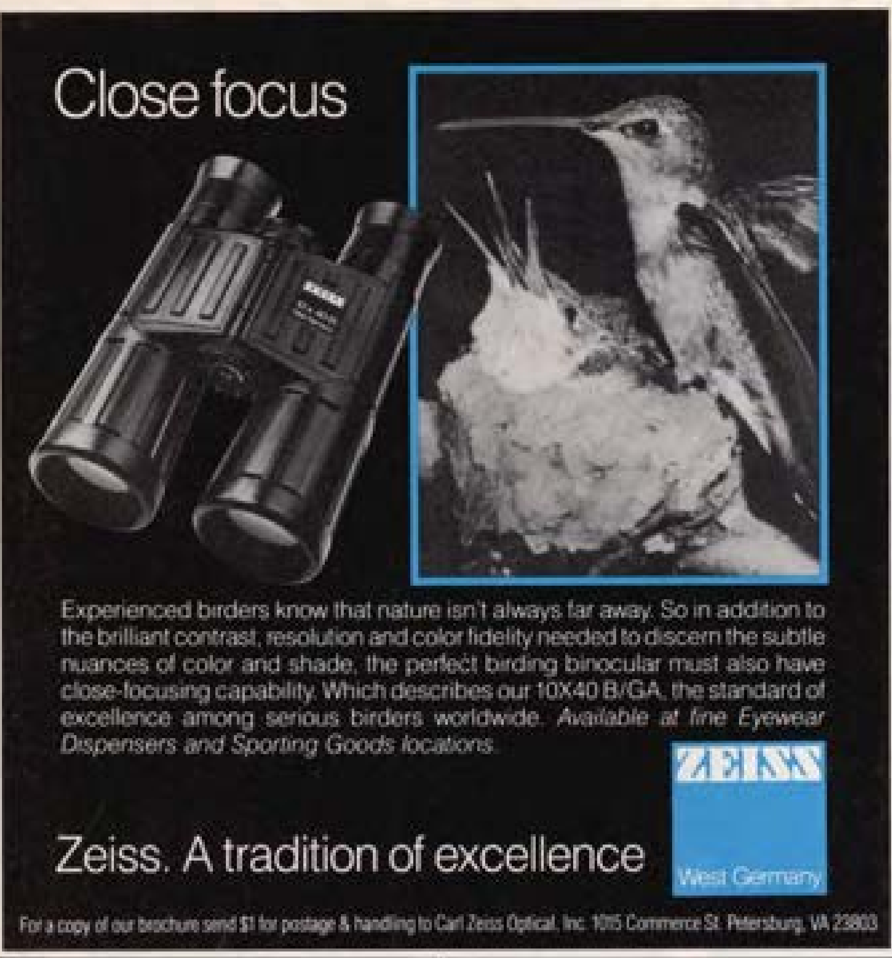

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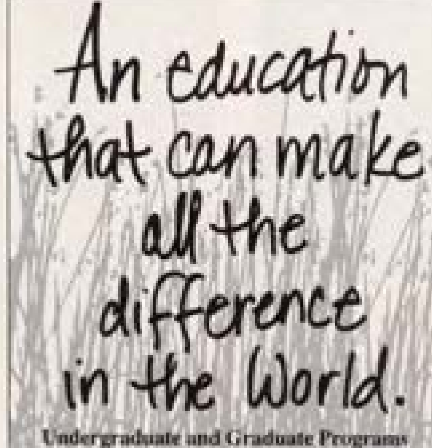

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isolation has fostered relicts—plant and animal species that survived in protected pockets during drought or other difficult times but that have been unable to regain their old range even after favorable conditions returned. According to Aila Keto, a biochemist and president of the Rainforest Conservation Society of Queensland, Australia's northeastern forests support the world's most complete remnants from the Age of Conifers and Cycads, a period that extended from 140 to 200 million years ago, when Australia was part of Gondwanaland, a southern supercontinent.

These holdouts fare poorly against machete and machine. Extensive logging and land clearing that began a century ago have destroyed more than half of Australia's rainforests. Today state laws usually force loggers to cut selectively, but even so some scientists argue that to remove large, old trees from a forest is to devastate it. Sun-loving vines invade, species diversity drops, and the botanic refugees of the deep forest are overwhelmed. To its credit, Queensland has established more than 50 rainforest parks, but these are scattered patches that preserve less than 15 percent of the available stands.

In Australia, concern for who determines the forests' destiny overshadows concern for the forests themselves. Many born-and-bred Queenslanders sneer at "southerners" from Victoria and New South Wales and assail the federal government that in the 1970s began to extend its authority over environmental affairs. Australia's constitution strictly limits the commonwealth's conservation role by giving states the powers to administer crown (public) lands and to create national parks, reserves, and wilderness areas according to their own criteria. The clash has been marked by lawsuits and international lobbying as well as by "greenie bashing" (scuffles with environmentalists) and threats to shoot down federal surveillance planes.

In the '70s, as interest in rainforests grew, the federal government created the Australian Heritage Commission to inventory and advise it on protection of historic and natural features of national significance. The government's biggest move, however, came when Australia ratified UNESCO's World Heritage

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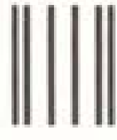

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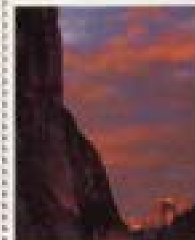

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Convention in 1974. That treaty, which provides the underpinning for federal involvement in environmental issues, allows a signatory country to nominate significant natural and cultural areas within its borders to the World Heritage List. Once an area is listed, a nation is obligated to "protect, conserve, present, and rehabilitate" it. This world-class roster includes 288 sites, among them the Grand Canyon, the Taj Mahal, and Mt. Everest. Australia boasts seven World Heritage sites, including the Great Barrier Reef.

AUSTRALIAN TOURIST COMMISSION

Thick tropical forests meet sea and coral reef in Queensland.

Putting its obligation into practice, in 1983 Australia passed legislation to protect any area nominated or listed as a World Heritage site. Over state protests and legal challenges, Australian courts upheld the commonwealth's right to protect such threatened areas. Aided by an international spotlight, the federal government marched into the rainforest controversy.

It did so backed by the political clout of a growing Australian "green vote." Polls taken before national elections in July 1987 showed that Prime Minister Bob Hawke's incumbent Labor Party could gain a number of marginal seats by supporting a strong pro-rainforest policy. Six months before the election, Hawke announced that he would nominate Queensland's forests for World Heritage status. Hawke's opponent, Liberal Party leader John Howard, offered inflation-weary voters tax cuts—and would have eliminated the federal environmental protection department, making Australia the only Western democracy without such an agency.

Backed by a television campaign, conservationists canvassed the country to distribute leaflets. The voters chose Hawke's party, and in December the Australian government nominated 3,552 square miles of rainforest (of which all but 38 square miles are publicly owned) for World Heritage standing. It imposed a ban on logging in the nominated area, conducted surveillance missions to ensure compliance, and proposed $75.3 million (approximately U.S.$60 million) to compensate "displaced" workers, offering 640 new jobs—most on tree plantations and in tourism and World Heritage management.

A war of words and numbers has ensued. Queensland's then-Premier Sir Joh Bjelke-Petersen charged that the federal government had "set out a blueprint to take over the whole of north Queensland." National Party state member Tom Gilmore sees the proposed listing as "cold-blooded decimation" of the north Queensland timber industry and considers the proposed federal compensation inadequate. World Heritage supporters argue that the region's rainforest timber industry is already in serious decline: Production has dropped by more than two thirds since 1974. Depending on the source, the number of jobs felled in the protected forest will range from fewer than 700 to more than 3,000.

In June the advisory World Heritage Bureau endorsed the Queensland nomination and passed it on to the full committee for a final decision in December. In the meantime, the state government is arguing in court and at World Heritage meetings that the vast majority of its rainforests are not of outstanding ecological value, one of the determining criteria for World Heritage status. Keto of the Rainforest Conservation Society disagrees. "These rainforests are an encyclopedic assemblage of plants and animals that help us unravel the development of this planet in a fundamental way," she says. "The case for the World Heritage listing is overwhelming." ■

DAVID G. KNIBB *is a Seattle attorney and freelance writer.*

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POLITICS

Pressure, counterpressure. Enemies and friends. Stalemate, strategy . . . resolution? High-school civics, it's not—but for conservationists, Congress is still the best game in town.

Dear Colleagues

Douglas Scott and Carl Pope

FOR MORE THAN 30 YEARS, conservationists have been taking their case to Capitol Hill. In part they've done so for a simple reason: Washington, D.C., is where the federal action is. More often, however, conservationists have deliberately chosen Congress as their forum because they believe they can influence decisions more effectively there than through often-inaccessible government agencies.

The strategy has been successful. Beginning with passage of the Wilderness Act in 1964, the Sierra Club and other groups have won protection for more than 90 million acres of federal forests, parks, wildlife refuges, and other public lands. In the same period, dozens of national park units have been established. Congress has also been the scene of repeated showdowns in which conservationists have blocked adverse developments and administrative proposals. Often, too, conservationists have lobbied successfully there for stronger environmental laws than even the most apparently sympathetic administration chose to advocate.

Inevitably, these achievements have created counterpressures. To blunt the impact of environmental groups, oil, timber, mining, and manufacturing industries of every kind have increased their own lobbying presence in Washington. Grassroots activism, once the particular specialty of conservation groups, is now big business: K Street in downtown Washington has become a ghetto of public-relations firms and corporate lobbyists manufacturing the notion that the common man favors environmental exploitation.

Not surprisingly, this has led to an era of congressional impasse, a time when the House and Senate are voting less and less—on all issues. A few years ago the directors of the League of Conservation Voters spent several long days sifting through the many decisions on environmental issues that had been cast during one session of Congress to find the 15 or 20 benchmark decisions that would best represent a balanced environmental record. In 1987, on the other hand, only half a dozen major environmental votes were taken in the House, and even fewer in the Senate. Important environmental issues (such as siting a high-level nuclear waste repository) were often simply buried in larger bills and never singled out for a clear vote.

Lobbying isn't the only factor bringing about the stalemate. Congressional power is now greatly fragmented among a jumble of subcommittees, leading to jurisdictional confusion; younger members who support conservation goals run into entrenched opposition from more powerful senior members; and lobbying itself has become more sophisticated. Finally, in the increasingly contentious world of election campaigns dominated by political-action committees, few members of Congress relish the idea of having to cast a vote that will anger a powerful constituency. Why vote for a strong Clean Air Act, pleasing the Sierra Club chapter back home, when doing so will bring down the wrath of the National Association of Manufacturers? Why choose between the environmentalists and the oil companies when it comes to drilling in the Arctic National Wildlife Refuge? Why make enemies when everyone wants to be friends?

Another key reason for the failure of Congress to legislate is personality—of its leaders and of its key committees. While Washington reporters no longer refer to congressional "barons" and "fiefdoms," and while chairs are no longer selected by an iron rule of seniority, one person or one committee can still sound the death knell for a piece of legislation.

Nowhere has this been clearer than in the effort to pass new clean air legislation. For eight years Congress has struggled—and failed—to address the issues of acid rain, urban smog, and toxic air pollutants, even as it has become increasingly plain that majorities of both the House and the Senate would vote for an effective clean air bill if ever presented with one.

On the Senate side of Capitol Hill, the problem is not the Environment and Public Works Committee, which is at least as pro-environment as the full Senate. The committee draws many of its members from the Northeast, where Republican senators are stronger environmentalists than their colleagues from the South and the West. Repeatedly in the past eight years the committee has either approved or been ready to approve legislation to clean up air pollution. Last October the Environment Committee approved Sen. George Mitchell's (D-Maine) S.1894, the most stringent piece of clean air legislation ever to emerge from any congressional committee.

Although Mitchell moved his clean air bill through his committee, month after month he was unable to bring it to a vote in the full Senate. The obstacle is Democratic Majority Leader Sen. Robert Byrd (D-W.Va.), who has refused to bring clean air legislation to the Senate floor, claiming that provisions to clean up acid rain will weaken markets for his state's coal.

The Sierra Club and other environmental groups responded to this logjam with a co-sponsorship drive for S.1894. The drive had several purposes: to let members of Congress demonstrate their support for the legislation; to provide citizen groups with a specific action request for each senator; and to force senators to think about the legislation and identify any problems they might have with its provisions, giving Mitchell and conservationists a chance to find solutions. But even after 28 senators had co-sponsored S.1894, Byrd refused to put the bill before the Senate.

Encouraging the Majority Leader in his intransigence was the long-standing inability of the House Energy and Commerce Committee to agree on clean air legislation. That committee, which has jurisdiction over clean air and toxics issues, is much less environmentally sympathetic than the House as a whole (unlike its counterpart in the Senate). Energy-producing districts are disproportionately represented on the com-

mittee, and many of its members see their role as protectors of a particular industry. But even more central to the Energy Committee's failure to tackle the clean air issue is a set of personality and policy clashes among its Democratic majority.

The personality dominating the Energy Committee is its chair, Rep. John Dingell (D-Mich.). Dingell has an impressive environmental history in Congress: He was co-author of the National Environmental Policy Act, one of the principal congressional advocates of more expansive federal programs for the protection of wildlife species, and, in the 1960s, a leader in the fight for the Wilderness Act.

But Dingell has another constituency: the auto industry. As regulating automobile emissions and improving automotive fuel economy became central planks in the environmental platform of the early and mid-1970s, Dingell began to side with industry against environmentalists more and more frequently.

This tension increased dramatically after 1976, when a new generation of junior Democrats on the Energy Committee began to challenge Dingell's leadership. These Democrats, most of them victors in the post-Watergate election of 1974, were strongly pro-environment. In further contrast to Dingell, they believed in decentralizing power on House committees.

Faced with an environmental challenge to the economic interests of the auto industry, and with a related challenge to his control of the committee from his subcommittee chairs, Dingell forged an alliance with a group of more conservative Democrats and Republicans. Issue after issue pitted Dingell and his conservative coalition against a majority of the Democrats, particularly Henry Waxman (D-Calif.), chair of the Subcommittee on Health and the Environment, and the leading clean air advocate in the House.

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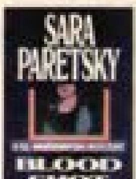
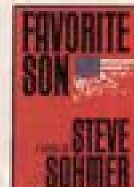
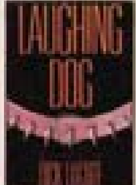
Dingell's alliance with the Republicans pushed the politics of the entire committee badly out of sync with the environmental sympathies of the House. The 1985 to '86 battle over the Superfund, for example, showed that the House was willing, even eager, to vote for a much stronger bill than Dingell's committee proposed. The House overrode Dingell and passed a strong Superfund. The memory of that defeat and the fear of such a loss on clean air, which concerns Detroit even more deeply, has made Dingell reluctant to allow any clean air bill to go before the full House this year.

To deal with this problem, the Sierra Club has adapted a venerable congressional practice: the Dear Colleague letter. When a legislator wants to rally the interest and support of his or her associates, he or she sends around a letter asking other legislators to co-sponsor a new bill, or to co-sign a letter to the President or a cabinet member urging some policy. The more signatures, the more political impact.

In April 1987 the Sierra Club collaborated with Rep. Bruce Vento (D-Minn.) and William Green (R-N.Y.) in drafting the Vento-Green Letter for a Strong New Clean Air Act. This letter, addressed to the committee leaders who have been blocking action on clean air



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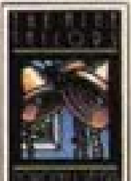
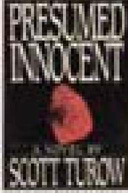

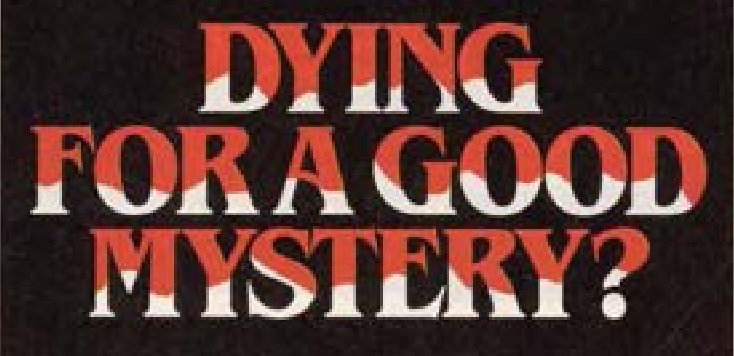

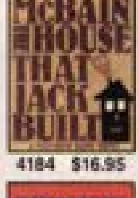

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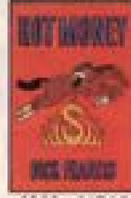

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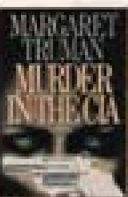

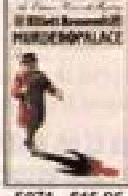
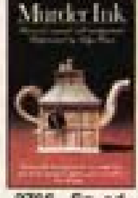
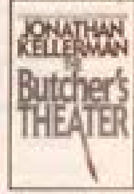

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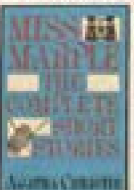

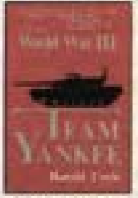

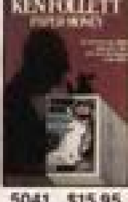
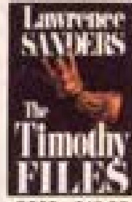

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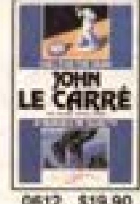
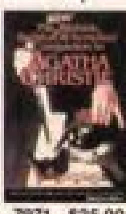
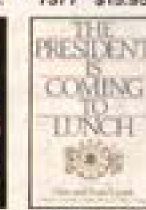
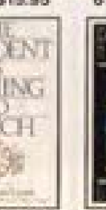

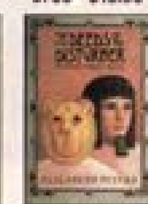

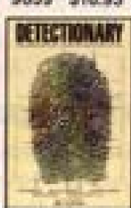
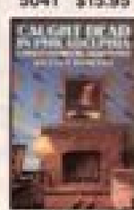

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legislation for a decade, specifies five key features that the co-signers support in a clean air bill and urges the committee to move such legislation to the House floor this year.

Clean air activists in every state went to work to persuade their representatives to co-sign. By August a majority of the House had signed the Vento-Green Letter, sending a powerful message to Rep. Dingell and his committee and transforming the politics of clean air.

Seizing this new momentum, Rep. Waxman, Sen. Mitchell, and their conservationist allies are utilizing parliamentary devices to bring the issue to a vote in the final weeks of the 100th Congress. They may try to force Senate action by proposing their clean air bill as an amendment, or "rider," to a piece of high-priority legislation that has already passed the House. If this tactic succeeds, the Senate will vote on the clean air provision and then send it back to the House for approval or disapproval, perhaps bypassing the House Energy Committee altogether. Even if it fails, over the last two years grassroots activists have built public and congressional pressure for new clean air legislation, despite formidable opposition.

The real civics lesson for conservationists is that Congress is an amorphous, loosely jointed collection of political egos. It's a place where random friction can build rapidly and immobilize an issue. But since it is also the most accessible branch of the federal government, conservationists will continue to work there. The challenge is to create an overwhelming sense in every member of the House and Senate that the people back home have three demands. Congress must do its job: to legislate. In so doing, it must respond to the public's desire to protect the environment. Finally, the leadership and committee structure of Congress must facilitate, not obstruct, this vital task. ■

DOUGLAS SCOTT *and* CARL POPE *are the Sierra Club's conservation director and deputy conservation director, respectively.*

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EDGAR W. GARBISCH

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The return of a landscape: A marsh in Tuckerton, New Jersey, thrives just one year after its restorers put the first grasses in the barren ground.

A Time To Mend

EDGAR W. GARBISCH

Restoring life on Long Island Sound.

The earth-movers, tree-harvesters, and river-changers have had their season of spoils, but that's not the end of the story. Working under the banner of restoration, people everywhere are repairing what others have put asunder.

BY SARAH POLLOCK

When Aldo Leopold persuaded the University of Wisconsin to re-create a piece of native prairie on the grounds of the university's new arboretum in 1934, neither he nor his colleagues knew exactly how to go about the task. The ecologist in charge dug up and transplanted large chunks of existing prairie, a practice that today would make a naturalist cringe. But through years of planting seeds, moving sod, and setting fires, those working on the 60-acre project began to understand what makes a prairie.

For several decades only a tiny group of people recognized the significance of what was happening in Madison. Now, as public concern for protecting the environment extends to learning how to repair it, the launching of Leopold's project is regarded as a seminal event: the moment when the notion of restoring nature, of re-creating natural communities, first stirred in the contemporary imagination.

The politics and science of environmental restoration are now blossoming. From small projects to large, people all over the world are involved in repairing some of the damage that has been inflicted on the environment. In Costa Rica, University of Pennsylvania biologist Daniel Janzen is trying to re-create more than 150 square miles of tropical forest; in Massachusetts, local residents have succeeded in cleaning up the heavily polluted Nashua River after a 25-year campaign; on the Atlantic coast, Ed Garbisch, formerly a professor of organic chemistry, has spent the last two decades developing techniques to restore saltwater marshes; in Florida, efforts are under way to bring back the seagrass beds of Biscayne Bay.

The bigger projects have received a lot of publicity in the past year, largely as a result of the work of John Berger, a journalist and Ph.D. candidate in ecology at the University of California at Davis. In 1985, Berger wrote *Restoring the Earth*, a book of case studies in restoration; he now heads an organization of the same name. Last January he organized a conference on restoration that drew 800 people to the University of California at Berkeley.

It became clear at the conference that what people are

To control erosion along a tributary of Chesapeake Bay, Ed Garbisch first constructed a shoreline (top), then planted a marsh. This is one of some 300 marshes that Garbisch's organization, Environmental Concern, has restored in the Northeast.

calling the restoration movement is more than just several large, well-publicized efforts; much more common are smaller projects. For some, restoration is revitalizing a creek; for others, it is revegetating a small plot of land in New York City. For some, restoration is a technical challenge; for others, it is the embodiment of a philosophical approach to life. Some people came to the Berkeley conference to exchange information; others came to build a movement that they hope will change humanity's relationship to the natural world.

The variety of projects and approaches discussed at the conference gave rise to a number of questions: What, exactly, does restoration mean? What do people envision when they talk about a restoration movement? Is it really a new and distinct philosophy, or is it a mélange of not yet fully connected activities that have been going on for some time under different names?

To David Brower, a Sierra Club board member and founder of Friends of the Earth and Earth Island Institute, "Restoration is the most important environmental and social opportunity of our time. Coming generations, for all the problems of their own, need something better to live on than the dregs of our civilization."

Brower wants the United Nations to sponsor a conference on environmental restoration in 1992, a proposal the Sierra Club has endorsed. He hopes that such a conference would stimulate an international discussion on building an economy based on renewing resources rather than on exploiting them. He envisions new jobs in an expanding field of restoration ecology, jobs funded with dollars redirected from the arms race. He suggests creating a United Nations Peace Corps to help transform an international war economy to a restoration economy. He notes that if restoration projects created jobs and shaped careers, the movement would become more than a marginal endeavor.

Corporations would be less reckless with the environment, Brower feels, if they had to pay to repair the destruction they cause. "If we start restoring, if we find out how much it costs, we'll be a lot more hesitant about ripping things up in the first place," he says.

Brower is not alone in his vision. The word "restoration" evokes feelings of rejuvenation and healing, and many find much to celebrate in this groundswell toward positive, reconstructive action. More than just a chance to reclaim turf that has been lost to the ravages of civilization, restoration offers a chance to do something life-affirming in a movement that so often fights defensive battles.

But partly because of its scope, restoration has its own hazards. As some of its strongest advocates point out, there is a certain hubris in thinking we can "rebuild" natural systems, an arrogance that holds something in common with the mentality that tampered with nature to begin with. And there is a danger that activists could become free cleanup crews for corporate polluters; in some cases, the possibility of restoration at some point in the future may be misinterpreted as a license for further destruction in the present.

Michael L. Fischer, the Sierra Club's executive director, is wary of overemphasizing restoration, arguing that it could distract activists who might otherwise be fighting to preserve what little wilderness remains in the world. He is most immediately concerned about the possible confusion of restoration and mitigation, which can involve requiring a developer to improve previously damaged habitat to compensate for destroying a new area.

"Federal agencies are now engaged in the process of reviewing and approving subdivisions, shopping centers, and freeways around the country," Fischer says. "'Restoration' and 'mitigation' are key parts of the lingo of the development business, and we must be conversant with the potential misuse

Daniel Janzen has won wide acclaim for his restoration of a Costa Rican rainforest. His daily work, however, involves tasks as glamourless as weighing spiny pocket mice.

of these concepts. We must be knowledgeable about what constitutes a viable restoration proposal and what does not."

While he supports preparing to heal damaged places in the future, Fischer believes the time for restoration will come when the major battles to protect what remains of the world's wilderness are finally won. "The protection of wilderness has a spiritual aspect," he says. "You're protecting a sanctuary. You're protecting the soul of a place. It's much more difficult to go back to a place that has been savaged and do other than be angry and grieve and say we can't let this happen elsewhere. I would say early in the 21st century is when the Sierra Club ought to be turning its eyes from wilderness protection to wilderness restoration."

Restoration, at its least controversial, is a descriptive term for one aspect of applied ecology; it is a means of returning damaged habitats as nearly as possible to the way they were before they were mined or logged or polluted. Some of the projects, such as Garbisch's saltwater marshes or the Nashua River cleanup, are large-scale and demand a decades-long commitment. But the more modest enterprises also underscore the complexity of restoration ecology and the devotion it requires.

A simple plan to restore natural vegetation on Washington's Olympic Peninsula is a case in point. In 1986, when construction crews began widening 14 miles of a road through mixed old-growth and second-growth forest in Olympic National Park, the National Park Service decided to depart from the standard practice of hydro-seeding the damaged areas with non-native grasses. Park officials requested $150,000 to rescue and replant more than 11,000 native plants from within the project site.

"There's a good reason for hydro-seeding with non-native grasses," says Nancy Dunkle, the environmental scientist who headed the project. "It's cheap. You just spray it out there and fertilize it. But if you want to speed the return of old-growth floor species, you do a lot of slope preparation."

At Olympic National Park that meant labor-intensive work: mulching the slopes, anchoring the mulch with logs and other barriers, laying down ladders, and then climbing the slopes and planting sword ferns by hand.

Part of the value of such a project is aesthetic; it keeps more of the park looking like old-growth forest. But it also helps preserve genetic diversity, which has potential economic as well as scientific value. Dunkle points out that if the native plants thrive, they will probably control erosion more effec-

CHARLES A. MAUZY/APERTURE PHOTOBANK

Roadside attraction: The National Park Service opted to enhance the re-colonization of old-growth forest vegetation by planting native species in Olympic National Park.

tively and be cheaper in the long run because they will require no fertilizer or replanting. "I think if it works well," Dunkle says, "you'll see more money being used for this kind of work on Park Service road projects."

The Olympic Peninsula project, though experimental, is fairly straightforward. The restoration was well-planned and incorporated plants that already inhabited the area; trying to minimize the impact of widening the road left little to lose and much to gain.

That isn't always true. When the damage has existed long before ecologists get involved, restoration can be much more problematic. Teri Knight, a botanist with The Nature Conservancy, notes that in many cases very little is known about how to repair damaged ecosystems. "It's really a new venture every time you get out there," she says. "There are so many different ecosystems we're trying to patch up. The idea is there, but we don't know enough about how to do it."

One place where restoration failed to fulfill its promise is in the wetlands of San Francisco Bay, home of two endangered species, the California clapper rail and the salt marsh harvest mouse. In the early 1980s, 250 acres of non-tidal salt marsh in the South Bay city of Fremont were converted to tidal brackish marsh as mitigation for the development of a nearby industrial park. It became clear after the dikes were breached that the mice needed the non-tidal salt marshes as a place to retreat to when the tide was high. Otherwise they were left desperately swimming for their lives, easy prey for marsh hawks and owls.

"At first it looked like a pretty good deal," recalls Paul Kelly, a wildlife biologist with the California Department of Fish and Game. "But in time we realized we had taken 250 acres of prime habitat of the salt marsh harvest mouse and destroyed it." According to Kelly, more than a thousand acres of salt-marsh habitat in the South and Central bays have been lost through such restoration/mitigation projects since the mid-1970s. "It's pretty amazing how misguided those projects were," he says ruefully. "And I was part of it."

An interesting twist to the problem—and a significant one for any restoration project—is that wildlife often adapts to mankind's intrusion, and changing the conditions again may hurt one species while helping another. Some of San Francisco Bay's artificially created wetlands, for example, now support species that are not indigenous—species that would suffer if the original salt marshes were restored.

"We're not saying we're not interested in creating tidal marshes," says Kelly. "But I sure don't want to do it at the expense of other species–and certainly not as part of some mitigation scheme where you're filling in even more habitat."

Some people involved in restoration work say the way to avoid mistakes is to make environmental repair one component of a major revision in the way we live. Restoration, they say, should always begin locally and include such things as educating children about the natural world and building a strong community understanding of the local landscape. Only then will people care enough to maintain the environment on a day-to-day basis, and to fight with full force against those who would threaten it.

"I'm a little daunted by this effort to create a professional class around restoration," says Freeman House, who is involved in the rehabilitation of the logged-out forests and depleted salmon runs of the Mattole River in Northern California. The Mattole restorers, who started their own salmon hatchery to boost the numbers of native fish, have also painstakingly revitalized the river so the fish can thrive. The community is now involved in a survey of its 300-square-mile watershed to determine where erosion is most critical and where seedlings should be planted.

Although state agencies have funded some of the work, Mattole watershed inhabitants have donated most of the labor. House has no argument with drawing upon the skills of ecologists at nearby Humboldt State University or the California Department of Fish and Game as long as the work remains community based and community run.

"We have always approached this work as inhabitants, to

Replicas of natural communities, such as this maple forest cultivated amid oaks at the University of Wisconsin Arboretum, can teach restorers the tools of their trade.

provide a place for our children to live," he says. In that spirit the Mattole project involves not only environmental work but an alternative high school, a touring dance troupe, and many other community activities that help create a culture of affirmation rather than destruction.

"Restoration is much more than a technical thing," says David Simpson, another member of the Mattole group. "We've enlisted people from all over the watershed to be our surveyors. By the time they're done, they'll never look at where they live the same way.

"To restore a damaged piece of land is not in itself a movement," he continues. "It's a job that needs to be done. But in order to make it more than a cheap janitorial service for big business, it has to relate to the way people live."

That remark underscores a very real concern: that in their enthusiasm for bringing a place back to life, people will forget who caused the damage in the first place. Individuals working to restore the Mattole watershed know the irony of living as paupers, performing labors of love, in order to heal a place that was ravaged for the profit of a handful of timber companies.

For John Berger of Restoring the Earth, the answer to such concerns is communication. The more people talk about their experiences and successes, he believes, the more easily conflicts and questions of responsibility can be resolved. Berger would like his organization to be a clearinghouse where news of local efforts is exchanged and lay restorers talk with their professional counterparts. "I think it gives people power and moral support to know they're not alone struggling with what appear to be monumental problems," he says. "The truth is, the professionals need the community people and the community people need the professionals."

For David Brower the answer is for governments, corporations, and citizens to work together to "find out what resources of science, technology, and human genius and spirit" are available to apply to the task of restoring what we have destroyed.

"The restoration agenda can be exciting, perhaps fun at times," he says. "It will be fun to restore health, our own and the Earth's, and to rediscover mutual respect, compassion, a bit of serenity now and then. To hear more silence than we have been hearing lately. And to renew acquaintance with our hard-won prescience, intuition, and wit." ■

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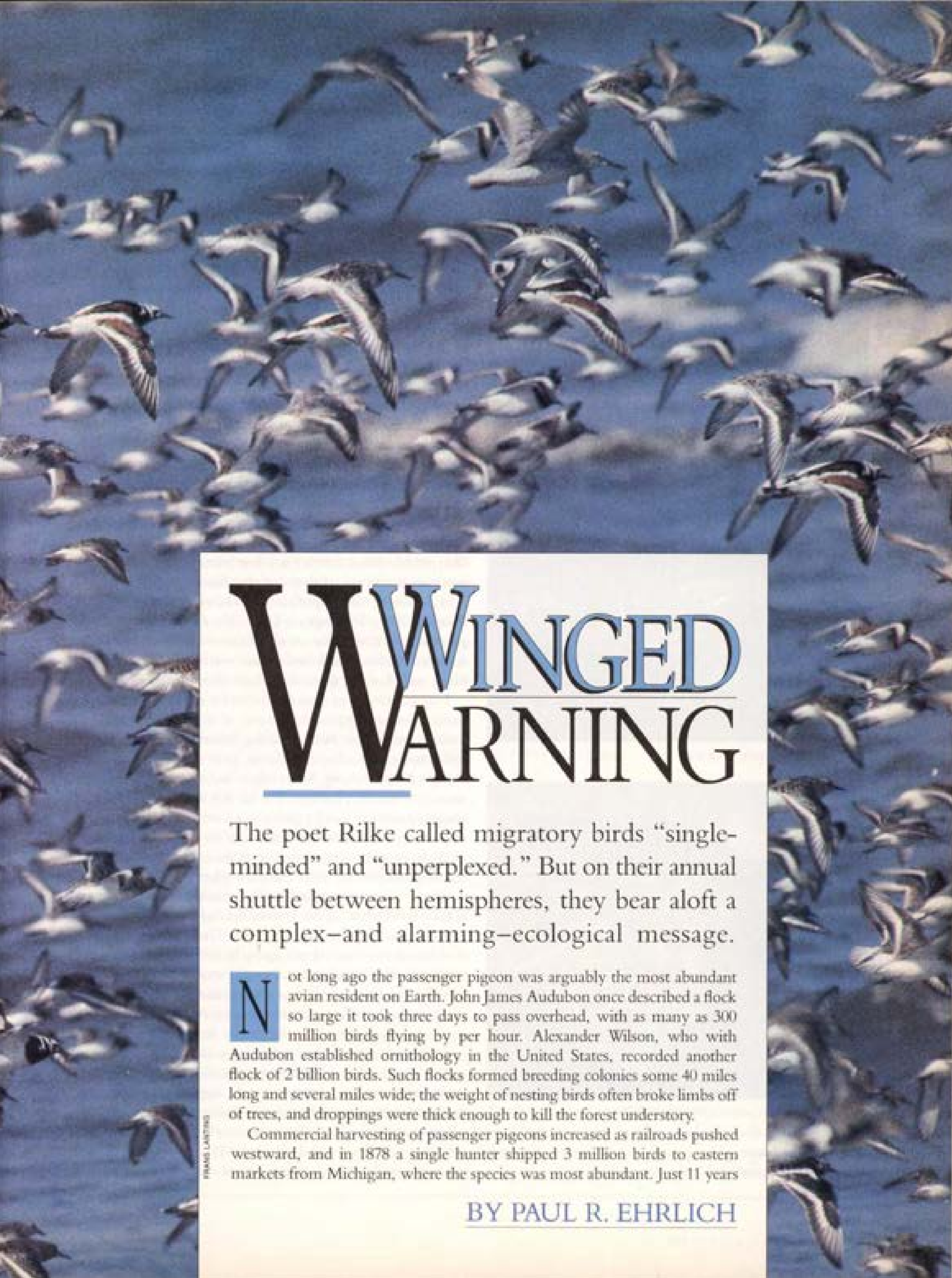


FRANS LANTING

WINGED WARNING

The poet Rilke called migratory birds "single-minded" and "unperplexed." But on their annual shuttle between hemispheres, they bear aloft a complex–and alarming–ecological message.

Not long ago the passenger pigeon was arguably the most abundant avian resident on Earth. John James Audubon once described a flock so large it took three days to pass overhead, with as many as 300 million birds flying by per hour. Alexander Wilson, who with Audubon established ornithology in the United States, recorded another flock of 2 billion birds. Such flocks formed breeding colonies some 40 miles long and several miles wide; the weight of nesting birds often broke limbs off of trees, and droppings were thick enough to kill the forest understory.

Commercial harvesting of passenger pigeons increased as railroads pushed westward, and in 1878 a single hunter shipped 3 million birds to eastern markets from Michigan, where the species was most abundant. Just 11 years

BY PAUL R. EHRLICH

ART WOLFE

SUMMER TANAGER

BILL DYER/PHOTO RESEARCHERS

BLACK-AND-WHITE WARBLER

ALVIN E. STAFFAN/NATIONAL AUDUBON SOCIETY COLLECTION/PHOTO RESEARCHERS

RED-EYED VIREO AND COWBIRD CHICKS

Woodland woes: Coming north to breed, forest minstrels find suburbs and parasites. Going south for the winter, the birds discover their rainforest habitat is fast disappearing.

later, the passenger pigeon apparently was extinct in the wild in that state. Hunting ceased throughout the country when populations became so small that commercial harvesting was no longer profitable. Many birds were still alive at that time, and there still were large stretches of satisfactory habitat, but the species nevertheless continued to decline. The last known passenger pigeon, a female named Martha, died in 1914 at the Cincinnati Zoo.

While the passenger pigeon was a victim of human overexploitation, the equally alarming decline of bird populations in this century has more often been a result of habitat destruction. The ivory-billed woodpecker, for example, is thought to be extinct in the United States as a consequence of the logging of the great stands of mature, swampy bottomland forest that once covered substantial portions of the Southeast. Bachman's warbler may well be extinct because the canebrakes (bamboo thickets) that at one time grew in seasonally flooded swamps in the same region have been destroyed.

Like habitat specialists such as the ivory-billed woodpecker and Bachman's warbler, migrant songbirds in the eastern United States are also plummeting in numbers. The decline is most notable among Latin American species such as the red-eyed vireo, Acadian flycatcher, and hooded warbler, which travel north for a few months to breed in the insect-rich summer forests of the East. Since the end of World War II, the population of red-eyed vireos in Rock Creek Park in Washington, D.C., has diminished some 80 percent, and that of the ovenbird about 95 percent. Yellow-throated vireos, black-and-white warblers, hooded warblers, and Acadian flycatchers have disappeared altogether.

Fragmentation of eastern forests by clearing and suburbanization have exposed the nests of migrant songbirds to intense predation. Nest-robbing animals (including blue jays, crows, cats, dogs, raccoons, gray squirrels, and small children) thrive along forest edges and in suburbs. Experimental work by ecologist David Wilcove has shown that songbird nests in small patches of forest, which have a great deal of edge in relation to the area of forest, are much more likely to fall prey to thieves than those in large tracts, where much of the interior is far from the edge.

One of the most serious problems in these eastern forests is the proliferation of the brown-headed cowbird. The species originally was a denizen of the Great Plains, where it searched for insects stirred up by buffalo herds. But today cowbirds find the herds of cattle with which they now associate and the open areas they prefer for courtship displays throughout most of the country. As a result they have expanded their range tremendously since Europeans first arrived on the continent, and are now abundant in the East.

The cowbird is an obligatory brood parasite: It never makes nests of its own, but lays its eggs in those of other birds. Many species are unable to detect the parasitism; one of the strangest sights in the avian world is a pair of warblers or other small songbirds desperately carrying food to a gigantic cowbird chick that is already larger than they are.

Needless to say, the reproductive output of such a pair is seriously compromised by the uninvited guest.

The lesson from the birds is clear: A habitat does not have to be utterly destroyed before it loses its ability to support certain organisms; relatively subtle changes, such as slight alterations in the balance between predators and prey, are often sufficient to lead to a serious loss of diversity.

While most of the decline of eastern forest songbirds seems to be due to destruction and alteration of habitat in North America, ornithologists believe that some migrant species have suffered from habitat destruction in their wintering grounds. Many of the most beautiful birds that breed north of the Mexican border spend most of their lives in the forests of Central and South America, which are among the most endangered habitats on Earth.

The Americas' tropical forests are falling to burgeoning populations of land-starved peasants who clear forests to establish farms, and to timber interests and rich landowners who clear forests to make temporary pastures for grazing cattle that eventually end up as hamburgers in the fast-food outlets of overpopulated rich nations.

North American birders have reason to be greatly concerned about this destruction, since more than 50 North American bird species spend the winter in mature tropical forests. In addition to depriving us of the pleasure brought by birds that were once abundant here in spring and summer, tropical deforestation will cost us many potential foods, medicines, and industrial products. It will possibly alter global climate to the point of seriously damaging agriculture in the United States and Canada. In this case, as in many others, the decline of birds signals a decline in the quality of our own lives.

Not only songbirds are in trouble in North America; shorebird numbers are also dropping. Most of our shorebirds nest in the far North, spread out over the polar fringes of the continent. But 40 of the 49 North American breeders migrate to Central and South America for the winter, many completing round trips of 15,000 miles. Because they depend heavily on wetlands and estuaries for resting and feeding stops, they are most at risk on their migratory flights.

Major assemblages of shorebirds pause in their migrations at the Copper River Delta in southeastern Alaska, Grays Harbor in Washington, the Bay of Fundy in Nova Scotia, and Delaware Bay. As many as 60 percent of the Americas' ruddy turnstones and 80 percent of their red knots may depend on the relatively small area of Delaware Bay for sustenance in transit.

One indication that coastal wetlands are diminishing is the "panhandling" that has developed among great white herons in the Florida Keys. Florida Bay apparently no longer produces enough aquatic life to feed the herons—probably at least in part because of the decline of the Everglades marshlands. The birds beg residents for fish, often defending territories around easy touches, keeping other

H. CHARLES LAUN/NATIONAL AUDUBON SOCIETY COLLECTION/PHOTO RESEARCHERS

COMMON LOON

ART WOLFE

RUDDY TURNSTONE

FRANS LANTING

SEMIPALMATED SANDPIPERS

Water worries: If loons, ducks, and shorebirds survive their long migrations, they still face a multitude of threats, including acid rain, oil spills, metallic poisons, and botulism.

Northern pintails

On the Wing

The arrival of birds in the spring and their disappearance at the end of the breeding season is one of the most familiar aspects of North American bird biology. Seasonal migration enables birds to avoid the physiological stresses of unfavorable climates and to exploit food supplies that are available for only limited periods each year. Thus, many species can breed at high latitudes during the brief but insect-rich arctic summer, and then fly south to the more hospitable climate of the southern United States, Central America, or South America. While we may think of them as "our" birds that go south for the winter, it may be more logical to think of them as southern species that make a relatively brief foray north to breed.

Seasonal migration presumably evolved as a means of increasing lifetime reproductive output. It permits exploitation of areas that are either more productive or provide less competition than the wintering grounds. Moreover, daylight periods in spring and summer are longer at higher latitudes, resulting in more hours per day in which birds can gather food. . . .

Migration in North America is essentially north-south along four principal routes of "flyways": Pacific, Central, Mississippi, and Atlantic. In Europe and Asia, some migration routes are oriented more east-west, although latitudinal change is still significant. About 150 species of land and freshwater birds that breed in our region winter to the south in Central and South America and the West Indies.

Different species characteristically migrate different distances between wintering and breeding areas. The Arctic tern, as its name implies, breeds in the high Arctic, and winters near the southern tip of South America and as far south as Antarctica. In contrast, Clark's nutcracker often migrates only a few miles to move from its high-elevation breeding sites in the Rockies or Sierra to lower elevations within the same mountain range.

In many bird species, males winter farther north than females (as in many birds of prey); where dominance relationships between the sexes are reversed (as in polyandrous spotted sandpipers and phalaropes), females often winter farther north. Three hypotheses have been advanced to explain this phenomenon of differential migration—males, females, and sometimes different age groups within each sex wintering at different latitudes. The body-size hypothesis suggests that larger birds have greater cold tolerance and enhanced ability to fast through periods of inclement weather, and therefore can better endure the rigors of winter. Hence, smaller individuals should migrate farther south. A second explanation is based on dominance relationships within a species: in general, smaller individuals are subordinate to larger ones and therefore should migrate farther south. Third, the arrival-time hypothesis states that if members of one sex experience more intense competition for breeding resources than the other, then individuals of that sex should benefit by early return to the breeding grounds. This can best be achieved by wintering as close as possible to breeding areas.

Because males are larger than females in most migratory species, and because older birds tend to be larger than younger birds, it is often difficult to distinguish among these three hypotheses, which obviously are not mutually exclusive.

Just as many species show strong fidelity to breeding sites to which they return each year to nest, many migrants show some degree of site fidelity to wintering areas. Recent studies of yellow-rumped warblers, however, indicate much greater plasticity in choice of wintering site than previously thought. Ornithologists Scott Terrill and Robert Ohmart found that warblers wintering in desert riparian habitats shifted to similar but more southerly habitats in response to changing climatic conditions that led to a scarcity of their insect prey. These observations suggest that birds maintain a physiological readiness to continue their migration in a properly oriented direction well into the winter months. How widespread this ability is among migratory species remains to be seen.

From The Birder's Handbook: A Field Guide to the Natural History of North American Birds, *by Paul R. Ehrlich, David S. Dobkin, and Darryl Wheye. The 785-page paperback includes detailed information on the nearly 650 bird species that regularly breed north of Mexico, and some 250 essays on the natural history and conservation of birds.* *Copyright © 1988 by Paul R. Ehrlich, David S. Dobkin, and Darryl Wheye. Reprinted by permission of Simon and Schuster/Fireside Books.*

potential panhandlers away. Some people actually buy fish to feed the tall, white birds, a local race of the great blue heron. Ecologists have discovered that only the panhandlers are sufficiently fertile to maintain local heron populations.

These signals tell us more than that fascinating birds are in danger. As many as two thirds of the fish that humanity extracts from the sea come from species that at some stage in their life cycles depend on nutrient-rich estuaries and coastal marshlands. Global per-capita yields of saltwater fish have been declining for nearly two decades. The shorebirds are sending us a message we ignore at our peril.

A recent study has shown that, in its brief history, *Homo sapiens* already uses, co-opts, or has destroyed almost 40 percent of the basic food supply available to all animals on land. In the process of attempting to appropriate more and more of Earth's productivity, humanity could completely destroy the complex ecological systems vital to the support of all creatures. Birds are already chronicling that destruction through their disappearances, and we can expect their tidings to become plainer and ever more stark in the coming decades.

The first message that birds were sending about the human environment came to public attention in the early 1960s in Rachel Carson's book *Silent Spring*. An immediate stimulus for her concern was the massive poisoning of robins in Michigan, where earthworms had accumulated large doses of DDT (a pesticide containing chlorinated hydrocarbons) that had been sprayed on elm trees to control a disease-carrying beetle.

Other birds—especially predators such as brown pelicans, bald eagles, and peregrine falcons—also had pesticide-related difficulties in those days. These long-lived birds accumulated heavy loads of chlorinated hydrocarbons as the compounds moved up food chains. The poisons interfered with the birds' calcium metabolism, making it impossible for them to produce adequate eggshells. Parents crushed their own eggs, and populations plummeted.

Public concern aroused by Carson's book led to a ban on the use of DDT, and species once endangered by it are now recovering. But the threat is not entirely gone; DDT is a component of other pesticides that are legally used in the United States, and the chemical itself is still sprayed in areas south of our border.

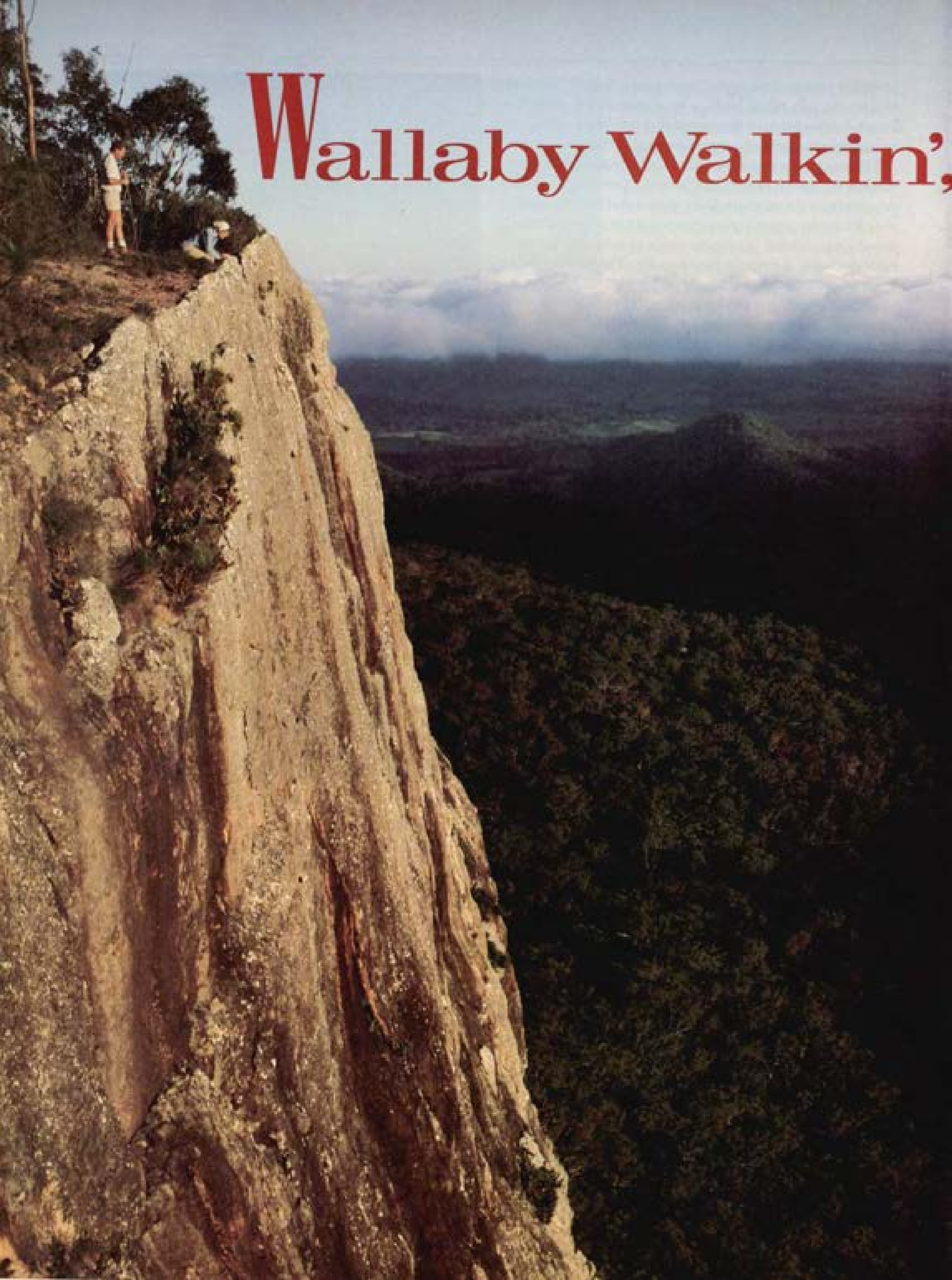
Meanwhile, other toxins are concentrating in some ecosystems, and birds once again are warning us. Epidemics of deformed birds were the first indications of selenium contamination in the Kesterson National Wildlife Refuge in California and at other locations in the West.

Birds are among our very best environmental indicators, and they serve well in that position for many reasons. First, as many as 60 million North Americans enjoy them—they are an indicator that is *noticed*. Second, they are relatively small organisms with high metabolic rates, and as such are sensitive to environmental toxins. Third, many birds have relatively specific habitat requirements and are heavily dependent on restricted sources of nourishment, especially during the breeding season. Loons, for example, are now failing to breed on some northeastern lakes where acid precipitation has decimated the fish populations on which they depend. Likewise, one of the several reasons black duck populations may be declining is that acidification of lakes has killed off invertebrate populations that provide the birds with protein. Finally, birds are the only tropical animals that send many representatives into our territory. Not only do they inform us of the quality of local environments critical to our lives, they also bring news from areas remote from the thinking of most North Americans, but crucial to the survival of our civilization. ■

ART WOLFE

To fill its upcurved bill, the American avocet needs the crustaceans and insects found in healthy marshes, ponds, and estuaries.

PAUL R. EHRLICH *is the Bing Professor of Population Studies and a professor of biology at Stanford University.*



Wallaby Walkin',

Kookaburra Talkin'

ANTHONY MERCIECA-ANIMALS FOR ADVERTISING

Sulfur-crested cockatoo

JANET L. HOPSON

Answer the call of the whip bird, cockatoo, and red-backed toad along the newest riding and hiking route down under—Australia's 3,000-mile-long National Trail.

IT IS STILL DARK IN THE TENT, BUT I AM SURREALLY alert. Adrenalin coursing, I reach for a flashlight. Once again, from just above my small nylon shelter, an ear-shattering screech pierces the predawn stillness. I consider the possibilities: It's a crazed backwoods mugger. It's Sasquatch. No, wait . . . it's Rodan! Perfect, I think: The Japanese pterodactyl has come to roost in Australia's prehistoric Snowy Mountains, and now he's about to swallow this dome tent like a gumdrop.

As the dawn brightens, I peer out from under the rainfly. There, perched on a dead branch, sits not a winged reptile but a creamy-white parrot with a bright-gold crest. Delighting in its crime, the perpetrator peals off yet another impossibly loud squawk, then flaps away.

I seem to be the only one in camp fooled by the confounded cockatoo. But I'm also the only one awake to hear the remarkable dawn chorus rising with the light. The fluting of a leaden flycatcher. The rasping of a red wattlebird. The call of a cuckoo, like wind blowing through wood chimes. The mani-

BY JANET L. HOPSON

Kroombit Tops

acal laughter of a kookaburra and its cohorts.

I dress and pick my way through the fragrant eucalyptus grove, avoiding wombat burrows and the ubiquitous downed wood that is woven across the ground like an open basket. The twisting trunks of snow-gum trees are dappled with silver, gold, and ash-green, and strips of dry bark flutter everywhere. A mob of gray kangaroos look like transmogrified deer as the marsupials effortlessly hop a fence and disappear down a misty trail.

I've got the enchanted forest to myself, and credit must go to an audacious sulfur-crested alarm clock.

AUSTRALIA'S NATIONAL TRAIL

Skirting the Great Dividing Range, which separates Australia's vast, arid west from its temperate eastern edge, the National Trail is within a day's drive of most of the nation's largely urban population.

My early-morning sojourn takes place in December, the start of summer in Australia, and my campsite is in Kosciusko National Park amidst the Snowy Mountains. This park, at the center of the "Australian Alps," is a highlight of what has become, overnight, the world's longest recreational track: Australia's Bicentennial National Trail. Inaugurated in June as part of the country's bicentennial celebration, the trail spans the island continent, linking a variety of terrain from tropical rainforest to alpine snowfields, sprawling almost half again farther than the United States' 2,200-mile Pacific Crest Trail. I've come to sample the many flavors of Australian wilderness from this backcountry byway, and my first stop is the Snowy Mountains high country.

Kosciusko, which is roughly one third the size of Yosemite, lies within a day's drive of Sydney, Melbourne, and Canberra, just a hundred miles inland from the South Pacific. While the park boasts four designated wilderness areas, mountaineer Charles Warner calls them "perceived wilderness." Because Australia is the driest, most fire-susceptible continent on the globe, fire roads abound. What's more, stock grazing, mining, and other human activities have left scattered marks on the "ceiling of Australia." Still, the ancient granite peaks have an alluring remoteness and solitude; they have been weathered to their current modest elevation by 350 million years of wind, rain, and snow, and are dressed in the blue-grays and olives of eucalyptus forest and rolling heath.

I explore the National Trail in a manner befitting *The Man From Snowy River*: from the back of a packhorse. I am with a group of 14 riders—some horse-owners, some novices like myself—from Reynella, the largest sheep and cattle ranch in southeastern Australia. Our guide is John Rudd, Reynella's rugged, gray-haired owner. The Snowies for me are forever mingled with images of this master horseman surveying his charges from a windswept knob, spinning a trail tale with eyes twinkling, or sleeping in his clothes by the campfire.

Rudd probably saves a few of us greenhorns from certain injury the day I awake to "Rodan." Already on the short trip we've seen a hot, sunny day and snow flurries, and this afternoon the Snowies are conjuring up a serious storm. The group has followed one part of the National Trail across an expansive peneplain to an abandoned hut, where we rest and boil "billy tea" with lunch. Our apprehensions rise, however, as the gentle rain splattering the tin roof turns to a downpour driven by powerful winds. We know we'll stay dry inside our Australian oilskins—remarkable garments that combine the protection and high style of a rubber slicker and a creosoted warming shed. But what about riding the whinnying, stamping horses all the way back to camp?

Our progress is crablike as the horses move into the wind with haunches forwardmost to keep rain from pelting their eyes. John Rudd circles the pack repeatedly, clutching a coiled whip, shouting directions to the nervous riders, and controlling us through sheer force of will and body language when the wind roars over his highland brogue. Rudd's assistant, Conrad Mathias, keeps stragglers from falling too far behind, and in this manner we slowly cross the Currango Plain.

I am secretly pleased—once back in my dry tent—to have experienced the "passionate music and motion" of weather in the Snowies, much the way John Muir appreciated storms in the Sierra Nevada.

"Nature has always something rare to show us," Muir wrote, "and the danger to life and limb is hardly greater than one would experience crouching deprecatingly beneath a roof." In fact, Muir's wanderings—and the trail system he inspired—have indirectly encouraged Australia's National Trail through Kosciusko and points north.

In the 1960s, a decade before Australia had designated its first wilderness area, a seasoned outdoorsman named Reginald Williams traveled extensively in the U.S. backcountry. Williams returned to his homeland with an inspiration: to create a transcontinental trail patterned after the Appalachian and Pacific Crest trails. The idea might have dead-ended in a bureaucratic thicket had it come from an ordinary bushman. But, explains friend and colleague Mike Allen (who himself became a key player in founding the National Trail), this was *the* Reginald Williams, the famous millionaire gold miner who earned a second fortune selling high-quality boots, saddles, and clothing.

As Australia's premier outfitter, Williams had for years received letters from young people seeking direction in life. Invariably he'd tell them, "Load up a horse and go bush," recalls Allen, a modest, lanky former bureaucrat from the town of Toowoomba. "Do some soul-searching, and maybe when you come out you'll know yourself." Having taken his own advice, Williams emerged with a vision that could help

other Australians make a literal rite of passage.

For a legendary horseman and producer of well-crafted saddlery, "loading up a horse" and "going bush" were inseparable. Thus, when Williams first proposed a formalized, extended wilderness track in 1972, he called it the National Horse Trail. Enthusiastic advocates formed the Australian Trail Horse Riders Association and, over the next five years, scouted likely routes for a continuous path running the length of the Great Dividing Range, which lies inland from and parallel to Australia's eastern seaboard.

To digest the enormity of such a volunteer effort, picture a mountain range stretching from San Francisco to New York, cloaked in nearly impenetrable rainforest at one end, topped by alpine snowfields and plateaus at the other, and with all manner of wooded and rocky terrain in between. Now picture people romping through forest and field, reconnoitering old fire roads, cattle routes, hiking trails, and bridle paths, and blazing a few new connections among them. Finally, imagine nearly a thousand riders gathering at points along the newly scouted route to relay a mail pouch some 3,000 miles along the lengthy mountain chain.

Horseback riders on a stock trail cross the Guy Fawkes River, in the gorge country of northern New South Wales (above); the view of 3,761-foot Mt. Warning from the National Trail (right).

This Pony Express reenactment in fact took place in Australia in 1978, from Cooktown in the northern state of Queensland south to Victoria's Melbourne. But somehow, recounts Allen, the ride failed to generate much media attention or inflame the popular imagination as its planners had hoped—"and everyone just collapsed after that." Without widespread public support, he says, they could not attract the interest of government officials. Despite the efforts of the mounted trail scouts, the project languished.

In 1981, Allen took up the torch for the transcontinental trail. He joined

forces with Reginald Williams and Brian Taylor, a soft-spoken rancher with the charm and bush-prowess of Crocodile Dundee. With their complementary skills and collective love of the Australian bush, they began to turn Williams' dream to reality.

At that time Australia was already beginning to gear up for its bicentennial celebration, and Allen was able to land a grant of $200,000 (approximately U.S.$160,000) from the Bicentennial Authority. This was a tremendous boon, but a formidable task still lay ahead. A 3,000-mile-long patchwork of preexisting trails required that only six miles be constructed, but Taylor and Allen had to check every part of the scouted and spliced trail personally; get access permission from private landowners; organize the installation of trail markers; establish campsites with water, firewood, and forage a day's travel apart; and compile 14 separate maps and guidebooks, each of them covering 250 miles of the span.

Through the herculean efforts of Allen and Taylor, Australia got what may be the recreation bargain of the 20th century: the world's longest trail for the price of a suburban home in the United States. There was, nevertheless, a curious string attached for the equestrian trail enthusiasts. In order to warrant government funding, the concept had to be broadened to a national trail for riders, bush-walkers, birders, cyclists, and any other outdoorspeople who could propel themselves along the route. Considering the history of the project and the quiet antipathy between some riders and some hikers, the alliance was bound to be a delicate one.

Australia still has its crusty frontier types and self-sufficient homesteaders, but "the bronzed bushman image is a bit furfy," says Allen. While Australia is a continent the size of the lower 48 states, 80 to 90 percent of its 17 million people are urbanites with little knowledge "beyond geography class and primary school" of the country's vast inland desert, rainforests, and eastern mountain range. Most of the interest in the trail, Allen notes, "is now coming from city people who want to go bush," but many of them have no love for horses in the backcountry.

Retired urbanite Joan Adams, for example, is an avid bush-walker who recently sought information on hiking a piece of the National Trail away from horses. "Horses are exotic animals that don't belong in the bush," she states. "Their hooves break up the track and pound the ground into fine powder." She does not think walking and riding are compatible uses of the trail, but believes "there won't be clashes because walkers will keep to the wilderness areas."

Allen agrees with this, but he's sensitive to the whole question of "wilderness." Although Australia has designated seven wilderness areas since 1976, debate continues over appropriate definitions in a nation whose narrow rim of temperate land has been logged, grazed, mined, and farmed for more than two centuries. In 1985 a government conservation committee recommended that horses (and camels) be permanently excluded from all wilderness areas. But in a move with more than a little irony, members of the National Trail Committee were among the first to object, since this would require rerouting the trail—at least for riders—in some scenic areas. The issue is not settled yet, and one frequently hears grumbles from all sides about "greenies," "bush-walkers," "bureaucrats," and "selfish stockmen" when the topic comes up in discussion.

Whiptail wallaby

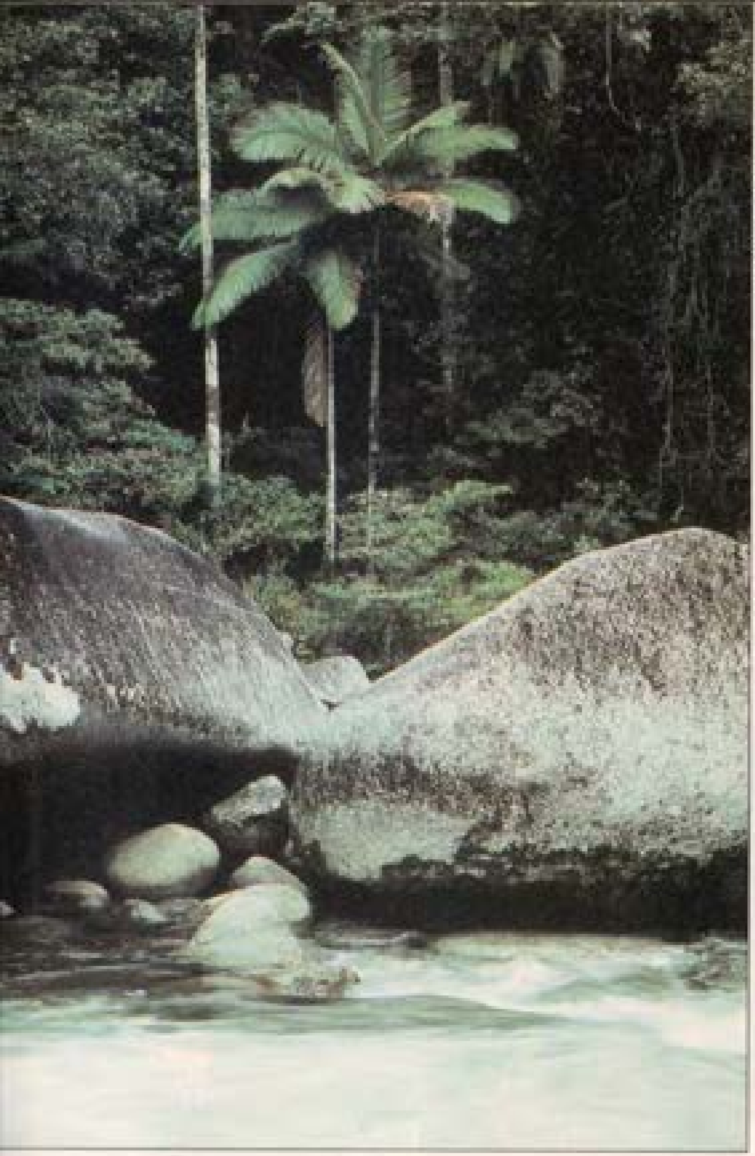
Despite this, one senses that Australians have the resilience—born, perhaps, of a tiny population surviving in a vast and spectacular land—to work around such inevitable conflicts. On my last evening in the Snowy Mountains, our horse-riding group from Reynella Ranch shares a campfire and hot food with four college students preparing to leave on a long-distance backpacking trip. The conversation is cordial, if a bit strained. The next morning the hikers move off toward a wilderness area through the damp, forested hills behind our camp while the rest of us trot away down a designated horse route. Within five minutes we can no longer see them, nor they us.

Traveling the entire length of the Australian National Trail would take well over a year, and thus, on the advice of Mike Allen and Brian Taylor, I hopscotch north to two other scenic stretches, skipping hundreds of miles of front- and back-country in between. One stretch bisects a strange tropical plateau in the central "gorge country" of Queensland, Australia's huge northeastern state, while the other lies along the Great Barrier Reef near the trail's northern end.

Throughout Australia, ancient geologic formations have been smoothed and scoured and ground down by time, and the gorge country is no exception. Here much of the exposed rock is sandstone, sculpted into tablelands, escarpments, cliffs, caves, and pillars. In the midst of this striking terrain lies a wide, rounded valley called Cania Gorge, and presiding above it, the plateau called Kroombit Tops.

My guide for this area is 28-year-old Ian Price—a dead ringer for Dennis the Menace raised as an Australian cowboy. This impish, bowlegged, charismatic jack-of-all-trades keeps a photo album of his projects: a giant paddock for holding the wild bulls he and his "mates" rope; a walkway and stairs made of 22,000 bricks; a cement-block restroom at the campground he runs with his wife and his parents.

Price shows me all the high spots around Cania Gorge. By day we hike up steeply through dry tropical forest to



North Queensland's dense tropical rainforest canopy (left), a shelter for a multitude of rare plant and animal species; the cool, rushing waters of Mossman River Gorge (far left); a sleeping koala.

cliffs and wind-carved caves. I am intrigued by the bizarre call of the whip bird—a magnified, electric whip crack that mimics the heterodyning of some oversized radio. I exalt in the tides of fragrant air that sweep up from below, perfumed with wild jasmine and lantana. By night we go spotlighting—shining a powerful beam into low brush and high tree branches in search of wildlife. We easily spot a dozen rat kangaroos and a dozen "whiptails," or pretty-faced wallabies. But the best specimens are watching us from above: ring-tailed possums with eyes close-set, round, and glowing as bright orange as cigarette lighters; and a lone koala, blinking sleepily from the bowl of a tree.

Despite its rich natural history, Cania Gorge seems a well-kept secret—even to Australians. No one I meet save Allen, Taylor, and the local residents appears familiar with the area. That may change, however, now that the National Trail bisects it. And Taylor may boost the gorge's reputation still further by opening a pack station near Three Moon Creek—a deeply shaded, slow-moving stream where platypuses paddle at dawn and dusk, and from which hikers and riders can depart, well equipped, for the mysterious "Tops."

The state forest called Kroombit Tops is the site of an unusual adventure in the Queensland bush. With Price piloting a four-wheel drive, we speed away from Cania Gorge through parched "properties," ranches where Brahmins and Herefords close-crop the rolling pastures and where Victorian farmhouses rise on stilts above the heat and insects. The unpaved road curves past the rusty mining equipment and wooden grave markers of an abandoned Gold Rush town, then soon mounts a 3,000-foot escarpment to Kroombit.

We bump dreamily along in the afternoon heat through open tropical forest. Here a sea of backlit ferns laps the trunks of Sydney blue gums—towering eucalyptus trees so smooth and evenly gray they appear to have been sketched by an artist with soft chalk. Suddenly Price whoops, shouts "Brumbies!" and accelerates the jeep. A family of wild horses—a palomino stallion, a dark mare, and a small white foal—clatter down the gravel road, our waggish guide keeping the bumper uncomfortably close to their heels. After a mile or so, the mad chase ends when the animals crash down an overgrown embankment and limp off through the woods.

Thoroughly unrepentant, Price soon has another idea: to follow the National Trail (here a drivable fire road) to the densest part of the forest, then hike to the head of Kroombit Creek to search for a rare and indigenous frog reputed to brood eggs in its mouth. Walking through the tangled vines and herbs is a

challenge, and as I gingerly step into one thigh-deep clump, I feel a twinge near my ankle. Lurking inside my sock sits a slimy black leech, just chiseling in for a hot draught of my type O positive.

"Leeches aren't bad here, mate," Price says, offering his own brand of reassurance. "You should see it when it rains —ground just crawls wid 'em!" In fact, the leeches are easily discouraged by insect repellents and a few tightly closed sleeve and neck openings. So we push on and reach a small, deeply shaded pool where dozens of frogs croon quiet mating songs from hiding places in crevices and rocks.

The amphibian chorus is splendid: Some frogs sound like dripping faucets, others like tiny ball-peen hammers; still others, knowing their place, sing "Kroombit! Kroombit!" Price starts overturning rocks, pulling back sections of the soggy bank, and poking his fingers into any crack where a frog could hide. Soon he crams his arm up to the elbow into a mud hole. I'm aghast; the area's field guide lists 17 snake species—11 decidedly poisonous and one, the taipan, the most dangerous snake in the world. But the indomitable Ian quickly has his frog, and though it is the wrong size and color, he pries its mouth open. Finding no eggs, he tosses it into the hole with a grin.

Back at camp, I spend the rest of the afternoon reading and dozing in the heavy tropical air, watching black cockatoos—the B-1 bombers of the bird world—and listening to butcher birds flute like Jean-Pierre Rampal. This odd tropical plateau, with its wild horses grazing beneath parrots and blue-gum trees, is unique. And it lies along just one short stretch of the world's longest hiking and riding trail.

My vacation time nearly spent, I day-hike a final piece of the National Trail in Daintree National Park, one of the few places left on Earth where rainforest spills down to the ocean and joins coral reef. In northeastern Queensland, the Great Dividing Range is low and heavily cloaked in jungle so dense that midday is as dim as twilight. Life literally explodes and piles up in layers: Tassel ferns sprout upon strangler figs that drape across finger cherry trees that shade out pandanus palms, lawyer vines, and nettles.

I am lucky to have a native guide for my hike through the jungle—Roy Gibson, chair of the Kuku Yalanji Aboriginal Reservation at Mossman Gorge. Gibson, a short, easygoing man, recounts aboriginal tales as we walk through the dark forest. He points out the plentiful resources his tribal ancestors learned to exploit: The wood of the cat's-paw vine, good for clubbing wallabies; thick, white witchetty grubs,

Trail founders Mike Allen (left) and Brian Taylor.

a favorite delicacy when spiced with wild ginger and cooked over coals; the ground nest where a scrub turkey lays its daily clutch of four eggs. "When the black-bean tree flowers," Gibson explains, "it's time to dig the eggs. If I'm really hungry, *bang*! I'll take the four." He grins: "Surviving. That's the point. We know what to grab."

The thick brown body of an eight-foot-long carpet snake, coiled lazily in the hollow of a rotting tree, reminds me why I chose a daylight visit to the Daintree. Brian Taylor's assessment was simple but chilling: The rivers there "have a crocodile problem." That, of course, is no deterrent to a confirmed bushman. To get to camp on a recent trip, Taylor and friends waded across the Daintree River after nightfall—while red eyes considered them from the shallows.

The Daintree Valley epitomizes both the diversity of Australian wilderness and the difficulties faced by the organizers of the National Trail. It is also the center of a land-use controversy that reveals some of Australia's current environmental dilemmas. In December the World Heritage Committee of the United Nations Educational, Scientific, and Cultural Organization proposed adding large chunks of the Daintree Valley to its list of fully protected natural areas, and the action touched off picketing and violence by loggers who cut virgin rainforest trees each year. Queensland state officials immediately attacked federal conservation authorities for intending to enforce a logging ban, and battle lines were quickly drawn between "greenies" and timber-industry supporters. (See "Laws of the Jungle," page 38.)

While details are complex, a few generalities seem clear. Australia's conservation movement is very young, but consumption of its natural resources is centuries old. Its small population must struggle simply to maintain roads, dams, and bridges in a huge and often inhospitable territory. Its somewhat depressed economy relies heavily on the exportation of raw materials. And local and regional politicians have significant influence. "Australia is a group of six states that reluctantly agree to get along with each other," says one former federal bureaucrat. Official dedication to preserving parkland and wilderness varies widely from state to state.

Given this backdrop and the preexisting development along Australia's eastern seaboard, it is remarkable that a handful of people with neither sufficient funds nor popular support have been able to carve a massive, continuous trail through the bush. The "bronzed bushman" may be a "furfy" notion in this nation of urbanites, but a few of the genuine articles clearly remain.

The two main framers of the Bicentennial National Trail are characteristically modest about their accomplishments. "I haven't put any more into this than some people put into their golf handicaps," says Allen.

Adds Taylor, "The real deal for me is people. I want to help Australians make better people of themselves. We've got kids locked away in the cities," he says, "but when they can get out with their families, boil the billy, have some tucker, and sleep on the hard ground, they'll see that the land is their heritage. Everyone will go and belong." ■

JANET L. HOPSON *is a writer and journalism teacher in Oakland, California. She is planning her third trip to Australia.*

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SECOND PLACE

ABSTRACTS IN NATURE
COLOR
JIM SOKOLIK
ST. LOUIS, MISSOURI

SYCAMORE LEAF IN ICE
FOREST PARK
ST. LOUIS, MISSOURI
[LEFT]

SIERRA'S ANNUAL PHOTO CONTEST WINNERS

PHOTO SYNTHESIS

The ice shivers and it's spring; the sun tousles the grass and it's morning; the swimmer lies in the stream and it's Creation all over again. One of the many challenges to the outdoor photographer is to see the moments when nature's parts become a new whole, to freeze forever yet keep alive the imperceptible motion of change. The winners of *Sierra*'s ninth annual photo contest rose to that challenge magnificently, and we are pleased to present their work in the following pages. Our warmest congratulations to all.

An unprecedented number of individuals (more than 1,700) entered this year's competition. The daunting job of judging the thousands of photographs fell to Carolyn Robertson of The Yolla Bolly Press and photographers Robert Cardin and Stephen Kasper. Nikon®, Timberland Company, Swift Instruments, and Buck Knives provided the prizes. Many thanks to those who took part—your talent and generosity created a most inspiring picture. ■

GRAND PRIZE

DAVID KENYON

EATON RAPIDS, MICHIGAN

•

LAKE MICHIGAN DURING SPRING BREAKUP FROM MACKINAC BRIDGE

(LEFT)

SECOND PLACE

THE MEETING OF LAND & WATER

COLOR

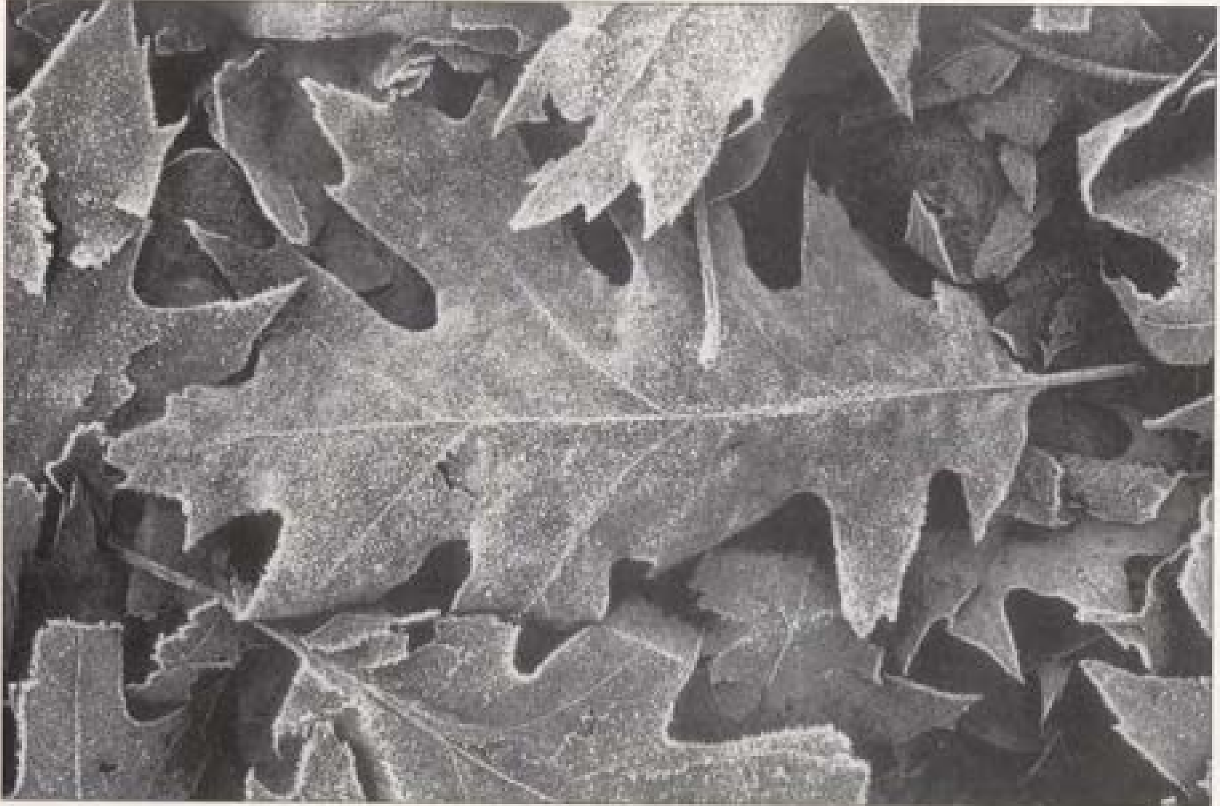
PATRICK A. LUNDQUIST

FREMONT, CALIFORNIA

•

SUNSET AT DAVENPORT BEACH CALIFORNIA

(BELOW)



SECOND PLACE

PEOPLE IN NATURE
BLACK & WHITE
BRIGITTA WOLMAN
SAN FRANCISCO, CALIFORNIA
•
SOLITUDE
PEMAQUID POINT, MAINE
[TOP LEFT]

FIRST PLACE

ABSTRACTS IN NATURE
BLACK & WHITE
GARY WALTS
WATERTOWN, NEW YORK
•
FROSTY OAK LEAVES
SALMON RIVER
PULASKI, NEW YORK
[BOTTOM LEFT]

FIRST PLACE

THE MEETING OF LAND & WATER
BLACK & WHITE
JEFFREY M. REYNOLDS
YAKIMA, WASHINGTON
•
DAWN AT A HOT SPRING
MONO LAKE, CALIFORNIA
[ABOVE]

FIRST PLACE

ABSTRACTS IN NATURE
COLOR
MARK CITRET
DALY CITY, CALIFORNIA
•
TREES AGAINST GRANITE
HAPPY ISLES
YOSEMITE NATIONAL PARK
[ABOVE]

FIRST PLACE

PEOPLE IN NATURE
COLOR
SCOTT ERICKSON
PINE CITY, MINNESOTA
•
RAVEN GLACIER
CHUGACH MOUNTAINS
ALASKA
[TOP RIGHT]

SECOND PLACE

PEOPLE IN NATURE
COLOR
G. SUZANNE LEWIS
FAIRFAX, CALIFORNIA
•
AYIO LISI IN THE
MILLET FIELDS
ROLWALING VALLEY, NEPAL
[BOTTOM RIGHT]

SECOND PLACE

ABSTRACTS IN NATURE
BLACK & WHITE
STEVE NOZICKA
CHICAGO, ILLINOIS

ROCK FORMATION
POINT LOBOS, CALIFORNIA
[ABOVE]

FIRST PLACE

PEOPLE IN NATURE
BLACK & WHITE
GARY A. THAXTON
GRAHAM, NORTH CAROLINA

NUDE
NANTAHALA NATIONAL FOREST
NORTH CAROLINA
[TOP RIGHT]

SECOND PLACE

THE MEETING OF LAND & WATER
BLACK & WHITE
STUART MURTLAND
RENO, NEVADA

ICE FORMATION AND GRASS
WASHOE VALLEY, NEVADA
[BOTTOM RIGHT]

WOLFGANG KAEHLER

On a hot summer night not long ago, the people of Thailand's most famous seaside resort put hospitality on hold while they ran a polluting industry out of town.

LOCAL HEROES

AP/WIDE WORLD

Thailand. The name evokes images of dancers wearing pointed gold headpieces, of wondrous fruits never seen in North America, of wide, white beaches, wild elephants, dense jungles, monks in saffron robes, glittering temples, and Bangkok—the hot, congested capital city filled with open markets and massage parlors. The national tourism authority knows the fantasies it can drive wild; posters and brochures tantalize potential visitors with images of "the world's most exotic country." A 1987 Visit Thailand Year campaign resulted in nearly 3.5 million visitors, an increase of 23.5 percent over 1986.

Every year hundreds of thousands of these tourists go to Phuket, Thailand's "Pearl of the South." Before this idyllic island province began promoting itself as a resort center in recent years, its citizens relied heavily on tin mining, rubber cultivation, and the seafood industry. In fact, those resources helped Phuket's residents earn the second-highest per capita income in the country. With the influx of tourists, though, the attitude of the people of Phuket toward traditional industry became something like that of shellfish farmers who have just discovered gold in their oyster beds.

BY DANA SACHS

These days it's hard to find anyone in Phuket who doesn't earn income from foreign travelers, whether it's the young *tuk-tuk* driver ferrying backpackers out to the bungalows on the beach, the waiter serving lobsters to Europeans, or the bookseller buying vacationers' used paperbacks. Tourism has made entrepreneurs of Phuket's people, and if some residents grow weary of the commotion, the bathing beauties and surfers, and the Americans with Nikons slung around their necks, well, they say so quietly. To their visitors they are always, always nice.

The landscape of southern Thailand is usually as serene as it is alluring. But all that changed on June 26, 1986, when the people of Phuket set a tantalum factory ablaze.

Tourism has also made Thailand's accountants happy: In 1982 it surpassed rice (the country's leading export) in generating income.

That doesn't make tourism a panacea for Thailand's problems, however, and nowhere is that more clear than in Phuket, a province with a population of 200,000. Discos, pizza parlors, and T-shirt shops now line the island's choicest shores, while tourist dollars lure young women from all over the country to provide a more personal form of entertainment. Phuket's crystal-clear waters have grown cloudier in the past few years, as inadequate water-treatment systems struggle to clean up after the crowds. And to keep an area quiet for resort guests, Club Med officials have torn up an important public road in the southern part of the island, cutting off a portion of Phuket's population from easy access to the province's main town.

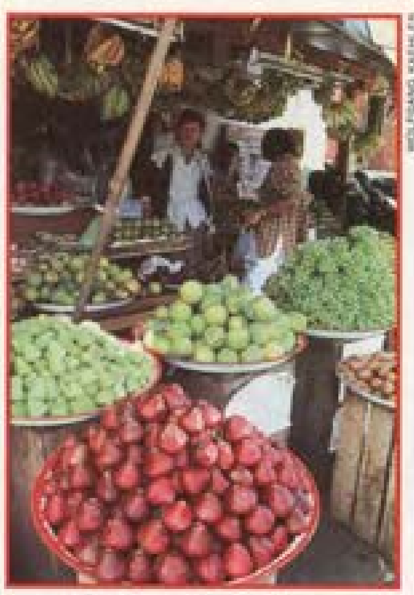
That damage aside, Phuket's people know the importance of the tourism industry, and their fear of losing it has given rise to a nascent environmental movement on the island—one whose origins can be traced to local opposition to the pig-raising industry and mining off the shore of Patong Beach. But the most emphatic demonstration of concern began in late 1985 when some of Phuket's people realized that the tin industry—long known for polluting the island—could soon pose a new, perhaps even greater threat.

The Thailand Tantalum Industry Corporation, a consortium of Thai and Malay businesses backed in large part by the World Bank, was building a refinery to produce tantalum for export throughout the world. A by-product of tin processing, tantalum is a rare and expensive metal used in aerospace and computer components as well as in nuclear reactors and missile warheads. The plant's potential danger lay not in the tantalum itself, which is harmless, but in hydrofluoric acid, a poisonous chemical used to produce the metal. The location of the plant in a residential area near a college fueled worries

that the waste it produced might pollute the air and water.

Early in 1986 a group of doctors, lawyers, nurses, laborers, and labor leaders formed the Committee to Coordinate Action Against Pollution to lead the community in a discussion of its concerns and to oppose the new refinery on environmental grounds.

In April and May, as the plant neared completion, a Japanese video describing the effects of the Bhopal disaster made its way around the island. It would be hard to imagine a better organizing tool in Phuket, where videocassettes are passed hand-to-hand like good books, and restaurants hang signs advertising free evening showings of *Beverly Hills Cop* or *The Terminator*.



A fruit market in Phuket offers visitors the Thailand they love to taste.

PHUKET IS USUALLY QUIET in June—the peak of the monsoon season, when all but the most optimistic of tourists have moved on. Though the town, the commercial center of the island, remains a busy place, out on the beaches the pace slows as restaurant owners relax at their tables to read the newspaper and hotel employees sit on lobby couches to chat with the few lingering guests. In the nightclubs colored lights beam down on empty dance floors.

But June 1986 was no normal June. On the first day of the month, sufficiently frightened by the Bhopal video and the recent accident at Chernobyl, 50,000 people came together to ask the government to halt the tantalum project. At the same time, opposition leaders presented a petition signed by nearly 65,000 people threatening to boycott the upcoming general elections if their demands were not met. Residents had also begun to express their concerns in other ways: Many stopped buying Coca-Cola, whose Thai bottlers owned shares in the tantalum corporation; others withdrew their assets from banks financing the development. Media coverage throughout Thailand led the country's officials to debate both the role of environmental protection in economic development and the rights of local people to have a say in that development.

On June 23 some 70,000 people waited in the streets to see a government minister scheduled to come from Bangkok to deal with the controversy. When Industry Minister Chirayu Isarangkun na Ayuthaya arrived in Phuket, he stopped at a monument to pay homage to two sisters who in 1785 had saved the island from the invading Burmese army. For the people of Phuket, the garlanded statues of Khunying Chan and Khunying Muk—who had tricked the Burmese into thinking they were well-matched by dressing up 500 women as male soldiers and giving them sticks that looked like guns—are shrines to the heroism of the Thai people.

For the industry minister, though, the statues represented something a little more threatening, as the crowd that met him there showed a determined anger not unlike that which drove the heroines more than 200 years ago. The mood of the protesters soon convinced Chirayu not to hold the planned meeting with the representatives of opposition groups at city hall. After first attempting to organize the meeting elsewhere, Chirayu, dodging the crowds, opted out of Phuket altogether and retreated to the neighboring province of Phangnga, while half the population of Phuket crisscrossed the island in an effort to find him. By late in the afternoon they were hot, hungry, tired, and angry.

By nightfall, the tantalum plant was in flames and Phuket had become a battleground for the country's worst rioting in a decade. The police, untrained to deal with the crisis, stood watching the buildings burn as demonstrators used logs to block access to the plant. At the fire station, protesters swarmed the driveway and lifted fire trucks off the ground to prevent them from going to save the burning buildings. In the end, the plant suffered $25 million in damage and was essentially destroyed; a major hotel faced another $400,000 in repair costs; one police officer was injured; and at least 50 people were arrested. Even those who had participated in the protest were stunned. To the Thais, known more for their passivity than for their passion in politics, the rebellion at the tantalum factory was a nightmare none would have admitted dreaming.

BY THE SUMMER AFTER THE RIOT in Phuket, the crowds had gone. Motorcycles and cars and taxis carrying tourists in from the airport whizzed by the monuments where protesters had once swarmed. Across the road, the patrons of restaurants dished up rice and curried chicken and sipped Coca-Colas. A large, white billboard stood in the shadow of the heroines, reminding every English-reading tourist that Thailand is a wonderful vacation spot.

But the riot may nonetheless have made an indelible mark on Thailand. The attitudes of one community that faced an industrial threat may be spreading across the nation.

Thailand's first full-scale environmental debate since the Phuket incident came to a head this past April. The government was planning to build a dam in the Tung Yai Wildlife Sanctuary, one of the last and largest protected areas in Southeast Asia. It didn't take long for people to realize that the 47-mile-long Nam Choan Dam reservoir would devastate the region's fragile ecosystem.

This time the fight didn't turn violent. Local residents held forums and collected 100,000 signatures on anti-dam petitions. Karen tribespeople, whose villages would be destroyed by the dam, wrote letters to the prime minister. Students throughout the country staged demonstrations. High-profile conservationists such as Britain's Prince Phillip drew international attention to the plan. In April, before the controversy could reach the stage of passion that incited the tantalum riot

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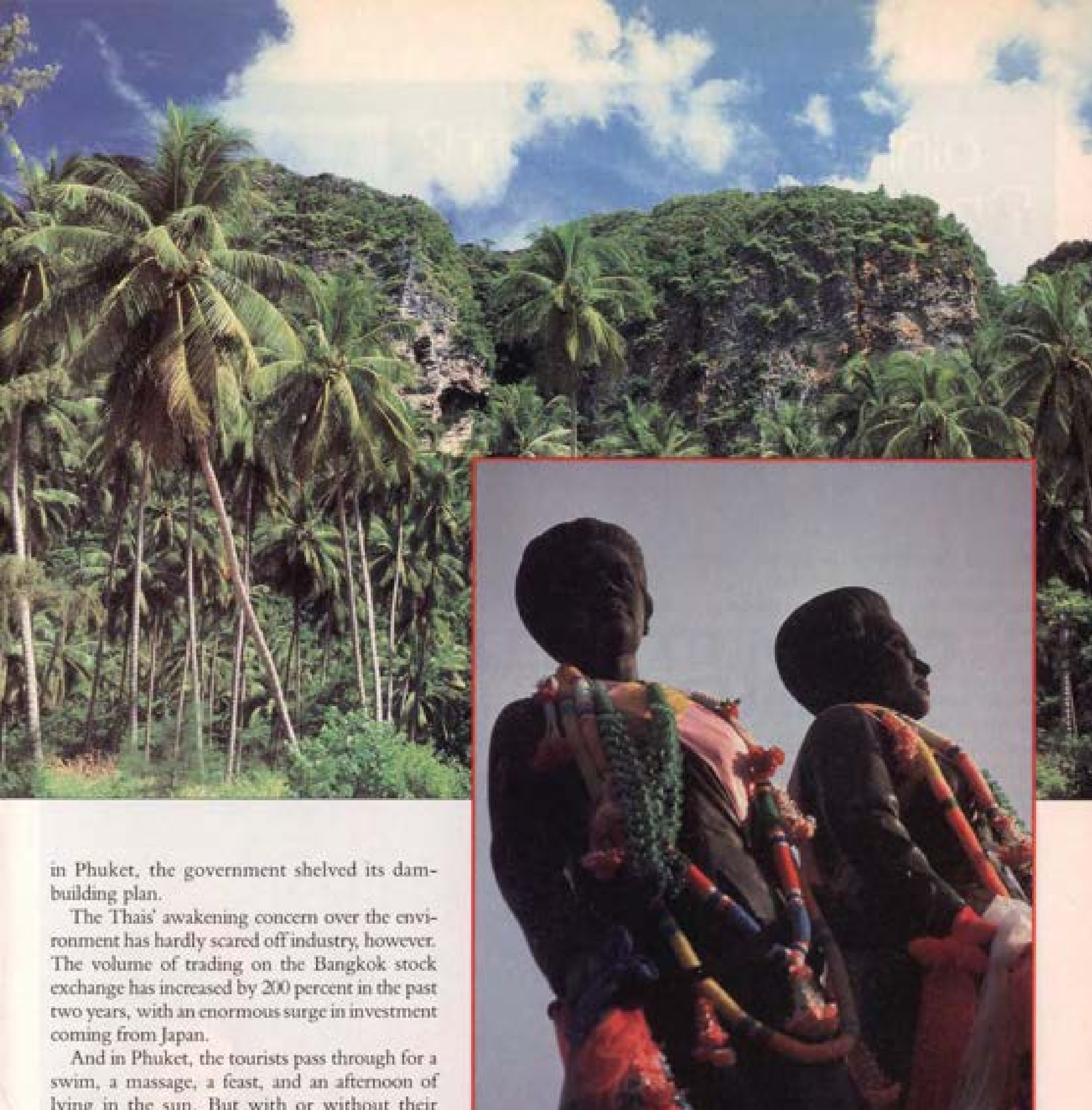

in Phuket, the government shelved its dam-building plan.

The Thais' awakening concern over the environment has hardly scared off industry, however. The volume of trading on the Bangkok stock exchange has increased by 200 percent in the past two years, with an enormous surge in investment coming from Japan.

And in Phuket, the tourists pass through for a swim, a massage, a feast, and an afternoon of lying in the sun. But with or without their guests, the people of the island continue to remember their heroines by hanging garlands of flowers below the statues and burning incense in copper urns.

And two centuries after Khunying Chan and Khunying Muk chased off the Burmese army with sticks, the people also remember a different group of heroes and heroines who protected themselves against a new kind of invader. A burnt-out, never-used tantalum factory is the monument to that. ■

DANA SACHS *is a freelance writer living in San Francisco.*

TIM THOMPSON

Phuket now boasts coconut plantations (background) and tourists, but thanks to a determination and passion born of heroic sisters Khunying Chan and Khunying Muk, the island will never be home for the tantalum industry.

Preserving the East's Wild Spirit

Larry Anderson

A SPRINGTIME VISITOR to the Vermont homestead of Laura and Guy Waterman is straightaway issued a pair of snowshoes and two buckets—and then set to work gathering maple sap. Guy, his pants cinched with a piece of climbing rope, wearing the plaid tam-o'-shanter that is emblematic of his Scottish heritage, describes carefully the lay of the landscape the two have shaped for the past 15 years. He leads the way from their cabin and sheds, down the slope past gardens and compost heaps, across the stream that supplies their water, and into the grove of maple trees and other hardwoods from which they harvest both sweetness and warmth. Laura, who has short, auburn hair, is less voluble than her husband but just as observant and articulate. She pauses along the snow-covered path to check the temperature at one of the "weather stations" that dot the property. Fifty feet farther, after descending from the open field to a tree-shrouded stream-crossing, she notes an abrupt drop in temperature, which she confirms at the next station.

On a circuit of their sugar bush, the Watermans refer by name to each of the 90 maple trees they tap: Everest, K2, Gawain, the Musketeers, Venus, Swamp Fox, Mad Dog. They check the sap buckets several times a day, always hoping for the below-freezing nights and above-freezing days that lead to a successful run. On charts posted in their hand-built log sugarhouse, they record the sap production of each tree, ounce by ounce, day by day, year by year.

The production of maple syrup is just one fixed point in a tightly organized round of subsistence activities the Watermans perform each year at their homestead. Not long after the last gallon of sap is boiled down, they begin turning over their garden (which is surrounded by a high wire fence to discourage deer) and planting the 31 vegetable varieties that provide most of their food. Laura cans hundreds of containers of fruits and vegetables during harvest season and stores root crops in the cool cellar beneath their living room floor. They cut and gather seven cords of wood to warm their house, cook their food, and fuel their maple-sap evaporator. Although they never resort to internal-combustion engines or electricity on their property of just under 30 acres, their home (reachable only by foot) is cozy and comfortable: A grand piano occupies one corner of their book-lined, kerosene-lit living room.

The meticulous attention the Watermans give to their homestead is only one measure of their purposeful lives. Garden schedules, wildlife sightings, visitors, hikes and climbs, weather data, the progress of their writing—they record everything. In fact, the Watermans bring the same zest, discipline, and thoroughness to all their endeavors, whether operating their homestead or working to preserve what they call the "spirit of wildness" in the mountains of the Northeast.

"The single cause that motivates us is

"There is still opportunity to test what a person is made of. All lovers of the outdoors tend to respond to the zest of challenge."

—Laura and Guy Waterman

to preserve the wildness of the country," Guy says. A decade ago, he and Laura wrote, in a characteristically single voice, that they use the phrase "spirit of wildness" to refer to "a wide spectrum of loosely connected elements of the backcountry experience: to solitude, to difficulty and challenge, to that indefinable but intensely real feeling that grips the hiker buffeted by wind on the rocky heights, or held in fascination by the silence and greenness of deep woods."

That spirit is certainly essential to the Watermans. Guy, a 56-year-old man of compact yet sinewy stature, last winter led a climb up icy Pinnacle Gully in Mt. Washington's Huntington Ravine on a raw, windblown New Hampshire day when climbers several decades younger dared not venture out. Laura, at 48, is just as fit, rugged, and energetic. Eleven years ago she led a winter climb up the same route and was quite possibly the first woman to do so.

Laura and Guy met in 1969 at the Shawangunk Mountains, an escarpment northwest of New York City that has become a mecca for rockclimbers throughout the East. In that culturally and politically tumultuous era—marked by a burst of environmentalism, a boom in outdoor activities such as backpacking and rockclimbing, and widespread interest in getting "back to the land"—the couple soon found they had more in common than simply a passion for climbing. Since then they have built from scratch their modest subsistence homestead and established a reputation as determined, articulate defenders of the wild northeastern landscape.

"They are *the* most effective spokespeople for backcountry users in the White Mountains," says Ned Therrien, public-information officer for New Hampshire's White Mountain National Forest. Even when the Watermans are critical of Forest Service policies and public-resource managers, he adds, their opinions command respect—on matters ranging from the nuts and bolts of trail maintenance and low-impact camping to the complex politics and philosophy of public-land management. "Laura and Guy bring out their points in a way that is not confrontational. You come away feeling that you've been approached in a ra-

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tional, honest way," Therrien says.

In fact, the Watermans know the region's backcountry terrain as well as anyone. They wander the hills of New York, Vermont, New Hampshire, and Maine relentlessly, keeping a protective eye on the peaks and trails, sometimes discovering old climbing routes long since abandoned. "Guy is an incredible map-and-compass man who can walk anywhere," says Walter Graff, director of education for the Appalachian Mountain Club (AMC). "He's been up every trail in the White Mountains and a lot of places without trails, in all seasons and all conditions."

"Unreconstructed peakbaggers" by their own description, the Watermans have demolished many of the records and milestones available to northeastern hikers. Laura has been up 47 White Mountain 4,000-footers half a dozen times, Guy 15 times—about half during the winter, their favorite mountaineering season. (They've also climbed all 46 of the Adirondacks' 4,000-foot mountains in winter.) Guy, ever on the lookout for a new challenge, recently tackled each of the White Mountain high peaks from all four points of the compass in winter, an endeavor, he notes, that often involved "ferocious bushwhacking." Laura was a member of the first all-woman parties to complete a winter climb of Maine's Mt. Katahdin and a winter traverse of New Hampshire's Presidential Range.

At the time they met, Laura worked in New York on the staff of *Backpacker* magazine, and Guy was a corporate speechwriter—following stints as a professional jazz pianist, a writer for jazz magazines, and a Capitol Hill committee staffer, speechwriter, and campaign operative. Both had grown up in families that encouraged scholarship and a love for the outdoors. Laura's father, a distinguished writer and an authority on Emily Dickinson, brought his family to rustic New England cottages during his daughter's childhood summers. Guy's father, a Yale University physicist and the first director of the National Science Foundation, was an avid outdoorsman who led canoe trips through Maine's North Woods every summer.

NED THERRIEN

The Northeast's wet snow is no deterrent to Laura Waterman.

While many people fantasized about living a simple life in the country, Laura and Guy, who married in 1972, actually began making plans for their move to Vermont. Inspired in part by Helen and Scott Nearing, who described their own experiences as Vermont homesteaders during the 1930s in *Living the Good Life* (Schocken Books, reprinted in 1971), the Watermans were convinced they could "live a very simple homesteading life only half the time and have the other half free for other pursuits," as Guy puts it.

Even as they prepared to move, they became involved in protecting New York's Shawangunk cliffs—the first of many environmental causes to which they would devote their combined talents and energies. Use of the "Gunks" was increasing rapidly by the late 1960s—as was the destructive impact of piton-pounding climbers.

The Mohonk Preserve, the private organization that owns the property including the cliffs, invited Guy to join its board as a representative of the climbing community; later Laura served on the group's publications and land-stewardship committees. Involvement with the preserve permitted the couple to test their belief that the key to protecting outdoor recreational resources is public education, not strict regulation.

"It couldn't be done by edict," Guy recalls of the effort to convince members of the notoriously independent rockclimbing community to change their carefree habits. "It had to be done by education." Through peer pressure and cliffside conversation, they helped convince climbers to begin using one main path instead of several. In just three years during the early 1970s, Shawangunk climbers gave up pitons and started using less-destructive nuts and other "clean climbing" techniques.

When the Watermans moved to Vermont in 1973, writing was a tentative part of their scheme for an independent livelihood; but it was also a way to express their growing sense of personal responsibility for the mountains.

Assignments from Laura's former boss at *Backpacker* soon led to other writing opportunities. In the mid-1970s they began a regular column in a New England outdoor magazine, a forum in which they could write whatever they wanted, Guy recalls.

The column also served as the basis for *Backwoods Ethics: Environmental Concerns for Hikers and Campers* (Stone Wall Press, 1979). The style and tone of that first book is "humorous, intelligent, thoughtful, and kindly"—also attributes of the authors, says long-time climbing friend Lou Cornell. Anecdotal and analytical, *Backwoods Ethics* is a down-to-earth guide to low-impact camping practices. But it also addresses a fundamental question that the Watermans posed for themselves and others: "What backwoods environment do we want?" The answer, they believe, includes both protected physical resources—such as soil, water, and vegetation—and the harder-to-define psychological and experiential qualities of wilderness.

While writing has provided one public platform for their views, the Watermans have also been active with the AMC and a number of other outdoor groups. As a member of the AMC's north country board (a committee that oversees north-country operations), Guy vociferously opposed a plan supported by many AMC and Forest Ser-

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vice officials to build a helicopter pad adjacent to the club's White Mountain hut at Carter Notch. Easier helicopter access, proponents claimed, would help supply the hut and support search-and-rescue missions. Guy persuaded the board to squelch the project, however, by arguing that the blasting, damage to the vegetation, and other environmental alterations would be out of proportion to the perceived need.

Laura and Guy again locked horns with the Forest Service in the late 1970s, this time over the fate of five popular hiking trails in the Great Gulf Wilderness of Mt. Washington. The Forest Service, hoping to discourage backpackers from crossing the area to gain access to the summits of the Presidential Range, proposed closing the trails. The Watermans argued that the wilderness area could not be managed as an island separate from the surrounding terrain and its traditional use by hikers. In the end the Forest Service kept the trails open.

Most recently the Watermans have been involved in an effort to protect a stretch of trail along Franconia Ridge, one of the most popular White Mountain hiking destinations. The effort, Guy observes, involves "reconciling a large number of people who want to be in the mountains with a very fragile environment." Above treeline, the 1.7-mile trail section from Mt. Lafayette to Little Haystack is part of a favorite dayhiking circuit because of its accessibility from the highway through Franconia Notch; it also serves as a link in the Appalachian Trail and is close to the AMC's busy Greenleaf Hut.

During the late 1970s the Watermans had been outspoken critics of an AMC attempt to protect the ridge by building scree walls alongside the trail. "The first impression was of a sidewalk," says Guy. "You could accomplish so much more if you could educate users to appreciate the resource. If they're asked, rather than told, people appreciate the spirit of the effort."

When the AMC initiated an Adopt-a-Trail program in 1980, the Watermans volunteered to work on Franconia Ridge. "It's now the focus of our summer activities in the mountains," says Guy. "We try not to let three weeks go by in the summer without checking on the trail." The goal, he adds, is not only to preserve the alpine vegetation but to soften the visual impact of human intervention above treeline. "The ideal is that people walking the trail will think that's the way it was naturally."

The Watermans schedule trail work on weekends, when they can most easily observe patterns of trail use and hiker behavior, and when they can talk directly with the hikers who stop to inquire about their activities. They estimate that they have reached hundreds of hikers with their trailside message about the prospects for the vulnerable alpine zone. "It's a fundamentally optimistic message, but it requires that everybody do their part," says Guy.

Indeed, the Watermans' efforts as backcountry educators are unceasing. During their trail-tending trips they often stay at Greenleaf Hut, where they give after-dinner talks about White Mountain history and the purposes of their trail work; this past summer they lectured at each of the AMC's eight huts. Until last winter, they had also been long-time instructors at the winter-mountaineering school operated jointly by the AMC and the Adirondack Mountain Club.

In their new book, *Forest and Crag: A History of Hiking, Trail Blazing, and Adventure in the Northeast Mountains* (to be published this fall by the AMC), the Watermans trace the evolving uses and perceptions of the region's mountain landscape. With their characteristic attention to detail, they spent eight years researching the area in preparation for the work: They visited more than 60 libraries and archives between Maine and Washington, D.C.; talked with more than 250 hikers, climbers, and trail builders; and corresponded with at least a thousand individuals. Adding their personal experiences to their findings, they compiled the stories of scores of men and women who have shaped the public forests and parks today's backcountry users sometimes take for granted.

The Watermans' next writing project, a companion volume to *Forest and Crag*, will focus exclusively on the history of technical climbing in the region. After that they hope to tackle a sequel to *Backwoods Ethics*, aimed at a new generation of hikers. They worry that the recent level of education about wilderness use and camping practices has declined, even though new people are coming to the mountains all the time, and they believe there is a need for more books and magazine articles on the subject.

In the eyes of some, the unconventional, highly disciplined life that Laura and Guy have set for themselves might seem full of hardship and tedium. From their perspective, though, they have found the freedom, independence, and peace of mind to pursue their varied and public-spirited interests.

"In this push-button age, humanity needs recourse to difficulty," they once wrote. "We need to encounter nature in ways that fully impress on us its enormous power, and set our own efforts in perspective . . . While there is still difficulty, there is still opportunity to test what a person is made of. The hunter and the fisherman know this. The birdwatcher knows it. All lovers of the outdoors tend to respond to the zest of challenge." ■

Guy chops wood to heat the Watermans' remote cabin.

LARRY ANDERSON, *a freelancer in Little Compton, Rhode Island, writes about environmental issues.*

Beargrass at Libby Lake, in the upper reaches of the beleaguered Cabinet Mountains.

A Deadly Silver Lining

CABINET MOUNTAINS, MONTANA

A PAIR OF PROPOSALS to literally undermine a Montana wilderness for its silver are threatening an isolated grizzly bear population with extinction and the state's largest river with massive pollution.

Two mining firms, American Smelting and Refining Company (ASARCO) and Montana Reserves Company, plan to work a rich silver deposit in northwestern Montana's Cabinet Mountains Wilderness beneath 94,000 acres of subalpine forest and rugged 8,000-foot peaks.

Both companies plan to tunnel beneath the Cabinets from surrounding nonwilderness land in the already heavily logged and mined Kootenai National Forest. They want to construct processing facilities next to the wild area and dump tailings near the Clark Fork River. The companies, which would hire 350 workers each, say their operations are destined to be the largest silver mines in North America—a distinction that appalls conservationists.

"These mining proposals threaten everything from water and air quality to habitat for endangered species," says Melinda Ferrell, chair of a conservation organization called the Cabinet Resources Group.

Montana Reserves is still in the process of buying silver claims in the area,

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so ASARCO is likely to be the first to develop. The latter alone would pile more than 100 million tons of heavy-metal–laden tailings less than half a mile from the river during the 30-year life span of its mine. Judy Hutchins, president of the Missoula-based Clark Fork Coalition, worries that the tailings could reach the river.

"Pumping that many tons of highly abrasive tailings in a pipeline always has a potential for disaster," she says. "A major spill of any kind eventually will end up in the river."

Biologists are also concerned about wildlife habitat. They say the Cabinets' 12-bear grizzly population, virtually the only grizzlies in the Lower 48 outside of the Glacier and Yellowstone national park areas, is on the verge of extinction and can't survive more human pressure. Ironically, the U.S. Fish and Wildlife Service has proposed transplanting more bears to the area's still-excellent habitat. Elk, bighorn sheep, mountain goats, and black bears may also be on a collision course with silver mining.

The ASARCO proposal has met the requirements of the Wilderness Act, which allows mining on claims made before 1985, and the 1872 Mining Law. For this reason, the Forest Service says, it must allow removal of the estimated $8 billion worth of silver in and around the wilderness area.

Environmental activists are now concentrating on the permit process. Fourteen state and federal permits as well as an environmental impact statement (EIS) will be required of each mine. At each step of the way activists want the projects to meet the most stringent environmental requirements possible.

A final EIS on ASARCO's proposal could be out by early 1989. If silver prices remain high, within five to ten years the Cabinet Wilderness could be a lot less wild.—***Bruce Farling***

Developers Lurk in a Pirate's Lair

TOPSAIL ISLAND, N.C.

In the early 1700s the English pirate Blackbeard found the perfect place from which to raid ships off the coast of what is now North Carolina. He and his scalawags waited in Stump Sound, an estuary separating the Carolina coast from a narrow, 25-mile-long barrier island with low dunes and gnarled oaks. From there they could see the tops of sailing ships passing in the Atlantic. Rounding the island at either end, the pirates plundered the vessels and then disappeared inland.

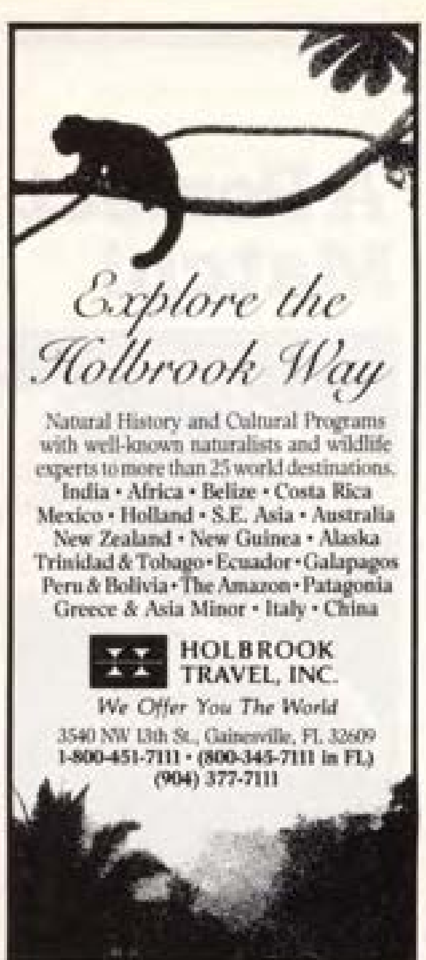
Today called Topsail Island, that thin barrier of sand is at the center of a wide-ranging battle to preserve the rustic North Carolina coast from a tidal wave of high-density development. Environmentalists are fighting to keep it free from the frenzy of construction that began in the 1970s along the state's 302 miles of oceanfront acreage and 4,000 miles of estuary shoreline.

At Topsail's north end, in an area ineligible for federal flood insurance and prone to over-washing by the ocean, plans are under way to build two $100-million high-density resorts. Here lines of 17-story condominiums would house up to 100,000 residents during summer months—ten times the number of people who live there now in the summer. Storm runoff from the development threatens the water quality of Stump Sound, considered by experts to support some of the most productive shellfish beds in the state.

"Development is out of control here," says Todd Miller, executive director of the North Carolina Coastal Federation, a coalition of 1,400 individuals and 50 environmental groups (including the North Carolina Chapter of the Sierra Club). The group believes that existing laws—if vigorously applied—are strong enough to protect both the island and the sound.

David Owens, director of North Carolina's Division of Coastal Management, says the state now has some of the most stringent coastal regulations in the United States, including bans on construction of jetties, bulkheads, and other permanent barriers. But the state alone can't protect Topsail, he says.

"The only way to prevent the kind of



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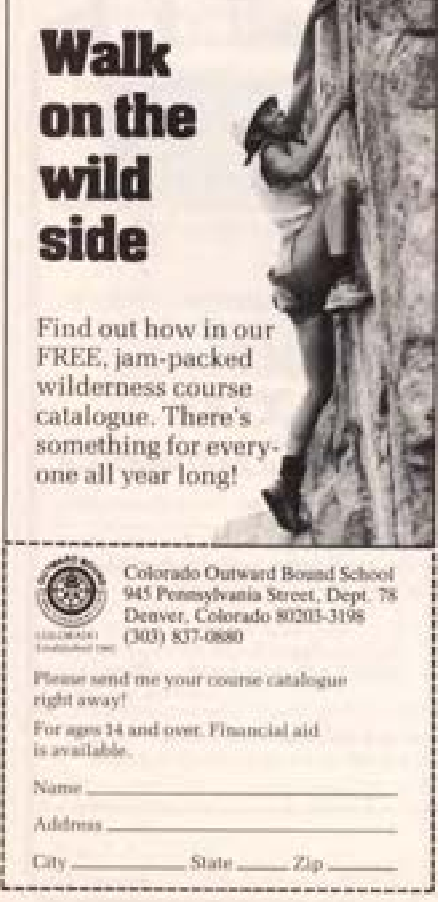


development proposed at Topsail is to convince Onslow County to zone for a lower density," Owens says. "But that's not what the county wants."

This increasingly emotional debate has now become an issue in November's elections, when Republican Gov. James G. Martin and all of the county commissioners will be up for re-election. The governor has belatedly made coastal preservation a campaign theme and is under pressure to preserve Stump Sound and several other environmentally sensitive estuaries by designating them "outstanding resource waters" under the federal Clean Water Act. The environmental protections provided by such designation would limit the density of future development on Topsail, Miller says. Meanwhile, a slate of anti-development candidates who hope to rezone the island for low-density development is waging a vigorous campaign to unseat the incumbent Onslow county commissioners.

What if conservationists don't prevail with the governor and at the polls? Referring to the powerful storms that some years send waves crashing onto islands like Topsail, Miller predicts, "There'll be a day of reckoning."

—Carl La VO

Careless Cutting Among the Giants

SEQUOIA N.F., CALIFORNIA

In 1982 the U.S. Forest Service quietly began to allow logging within groves containing some of the largest and oldest trees in the world. A legal challenge brought by environmentalists has temporarily quieted the chainsaws, but the logging could begin again soon.

The trees are *Sequoiadendron giganteum*—giant sequoias. California's Sequoia National Forest holds one third of the virgin sequoia groves left in the world. The species is native only to the Sierra Nevada, growing mainly in isolated stands on the west slope between 5,000 and 8,000 feet. Mature sequoias are the largest of all living things, reaching more than 300 feet tall and more than 20 feet in diameter.

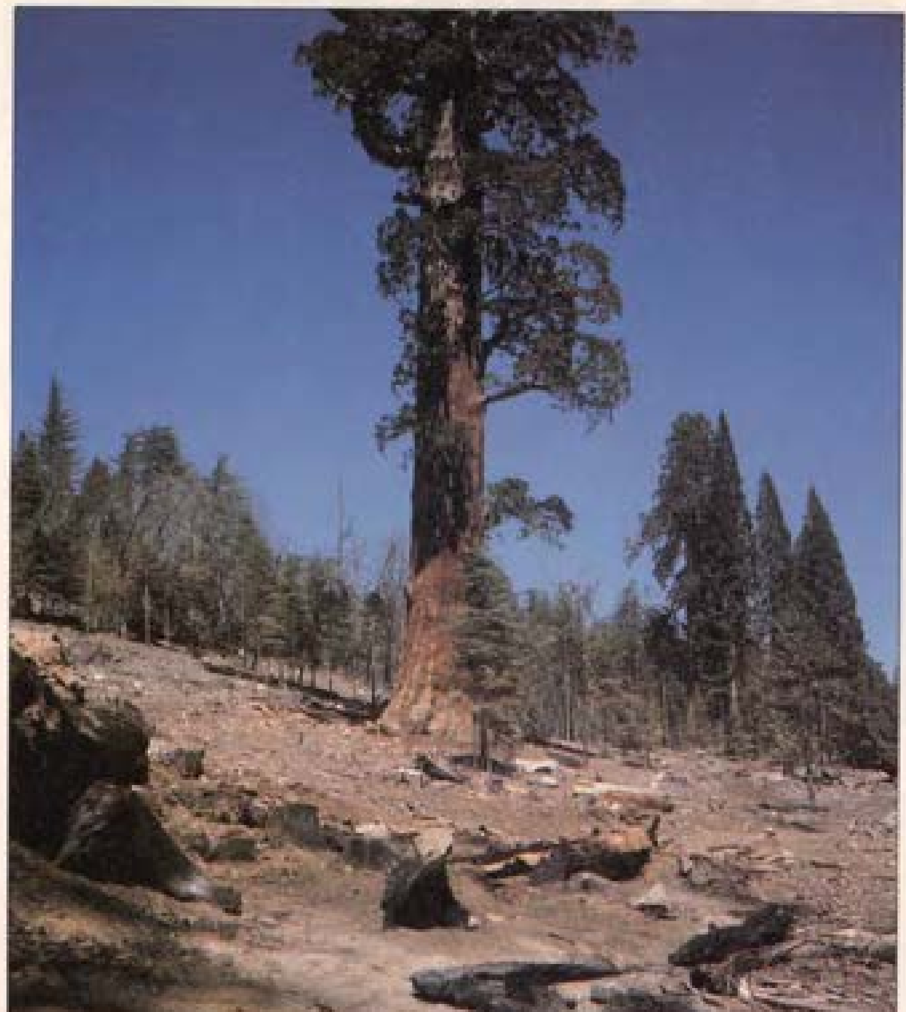
Only a few groves have been cut so far, but Sequoia National Forest officials plan to allow "nonintensive" logging in 70 percent of the forest's 13,200 acres of sequoia groves. "Nonintensive" logging means sequoias more than 150 years old or eight feet in diameter cannot be cut, but all other timber can be removed.

"Bulldozed rubble is the result," says activist Charlene Little of the Sierra Club's Kern-Kaweah Chapter. "The natural setting is gone. It's like having a giant sequoia in a parking lot."

Eleven groves had already been cut by the time conservationists discovered the activity in 1986. After exhausting the Forest Service's appeals process, the Sierra Club went to court in May 1987 to stop the cutting in groves where timber had already been sold to logging companies, claiming that the agency had violated the National Environmental Policy Act by failing to plan adquately before making the sales. In April the Ninth Circuit Court of Appeals granted an injunction that halted the logging, and all parties to the suit are currently trying to negotiate a settlement. If that effort fails, the case will go to trial in U.S. District Court in Fresno.

Meanwhile, the Forest Service is preparing a management plan for the sequoia groves—a document that conservationists are not optimistic about in light of the agency's past policies. According to Little, "nonintensive management" has permitted loggers to sever the shallow roots of sequoias with machinery and expose them to disease. Clearing and compacting the soil has increased runoff and erosion, decreasing the amount of moisture available to the trees. Sequoias standing alone take the full brunt of the wind, and with soil erosion around their roots they become vulnerable to "windthrow"—being toppled by strong winds.

Sequoia seeds need bare, open ground to germinate; theoretically, cutting in the groves could help clear out areas in which young giant sequoias could eventually take root. But according to Little, the Forest Service has planted pine and


CHARLENE LITTLE

Rubble left in the wake of "nonintensive management" in the Sequoia National Forest.

fir trees in the groves that have been cut.

The supervisor of Sequoia National Forest, James Crate, has said he won't sell any more timber from the groves until the sequoia-management plan is complete. Between that promise and the injunction, the groves are safe for now. "But the real test will come when the Forest Service issues its plan," Little says. The current lull may be just the calm before an even bigger controversy ensues.

—Matt Jaffe

Wetlands Wildlife in Want of Water

STILLWATER NWR, NEVADA

Before the Bureau of Reclamation began diverting water from northwestern Nevada's rivers in 1905, more than 84,000 acres of wetlands in the Lahontan Valley teemed with bullrushes, fish, and great flocks of birds. Nearby Pyramid Lake supported numerous cutthroat trout and ancient fish called cui-ui.

But when water began flowing to the farmlands of the Newlands Project in that year, the vast desert marshes began to disappear. As alfalfa and cattle ranches spread, 82 percent of the Lahontan Valley marshes dried up. The remaining wetlands became totally dependent on irrigation runoff and spills from farms. At the same time, Pyramid Lake's level dropped precipitously, wiping out the cutthroat trout and making the cui-ui an endangered species.

Today the Stillwater National Wildlife Refuge is one of the only reminders of the Lahontan Valley's ecologically rich past,

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EXPLORATION CRUISE LINES

JON CHRISTENSEN

Waterfowl are at risk in the once-teeming, now-toxic Stillwater National Wildlife Refuge.

providing a crucial desert rest stop for shorebirds and waterfowl on the Pacific flyway. Yet it, too, is in danger.

Acting under a court order last spring, the Bureau made a decision involving Pyramid Lake that could indirectly deal a death blow to the Stillwater oasis. To protect Pyramid's cui-ui, the agency decided that irrigators must divert less water—and use it more carefully. In doing so the agency ignored the fact that the Stillwater Refuge, on another drainage southeast of the lake, depends on spills from the irrigators.

This decision "spells the end of the wetlands," says refuge manager Ron Anglin. Even before the Bureau's action, the refuge was in trouble. Last year 7 million fish and 1,500 birds died in the area as evaporation left dangerous concentrations of chemicals carried to the refuge by agricultural runoff.

According to Anglin, wildlife populations at Stillwater require a minimum of 32,000 acres of prime wetland to remain healthy. But by the end of this year the refuge will be lucky to receive enough water to maintain 12,000 acres of dangerously contaminated marshes. "Conditions look ripe for [another] big die-off," Anglin says.

Some politicians and the local irrigation district have tried to paint the crisis as a conflict between Pyramid Lake and the wetlands. Yet conservationists support Interior's effort to protect Pyramid Lake. "It's wrong to pit wildlife resources against each other when the irrigation project that sits in the middle accounts for the tension," says David Yardas, an Environmental Defense Fund economist.

Given the need to protect Pyramid, buying water from agriculture is the best way to preserve the Stillwater Refuge, conservationists say. Several farmers have already offered to sell their rights. The Lahontan Valley Wetlands Coalition (P.O. Box 50706, Reno, NV 89513), a group that includes the Sierra Club, is trying to raise money to help state and federal agencies acquire some refuge water rights and to lobby for government purchase of the rest. A total of $50 million to $60 million is needed, according to the group.

Senator Harry Reid (D-Nev.) has agreed to introduce legislation that would resolve the issue—if conservationists and water users on the rivers that supply Pyramid Lake, the wetlands, and Newlands can agree to a plan. Negotiations sponsored by Reid began this spring and are still under way.

David Hornbeck, chair of the Sierra Club's Pyramid Lake/Stillwater Task Force, says that the bottom line for conservationists is clear: "We need to reach a settlement in which water for both Pyramid and Stillwater is assured. It's not a choice between waterfowl and fish." —*Jon Christensen*

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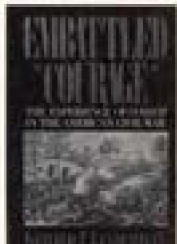

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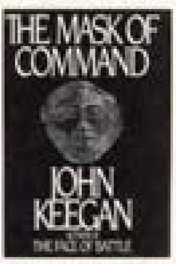

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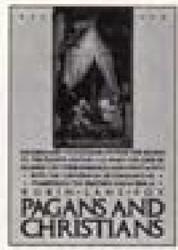

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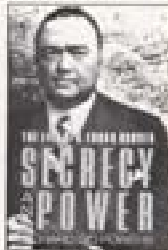

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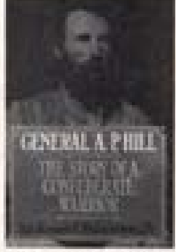

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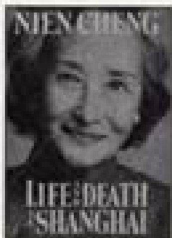

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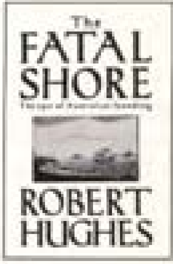

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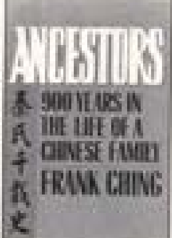

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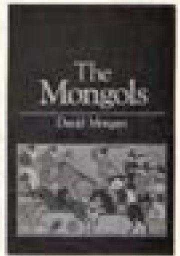

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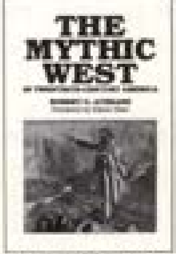

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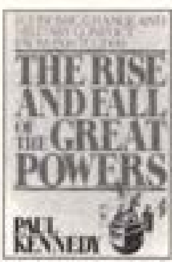

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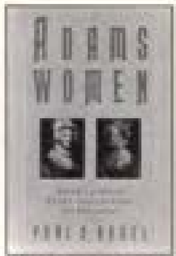

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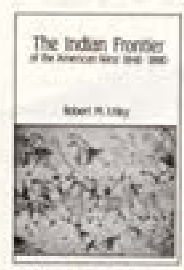

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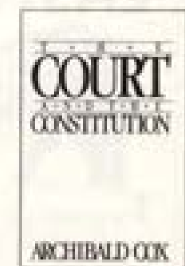

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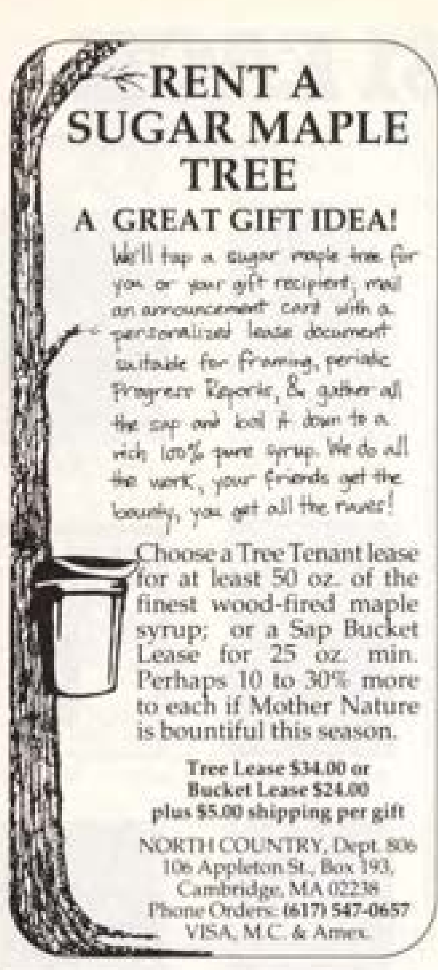

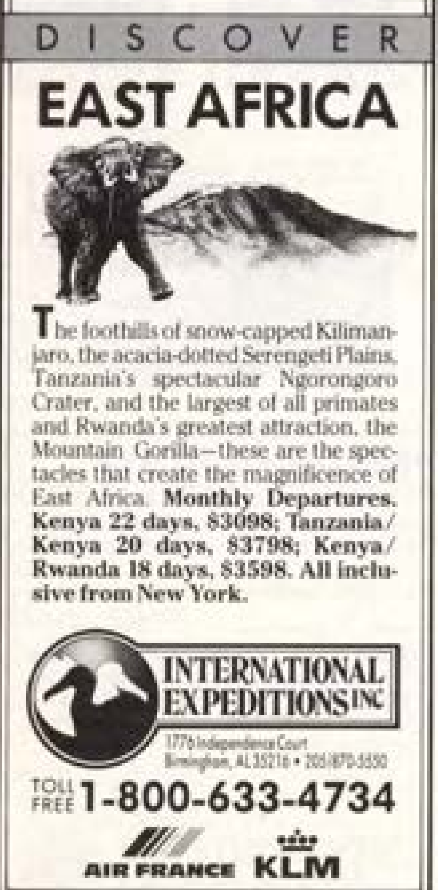

SIERRA NOTES

The late Linda Billings, a former Sierra Club lobbyist, will be honored at a Washington, D.C., fundraising dinner in December. The Workplace Health Fund, a nonprofit organization aligned with the labor movement to fight occupational disease, is sponsoring the event.

After leaving her position at the Sierra Club's Washington, D.C., office, Billings became director of an Environmental Protection Agency program designed to protect the health of migrant farmworkers' children. She was instrumental in passing the Toxic Substances Control Act and worked diligently to find ways to safeguard farmworkers from pesticide poisoning.

On the evening following Thanksgiving Day, 1985, while working late at her office, Billings was attacked and killed by a robber. As a result, the pesticide-poisoning project has never been completed.

For more information about the Linda Billings Memorial Dinner, contact Joyce Reimherr or Sheldon Samuels at the Workplace Health Fund, 815 16th St., N.W., Suite 301, Washington, DC 20006; phone (202) 842-7832. Donations to support the fund and the dinner are welcome.

Sierra Club Books will resurrect one of its most acclaimed Exhibit Format books, *In Wildness Is the Preservation of the World* ($35), as a commemorative edition to be published in October. The book combines Henry David Thoreau's writings with the celebrated New England photographs of Eliot Porter.

Full-color photography also serves as a centerpiece in Richard Bangs' and Christian Kallen's *Islands of Fire, Islands of Spice: Exploring the Wild Places of Indonesia* ($35). From rafting wild rivers in Sumatra to participating in tribal dances in Borneo, the authors explore some of the 13,000 islands of the world's fifth-largest nation.

Contemporary cuisine from 17 theme gardens—among them Italian, French, oriental, edible flower, heirloom, and chili—is the savory heart of Rosalind Creasy's *Cooking from the Garden* ($35). The author gives advice on growing, harvesting, and preserving familiar vegetables and herbs, and on ways to locate unusual varieties. Interwoven throughout are tips on preparing meals from America's leading chefs.

The Bhopal Syndrome, an examination of the pesticide industry's global impact by investigative reporter David Weir, is now available in paperback ($8.95).

These books may be ordered from the Sierra Club Store, Dept. T-150, 730 Polk St., San Francisco, CA 94109. Include $3 per order for shipping and handling; California residents should also enclose applicable sales tax. Club members may subtract a 10-percent discount from prices listed. Allow four weeks for delivery.

The African Development Bank (AfDB) recently agreed to consult the Sierra Club on ways to involve African non-governmental organizations (NGOs) in shaping projects that the bank helps fund. Sierra Club International Representative Larry Williams negotiated with the AfDB at recent meetings in Egypt and the Ivory Coast as part of the Club's ongoing effort to encourage multilateral development banks to include NGOs in planning, designing, and implementing the projects they support.

Deadly Defense: Military Radioactive Landfills is the title of a new publication from the Radioactive Waste Campaign, a New York–based public interest organization. The 169-page book, illustrated with diagrams, maps, and charts, contains detailed information about the United States' nuclear weapons production system and the problems of military radioactive waste. Copies are $15 each for individuals or $25 each for corporations, available from the Radioactive Waste Campaign, 625 Broadway, 2nd Floor, New York, NY 10012.

Orion Nature Quarterly, an attractive magazine published by The Myrin Institute in New York City, has teamed up with Conservation International, which consummated the "debt-for-nature"

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trade with Bolivia last year (see "Afield," November/December 1987), to provide regular reports on global conservation. This summer's issue focused on tropical conservation and featured articles by renowned biologists E.O. Wilson, Daniel Janzen, and Richard Schultes. A one-year subscription is $14 ($4 for single copies) from *Orion Nature Quarterly*, 136 E. 64th St., New York, NY 10021.

Coastweeks '88, a series of events endorsed by the Sierra Club's national coastal committee, is designed to foster public awareness of the country's valuable salt- and freshwater shores. Activities planned around the nation from September 17 to October 10 will include beach cleanups, whale watches, boat outings, poster and essay contests, conferences, and beach parties. For more information contact Margaret Fleming, National Coordinator, Coastweeks '88, Coastal States Organization, 444 N. Capitol St., N.W., Suite 312, Washington, DC 20001; phone (202) 628-9636.

Eastman Kodak Company and the Sierra Club have teamed up with Survival Anglia of Great Britain to produce a series of video documentaries on barren ground caribou, humpback whales, bison, and polar bears, among other subjects. Narrators include James Earl Jones, Richard Widmark, Michael Landon, and Peter Ustinov.

Each video program is about 60 minutes long and retails for $29.95. For ordering information and a complete listing of titles, write to Eastman Kodak Company, Sierra Club Series, Kodak Video Programs, 343 State St., 4th Floor, Building 20, Rochester, NY 14650. To order by phone call toll free 1-800-331-6839; ask for operator #6. (In Tennessee phone 1-800-654-9269.)

The Ninth National Trails Symposium will be held in Helen, Georgia, September 11–14. Trail managers, researchers, planners, and users will discuss maintenance and improvement of the nation's trails. Workshops, field trips, and social events are planned. The National Trails Council is sponsoring the symposium in conjunction with the U.S. Forest Service, National Park Service, Tennessee Valley Authority, Georgia Department of Natural Resources, and University of Georgia. For more information contact the Outdoor Recreation and Wilderness Assessment, USDA Forest Service, Athens, GA 30602; phone (404) 546-2451.

The Roger Tory Peterson Institute of Natural History is sponsoring a national forum on educating children about nature and wildlife. The forum, "Breaking the Barriers: Linking Children and Nature," will take place October 26–28 at Peek'n Peak Resort in Clymer, New York. For more information, contact RTPI, 110 Marvin Parkway, Jamestown, NY 14701; phone (716) 665-BIRD.

Sierra Club Catalog operations have been reorganized to provide better service to Club members. Replacing the catalog is a new mail-order service that will make the Club's own products available to members and the general public.

A mail-order service guide, to be published twice yearly, will feature a complete list of Sierra Club books and calendars, as well as selected graphic products and logo items such as videos, notecards, cups, posters, T-shirts, pins, decals, and patches. The guide is available on request from Sierra Club Store Orders, 730 Polk St., San Francisco, CA 94109; phone (415) 923-5500.

The Club has also set up a seasonal mail-order program for Sierra Club calendars. To place calendar orders or to receive a free descriptive brochure, write to Sierra Club Calendars, Holiday Orders, c/o JV West, P.O. Box 11950, Reno, NV 89510; phone (702) 359-1569. Visa and Mastercard are accepted. ■

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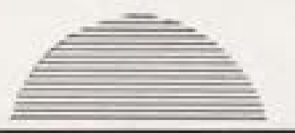

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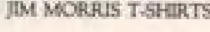

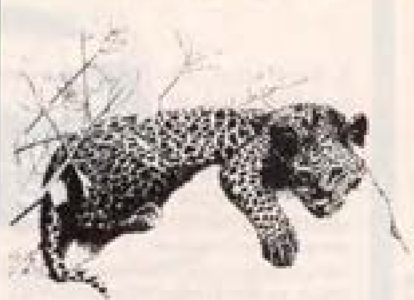

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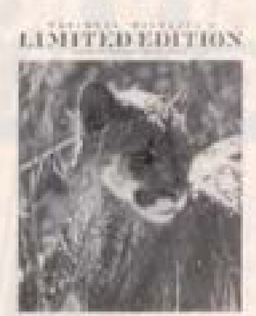

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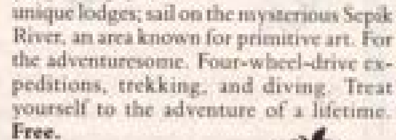

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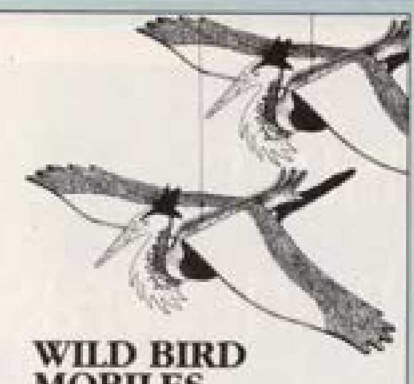

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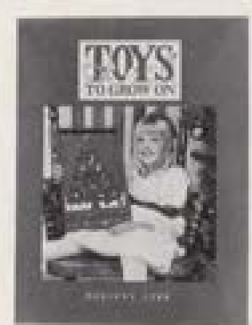

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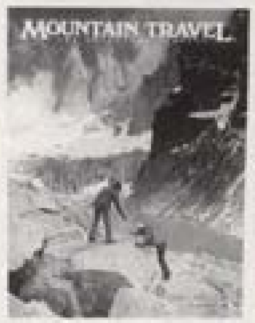

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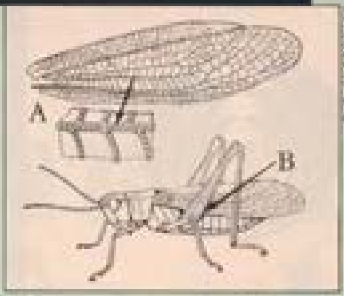
HARRY ROGERS/NATIONAL AUDUBON SOCIETY COLLECTION/PHOTO RESEARCHERS

Insect Orchestras

Chirping crickets, humming cicadas, and buzzing mosquitos all make up a dazzling insect symphony. Some are fiddlers, some are drummers, and others play wind instruments. But in this orchestra each kind of insect plays a different song, and the instrument is a part of the insect's body.

To humans, hissing, creaking, and chirping may seem like strange sounds for an orchestra. But insect music isn't played for the enjoyment of humans. In fact, our ears are not sensitive enough to hear most insect sounds. Even on the warmest nights, when insect noises seem to surround us, we hear only the lowest notes produced by the largest insects.

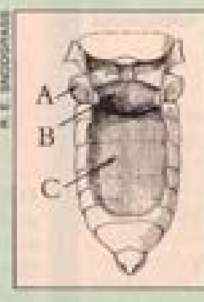
When we hear a cricket, a grasshopper, or a cicada, we may be hearing part of a mating song. The male rubs together rough parts of its wings or legs to create a melody that it hopes will attract a mate. The song's simple repetition may seem boring to us, but it sends two important messages to the female:



R. E. SNODGRASS

▲ If you've heard a cricket (above), grasshopper, or katydid chirping on a warm night, you've heard the sound of a fiddler insect. These creatures make their music with a file and a scraper. The file of one type of grasshopper is a toothed vein on the wing (A). The scraper is a hard portion on the inner side of the leg (B). When the grasshopper rubs the scraper against the file, a membrane vibrates to produce the familiar melody. Other types of grasshoppers (and other insects, too) produce sounds in a similar fashion, but their files and scrapers are often on different parts of their bodies. For example, the cricket's file is a hardened vein on one wing, and the scraper is a stiff portion of the edge of the opposite wing.

ROBERT AND LINDA MITCHELL



R. E. SNODGRASS

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◀ The cicada is a drummer. Large "drumheads" on either side of its body (A) are attached to sets of muscles that act like drumsticks (B). By contracting and releasing these muscles, the cicada starts the "drumheads" vibrating. The air spaces in the cicada's abdomen (C)

"I am here, and I am one of your kind." Mosquitos also play a mating song, but they do so by vibrating their wings. In this case, though, the female plays a song to attract the male.

Many insects use sound to drive intruders away from their territories or to warn each other of danger. When a conenose is disturbed, for example, it rubs the tip of its beak along the ridges of its thorax. The squeaking this produces scares off invaders.

Social insects use sounds to communicate within a group. When a termite nest is disturbed, termite soldiers bang against the roof of the nest to warn others. Alerted to danger, the insects run to safer areas. Bees and some ants also respond to danger signals produced by their own kind. When a trapped worker ant makes its creaking noise, fellow ants rush to the rescue and begin digging to set it free.

An insect's song may be affected by its location, the weather, or even the sounds of its neighbor—but the basic tune is inherited. Each kind of insect makes a sound that is meaningful to others of its kind. While humans may not know exactly why an insect plays its instrument, we can be sure that its fellow insects do.

Kathleen Almy *is a naturalist and writer in Fort Collins, Colorado.*

ROBERT AND LINDA MITCHELL

DEBBIE DRECHSLER ILLUSTRATIONS

◀ Insects that play wind instruments are less familiar to us. One such insect, the death's-head hawkmoth, might be compared to a flute. Inside its mouth is a flap of tissue, called the epipharynx, which covers the throat. When the moth sucks in air, the tissue vibrates. This changes the size of the opening in the throat and produces a low-frequency sound. When the moth forces air out, the epipharynx is up out of the way and the opening is large. The sound produced is higher, like a whistle. Some cockroaches also play wind instruments. When they push air through their spiracles—tiny openings on their bodies that are actually part of their breathing systems—they make hissing noises.

▶ One reason insects make music is to help each other find food. Social insects such as ants, bees, and termites live in groups and often have intricate communication systems. Leafcutter ants (right) "talk" to each other by rubbing a file located behind the pedicel, or "waist," against the abdomen. Honeybees returning to the hive from a food source combine song with dance to tell other bees where to find the food.

N. SMYTHE/NATIONAL AUDUBON SOCIETY COLLECTION/PHOTO RESEARCHERS

intensify the sound produced. The cicada's song is not what we might think of as a drummer's solo—it's harsher and creakier. Termites may also be considered percussionists: They rap their heads or bellies on wood to make noise.

▼ All insects have a pair of antennae on their heads, but in most cases these are used for smelling and touching rather than for hearing. Most insects have sound receptors on their abdomen, thorax (the section bearing the legs and wings), or, like the brown cricket (left), on their legs. These receptors, which are far more sensitive to sound than human ears, allow the insect to distinguish the intricate tunes of its mates.

JEROME WEXLER/NATIONAL AUDUBON SOCIETY COLLECTION/PHOTO RESEARCHERS

Sierra Club ◆ Foreign Outings 1989

Bodnant Gardens, North Wales; see Trip #89903.

Now is the time to plan for your 1989 foreign outing. In the company of experienced volunteer leaders, you may bicycle among the medieval hill towns of Tuscany, trek in the seldom-visited Dragon Kingdom of Bhutan, or visit the fascinating hill tribes of northern Thailand. For more detailed information about these trips, send in the coupon on page 103. Refer to the January/February issue of *Sierra* for our reservation and cancellation policy and an application form. Read the policy carefully before applying. Note that trip prices are subject to change and do not include airfare.

[89887] Paris, France: A Non-Tourist View—May 11–22, 1989. *Leaders, Sidney Hollister and Sandy Tepfer, 42 August Alley, San Francisco, CA 94133. Price: $2,525, Dep: $100.* A repeat of a successful 1988 outing, this trip will introduce you to parts of Paris the tourist doesn't usually see—from the wholesale produce market at Rungis to the basement ovens of a famous bakery; from a restored park to walking paths along a recently polluted but now healthy river just south of the city. Environmentalists will talk to us about the role Paris plays in the ecology of its region, how the city gets its water, food, and energy, and what it is doing to keep its air clean and its streets free from gridlock. We'll take a tour of the subway, train, and bus system that moves millions of people every day, and we'll use that system to reach places Parisians go to escape the city's bustle. And, of course, we'll walk—through parks filled with blooming chestnut trees and scarlet tulips, markets filled with spring vegetables, immigrant neighborhoods filled with exotic sights and sounds, and remarkable new urban housing areas. Our Parisian home will be a hotel in the heart of this ever-changing yet timeless City of Light.

[89903] The Best of Wales and the Welsh Borders, United Kingdom—June 25–July 10, 1989. *Leader, Jane Edginton, 2733 Buena Vista Way, Berkeley, CA 94708. Price: $1,945, Dep: $100.* This special, uniquely Welsh outing will include adventures at lakes, in deep valleys, and on rugged mountains. The Welsh are an independent people with a language and place names that most Americans cannot pronounce—Blaenau Ffestiniog ("Heads of the Valley in the Land of the Ffestin"), Bettws-y-Coed ("Prayer House in the Woods"), Nant Gwynant ("Whitewater Stream"), and Beddgelert ("Grave of Gelert"). We will visit all of these places in the company of Dr. Franklyn Perring of the Royal Society of Nature Conservation. Highlights of the trip will include locally guided town walks; hikes to view wildlife, birds, and scenic grandeur in nature preserves; countryside rambles; visits with local conservationists; a ride on the long boat or a walk on the towpath along the canal to Llangollen; a hike or a train ride to the top of Mt. Snowdon, the highest peak in Wales at 3,560 feet; a visit to Bodnant, one of Britain's finest gardens; and exploration of an island seabird sanctuary with carpets of wildflowers. We'll also have castles to enjoy and may attend an evening concert in a magnificent 12th-century cathedral. Accommodations will include a historic coach inn, and hikes will generally be six to seven miles long.

[89945] Central Italy by Bike—September 17–30, 1989. *Leader, Thelma Rubin, 899 Hillside, Albany, CA 94706. Price: $2,145, Dep: $100.* Enjoy the gently rolling farmland and medieval hill towns

of Tuscany and the spectacular coastal region of Liguria. Our tour will take us south and west of Florence. We will ride through farm and wine regions meticulously nurtured for more than 20 centuries and spend nights and layover days in towns famous for art, history, and architecture. On the coast of the Cinque Terra in Liguria we will take a break from bicycling and hike along the terraced bluffs between villages. Accommodations will range from pensiones to a convent. Continental breakfasts, picnic lunches, and dinners in local trattorias will be our daily fare. A support vehicle will carry our luggage. Leader approval required.

[90500] China Study and Walking Tour—September 17–October 7, 1989. *Leader, Phil Gowing, 2730 Mabury Square, San Jose, CA 95133. Price: $2,745, Dep: $100.* A highlight of this moderate walking tour in some of China's most beautiful and scenic areas will be a one-week stay in and study at Qufu, the birthplace of Confucius. We will participate in low-key morning classes on Chinese customs, culture, language, history, philosophy, and cooking. In the afternoons and evenings we will experience Chinese life-styles firsthand by visiting schools, collective farms, and hospitals. In addition to this week of study, we will visit the Forbidden City, Summer Palace, and Great Hall of the People in Beijing, and the Great Wall; explore the two jewel cities of Suzhou and Hangzhou; and, possibly, climb Tai Shan, one of China's most sacred mountains. The trip will begin in Beijing and end in Shanghai.

[90505] Trekking in the Dragon Kingdom, Central and Eastern Bhutan—September 23–October 21, 1989. *Leader, Jane Edginton, 2733 Buena Vista Way, Berkeley, CA 94708. Price: $3,945, Dep: $100.* Among the last unexplored frontiers, the Himalayan border of central and eastern Bhutan is the site of colorful village life and glorious mountain scenery that few westerners have been able to experience. The eastern portion of this secluded, remote kingdom has been opened to visitors just this year. Imposing temple forts; picturesque, rural, carved and painted architecture; people in native dress—these are parts of Bhutan's Tibetan Buddhist culture without parallel. The trip mixes trekking with cultural exploration. Altitudes will range from 7,000 to 18,000 feet, as we traverse the Lunana area. Bhutan's green alpine valleys, towering white Himalayan peaks, and forested canyons in fall colors will delight photographers.

[90510] Autumn Colors in East Bavaria, Germany—September 24–October 7, 1989. *Leaders, Sigrid and Ken Miles, 1056 1st Ave. N., Napa, CA 94558. Price: $2,020, Dep: $100.* Experience autumn on this leisurely to moderate hiking trip through friendly Bavaria. From the Roman-founded town of Regensburg ("Castra Regina"), we will hike through the Bavarian forest (central Europe's largest mixed mountain forest) to Passau on the Danube. We will encounter not only great natural beauty but also historic sites, castles, and villages. We will stay in local "Gasthofs" where a friendly welcome and cheerful service are still tradition. Our luggage will be transported for us each day; we need carry only daypacks and cameras as we enjoy this wonderful region.

[90515] Makalu Trek, Nepal—October 2–28, 1989. *Leaders, Emily and Gus Benner, 155 Tamalpais Rd., Berkeley, CA 94708. Price: $2,660, Dep: $100.* The base camp for climbers of Makalu, the world's fifth-highest peak, is one of the most spectacular and remote in Nepal. Five days from the nearest village, the pleasant, grassy campsite at 15,744 feet is directly beneath Makalu and includes access to a magnificent and unusual view of Mts. Everest and Lhotse. Our 15-day trek starts in the foothills at 6,000 feet, passes through Nepalese villages as it ascends to the Arun River, then crosses historic Shipton Pass to the Barun River and the base camp. A plane flight to Kathmandu will shorten our return trek to seven days. This moderately difficult trek is great for veterans as well as for strong hikers new to Nepal and the inimitable trekking experience. Leader approval required.

[90520] One Trip—Four Chinas—October 15–November 4, 1989. *Leader, Dwight Taylor, 2 Marston Rd., Orinda, CA 94563. Price: $2,925, Dep: $100.* Our odyssey will take us through four regions of China, beginning with tours of Beijing (including the Forbidden City) and the Great Wall. Then we'll travel to Central China to the remote mountain home of the giant pandas for a leisurely natural-history trek in the Sigunian valley. Few westerners have seen this uninhabited valley, which is at an elevation of 11,000 feet and is surrounded by 20,000-foot-high granite spires. We will acclimatize for the trek by staying nights at a panda preserve and at a tiny village. On our return we will visit the famous mist-covered limestone mountains, near Guilin in southern China, that have inspired artists for centuries. We will end our trip in fascinating Hong Kong, arguably the world's most interesting port.

[90525] Trekking Among the Hill Tribes of Northern Thailand—December 21, 1989–January 7, 1990. *Leader, Fred Schlachter, 7185 Homewood Dr., Oakland, CA 94611. Price: $1,775, Dep: $100.* While trekking among the hills of northwest Thailand, we will see spectacular scenery and visit the villages of many tribes, including the Karen, Meo, Lisu, Lahu, Yao, and Shan. Traveling on foot and by bus, truck, taxi, riverboat, raft, and elephant, we will briefly visit several beautiful and fascinating cities and towns—but the heart of our trip will be in the jungle and mountains. We'll complete our trip by flying to the island of Phuket in southern Thailand. Here we'll relax, swim, snorkel, and explore neighboring islands. This trip is for people who are prepared to walk a lot and travel with minimal comfort in order to experience adventure, beauty, and excitement in an exotic and remote corner of the world.

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Diverse Considerations

Biodiversity
Edited by E. O. Wilson.
National Academy Press
$32.50, cloth; $19.50, paper

David Graber

When this decade closes, its conservation keystone will have been "biological diversity." Those two words have worked their way in just a few years from the laboratories and offices of a few ecologists and geneticists to the floors of Congress, the boardrooms of the World Bank, the evening news, and the everyday dialogue of conservationists. The phrase harbors a complex set of ideas and images: The champions of biological diversity are still struggling to understand it and haven't worked out a consensus as to how to preserve it. But they—we—must, and soon.

The rapid conversion of wild systems around the planet for human use has produced a chilling side effect: We are destroying the diversity of life forms developed over billions of years. Perhaps everybody within reach of a television set is aware of the plight of the Javan rhinoceros, the golden-headed lion tamarin, the Bengal tiger, and the California condor; those and other conspicuous animals represent the so-called charismatic megafauna on whose behalf concerned Westerners will write checks and pester legislators. But such exalted species are merely the shimmering crest of a catastrophic wave of extinction just beginning to break. That wave is carrying off hundreds of vertebrate animals, thousands of vascular plants, and probably millions of invertebrate and nonvascular species—all with genetic riches we cannot recall once they are lost.

All species eventually become extinct, of course, and global events in past eons have caused the demise of entire groups of species. But if humanity persists on its present course, the next punctuation will be the first such man-made event, and we will have to endure its consequences. Whether human beings survive, and whether survival will be worthwhile, are other issues.

The complexity and urgency of this problem prompted the National Academy of Sciences and the Smithsonian Institution to sponsor the National Forum on BioDiversity in Washington, D.C., in the fall of 1986. That event was intended to communicate the concern of the scientific community to the nation. Many panels encouraged public participation, and a closing teleconference linked the conferees with college students at more than 100 sites across the nation. The fact that scientists went to such lengths to garner publicity says volumes about their level of concern.

Biodiversity is based on that forum. Some of its 57 papers were written by leading conservation biologists, including Paul Ehrlich, Norman Myers, Peter Raven, Daniel Janzen, David Ehrenfeld, Ulysses Seal, Thomas Lovejoy, and Michael Soulé. But this collection also includes writings by economists, agrogeneticists, systems ecologists, restoration ecologists, foresters, sociologists, and anthropologists—as well as by Worldwatch Institute president Lester Brown and poet Michael McClure.

Like blind men describing an elephant, the contributors explore many facets of one awesome phenomenon. Tropical forests, the geographic focus of biodiversity, are home to the richest, the least-known, and the most-endangered biota on Earth. While only about three quarters of a million insect species have been cataloged so far, entomologists estimate that 5 to 30 million species exist, nearly all of them in the moist tropics. Taxonomists are still discovering and classifying tree and vertebrate animal

species in the tropics—but today the rate of extinction is exceeding the rate of discovery. Many scientists, in particular, feel a sickening panic stemming from their awareness that a world is being lost before it has been understood. And how do you argue for protection of something unknown?

Diversity, however, is not measured simply by the aggregate number of species. Diversity among ecosystems also exists. As Stanford University biologist Peter Vitousek points out, when you flood a place with alien species—as has taken place in Hawaii—local diversity is nominally increased. However, as introduced plants dominate and replace native ones, both local and planetary diversity suffer. As in Hawaii, endemic species are lost, and a distinctive ecosystem becomes homogenized.

While introducing new plants and animals usually has the ultimate effect of reducing diversity, there may be exceptions. Biologist John Cairns, Jr., and Ocean Arks International president John Todd offer some contrary—and arguable—examples in the context of "restoration ecology." According to Cairns, restoration includes efforts to convert damaged ecosystems into functioning ones, replacing habitat once lost to development—"even when such habitats did not originally exist on the damaged site."

Several of the papers expound on the potential loss of food and medicinal plant genes, especially from the tropics. Norman Farnsworth, a pharmacognosist at the University of Illinois, Hugh Iltis, director of the University of Wisconsin Herbarium, and Mark Plotkin, plant-conservation director of the World Wildlife Fund–U.S., offer some telling case studies. "Approximately 119 pure chemical substances extracted from higher plants are used in medicine throughout the world," Farnsworth says. And yet, he points out, "not a single pharmaceutical firm in the United States currently has an active research program designed to discover new drugs from higher plants."

The book's economists attempt to quantify the potential value to humans of the world's biodiversity. But a new weltanschauung is emerging: Put simply, the diversity of life forms and ecosystems is itself a kind of wealth, as real as material or cultural riches. The increasing estrangement of urban humanity from its natural support base aggravates our failure to conserve that wealth, as does the trap of global overpopulation. The adherents of Deep Ecology take this argument a step farther, arguing that all life forms have an inherent right to exist independent of their value to humans.

Biodiversity is not a gloomy work; it is designed to serve as a sourcebook for conservationists. It is complex, sometimes confusing, occasionally contradictory; a fair bit of the writing is technical, and the tone is scholarly rather than emotional. But it is also a surprisingly readable book. One of the bothersome features of conservation is that goodwill is not sufficient; the price of lacking good, comprehensive information is failure. *Biodiversity* is a commendable effort toward success.

DAVID GRABER, *a research biologist who works for the National Park Service, frequently reviews books on nature for the* Los Angeles Times.

Maturity From Melancholy

Reading the River: A Voyage Down the Yukon
by John Hildebrand
Houghton Mifflin
$17.95, cloth

Peter Wild

IT'S A DARING THING TO DO, to step off from land, dig paddle into water, and face the unknown with set jaw—especially if the river is the Yukon, a giant storming its way across the length of corrugated Alaska, through perhaps the most awesome wilderness left on the planet.

But do we really need another book about this sort of Alaskan adventure? After all, as far back as 1885, Lieutenant Frederick Schwatka produced *Along Alaska's Great River*. That tale of Huck Finn-like adventure, if ringing a bit of blarney, is close to the top in the boldness category. In the more contemplative climate of our own time, we have such writers as Barry Lopez and John McPhee, whose quiet eloquence and good sense call into question the nation's manipulation of nature in the "last frontier." Today's readers have become accustomed to one approach or the other.

John Hildebrand's *Reading the River* reminds us that a vast literary territory waits to be explored between the extremes. His approach is neither tied to the past nor revisionist. He's simply a man in a canoe who, in 1983, puts in at Whitehorse, in Canada's Yukon Territory, pulls out near the Bering Sea 2,000 miles later, and makes a book out of what he's seen in the interval.

Hildebrand is no wide-eyed newcomer to Alaska. He tried his hand there for five years beginning in 1972, earning a master's degree and teaching English during winter months to students at the University of Alaska at Fairbanks. In the process he lost not only his wife to divorce, but also his somewhat boyish dream of living off of nature's bounty during summers in an isolated log cabin. However, Hildebrand's reflective leitmotiv, which could easily have thrown a dark cast over the book, instead shows us a man who has rescued maturity from melancholy. We are the beneficiaries of a tried, meditative, and trustworthy observer.

Granted, Hildebrand gives us doses of the expected—of horrific grizzly stories and dicey moments as he maneuvers his shaking craft through Yukon waves looming before him "like a range of green hills dusted with snow." That's the obligatory part of his account. And as a journalist, he doesn't shy away from reporting on the bizarre characters he meets on Alaska's largest river—the "end-of-the-road types," as he calls them, who have escaped into the wilds with their maladjustments and madnesses firmly intact. One such fellow announces himself as King David and says he is "on his way to Siberia to test the theory of gravity"—not the best of companions to share a wilderness campfire while the star-filled Yukon night slips by.

While all of that is interesting, what makes the book worthwhile are the

AT A GLANCE

PHILIP HYDE

Drylands: The Deserts of North America
Photographs and text by Philip Hyde
A Yolla Bolly Press book published by Harcourt Brace Jovanovich
$75, cloth

"Natural places . . . have integrity," writes Philip Hyde. "It is this sense of place that is the foundation of my work." Hyde toured the Great Basin, Mojave, Sonoran, Chihuahuan, and Painted deserts to capture their essence on film. "Hills and lava flows, Craters of the Moon, Idaho, 1983" (above) is one of the photographer's luminous results.

more ordinary people the author hobnobs with: Hildebrand turns out to be a traveler whose wilderness-whetted loneliness makes his encounters with strangers all the more piquant. Often his meetings with river pilots, Indian fishermen, and missionaries probe a history that deepens our understanding of the vast landscape.

The Yukon makes a great loop north of the Arctic Circle. Once around it, Hildebrand arrives at the village of Beaver where he sips tea in a native villager's cabin, then remarks that many people in this Athabascan Indian country deep in Alaska's interior have the features of coastal-dwelling Eskimos. His host launches into the story of Kyosuke Yasuda, a Japanese wanderer who settled among the Eskimos on Alaska's northernmost coast around the turn of the century. Hard times and his own wanderlust compelled Yasuda to venture far inland in search of gold. Eventually he became a kind of Alaskan Moses, inducing Eskimos hurt by the decline of the whaling industry to undertake a migration that lasted nearly two years and crossed hundreds of miles through the Brooks Range wilderness. The storyteller is himself one of Yasuda's descendants.

On other pages, the canoeist recounts the Russian heritage of the Demientieff family, founded in Alaska by a man banished from Mother Russia for "committing a crime that nobody could now remember." He passes along tales from the gold-rush days. Gliding past an island, he points out where Jack London camped. Attending church at Fort Yukon, he gives a whimsical doff of his hat to Albert Edward Tritt, "the Mad Bishop of the Chandalar," a member of the Chandalar Gwich'in nomadic hunt-

ing tribe. Tritt, converted by his father to Christianity, once led his people in ambitious construction projects that all ended in failure.

Hildebrand is a good storyteller. Both the immediacy and the depth of what he winnows from his adventures make *Reading the River* a gentle and ruminative book.

PETER WILD *is a regular contributor to* Sierra.

Landscape and Solace

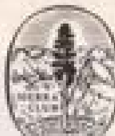
Crossing Open Ground
by Barry Lopez
Charles Scribner's Sons
$17.95, cloth

Carol Polsgrove

ONCE, ON THE SHORE of the Yukon River, Barry Lopez mulled over the stones and bits of debris that glistened at the water's edge, his pockets slowly filling as the low sun threw its light across the sky to the full moon. "I could poke here until I dropped of old age," he tells us in his story of that visit to the Yukon-Charley Rivers National Preserve.

The moment serves as a metaphor for many of the pieces collected in his newest book, *Crossing Open Ground*: slow and careful musings over tracts of Earth—Arctic seashores, Southwest deserts, Northwest woods. Carefully he notes plants, rocks, animals, and animals' bones along the way, naming them precisely, collecting them in his mind. Slowly he builds a case for his key point: that landscape and the human mind are bound together in a profound relationship.

In one essay, "Landscape and Narrative," Lopez writes that a person's thinking is shaped "by where on this earth one goes, what one touches, the patterns one observes in nature—the intricate history of one's life in the land, even a life in the city, where wind, the chirp of birds, the line of a falling leaf, are known. . . . The interior landscape responds to the character and subtlety of an exterior landscape; the shape of the



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individual mind is affected by land as it is by genes."

And so we should not be surprised to find that, as in Lopez' *Arctic Dreams*, on these finely wrought landscapes, tapestry-like in their density and detail, the human figure takes a prominent place. Lopez sits patiently for three hours at Northern California's Tule Lake, watching snow geese sweep the skies in "dazzling synchronicity." He listens quietly, filtering their unfamiliar voices through familiar sounds: "A barking of high-voiced dogs, like terriers, the squealing of shoats . . . the cheering of a crowd in a vast stadium."

Or in a desert dawn, he watches—once again for hours—as the sun fills in the lines of a stone horse etched on desert pavement 300 years ago. He scans his memory for knowledge of horses particular enough to let him identify this horse, and finds, to his disappointment, that his memory has no depth.

But the horse itself, the physical rendering on the floor of the desert, draws Lopez back into a longer human history, and images of other horses flicker in his mind: "Huge horses carved in the white chalk downs of southern England by an Iron Age people; Spanish horses rearing and wheeling in fear before alligators in Florida . . ."

He comes away from the encounter with a sense of solace. "A history like this one, which ran deeper than Mexico, deeper than the Spanish, was a kind of medicine. It permitted the great breadth of human experience to reverberate, and it did not urge you to locate its apotheosis in the present."

Without making too much of it, Lopez invites us to question the turn that history has taken. Most industrial people have so distanced themselves from the rest of nature, so debased wilderness, so reduced their assessment of the land to economic terms, that "we stand to lose the focus of our ideals . . . our sense of dignity, of compassion, even our sense of what we call God."

In this matter, Lopez is more of an optimist than I. Not only do I think "we"—most of us, and certainly the people in power—have already lost these things, but I also question the hypothesis, stated in his closing essay, that "modern people desire a new relationship with the natural world, one that is not condescending, manipulative, and purely utilitarian."

I can't help feeling Lopez has kept himself too much among kindred spirits and has not been reading the newspaper. The voices calling for such a relationship do not ring loudly on Earth in the year 1988. But hope—like compassion, dignity, and God—may be something an encounter with landscape gives to us, and I confess I have been city-bound for too long.

Carol Polsgrove *is a freelance writer in Oakland, California.*

BRIEFLY NOTED

A weed by any other name is most likely a "ruderal," a plant that has taken over land disturbed by humans. The nice thing about the term, according to Matthew F. Vessel and Herbert H. Wong's ***Natural History of Vacant Lots*** (University of California Press; $22.50), is that it lacks the disparaging connotations of "weed": It doesn't imply that one plant is more valuable than another. Urban dwellers wishing to unravel the mysteries of horseweed and banana slugs, wolf spiders and ryegrass—and a lot more—will find this a satisfying field guide, infused with a touch of unintended whimsy. . . . The old way of identifying birds, say the authors of ***Hawks in Flight*** (Houghton Mifflin; $17.95), was the gunshot approach: "Sight along the barrel of a Winchester, pull the trigger, and collect the trophy." But authors Pete Dunne, David Sibley, and Clay Sutton instruct readers according to a different school of recognizing birds in flight (in this case daytime birds of prey) by looking for marks visible at a distance. Black-and-white illustrations depict raptors on the wing, but the book differs from most guides in that it is predominantly prose, meant to preface a trip into the field. One of the book's limitations, admit the authors, is its bias toward hawks in the eastern United States. . . . "Birdwatching is much more than the art of bird identification," believes Terry McEneaney. To him it's the art of discovering how birds live. Appropriately, McEneaney does not intend ***Birds of Yellowstone*** (Roberts Rinehart; $8.95, paper) to be just another guide to recognizing birds. He offers it, instead, as a guide to locating them. To this end he describes the life zones of Yellowstone, recommends birding areas, and describes useful roads winding through the national park's ecosystems. The largest section of the book, though, looks like a typical field guide with four-color photographs. . . . Some feathered creatures that you will never encounter in the field appear in ***Extinct Birds*** (Facts on File; $35). British artist and natural historian Erroll Fuller has selected and reproduced a variety of fine-art portraits, including some of his own oil paintings, to depict 75 once-common bird species that have become extinct since 1600. Fuller discusses the ill-fated history of each species and describes each bird in field-guide fashion. . . . A quarter of the world's mammal species are in danger of extinction, note two Britons, conservationist John A. Burton and wildlife illustrator Bruce Pearson, in ***The Collins Guide to the Rare Mammals of the World*** (The Stephen Greene Press; $25). "One of the most disturbing facts to us," they write, "is the ignorance—even among generally well-informed people—of which species are likely to be threatened." To enlighten us they've prepared a guide to 1,179 endangered mammals, ranked with one to five stars depending on rarity and the likelihood of extinction. . . . Biologist Robert A. Ross, botanist Henrietta L. Chambers, and artist Shirley A. Stevenson conducted field studies for ***Wildflowers of the Western Cascades*** (Timber Press; $19.95, paper) on Iron Mountain, 36 miles east of Sweet Home, Oregon. Among the blossoms and habitats they encountered were grass of Parnassus in forest seeps, elephant's head in mires, and turkey peas in melting snow. While most appropriate if you're hiking that mountain's trails, some accessible from U.S. Highway 20, the guide is useful anywhere on the western side of the range from the Columbia Gorge to just north of the California border. . . . No frills, just the facts fill ***Concise Flowers of the Himalaya*** by Oleg Polunin and Adam Stainton (Oxford University Press; $39.95). Illustrated with color plates, this book is a useful reference for naturalists on outings in Nepal and northern India. ***—Mark Mardon***

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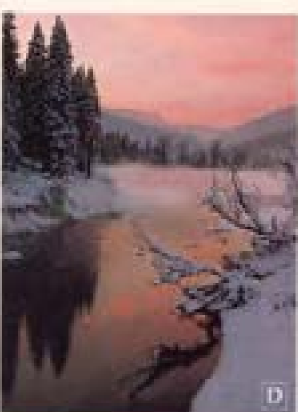

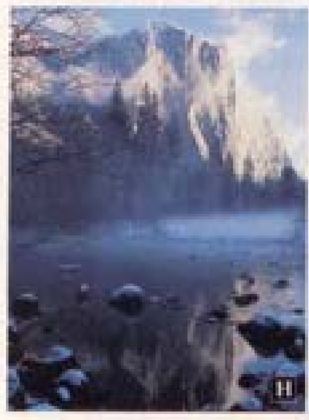

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Foul-Weather Fabrics

Clothing for outdoor enthusiasts who haven't the sense to come in from the rain.

Gregg Williams

DURING THEIR 1953 ASCENT of Mt. Everest, Edmund Hillary and Tenzing Norgay wore bulky layers of clothing made primarily of cotton, down, wool, and canvas. This year's team of Japanese climbers, whose efforts were televised worldwide, took on the peak swaddled in high-tech garments made from synthetic material. While both groups triumphed, their approaches to high fashion were generations apart. Hillary's party hearkened to ages past when hunter/gatherers discovered the value of fur in cold weather; modern climbers find their inspiration in Du Pont's 1939 unveiling of then-revolutionary nylon.

Any well-rooted couch potato can explain why it's prudent to avoid the elements altogether. Rain is wet. Snow is cold. Add to this the sweat you produce while exercising, and you're begging for clammy discomfort. Providing simple necessities like waterproofing and insulation is challenging: Humans have a low tolerance for even slight changes in temperature and can produce ten times more heat and sweat when active than when at rest.

Modern synthetics don't carry the time-honored look and feel of natural fibers, but they excel at the contradictory tasks of keeping external moisture at bay and letting body moisture escape. Even with modern technology, at the heart of an outdoor clothing system is the proven principle of layering, an efficient method of keeping warm and dry. Most synthetic fabrics are designed with three basic layers in mind: an underlayer for insulating, drawing moisture from the body, and speeding evaporation; a thermal layer for warmth; and an outer layer for ironclad protection from rain, snow, and wind.

Underwear is functionally the most important layer. Polypropylene, now the old guard of synthetic underwear, faces competition from polyester-blend rivals Thermax, Capilene, Thermolite, and Prolite 5000. Unlike polypro, the new fabrics can be machine-dried; they also tend to be softer, resist odor better, and pill less easily.

Like polypro, however, these fabrics earn their keep by their uncanny ability to transport energy-robbing moisture away from the body without absorbing much of it. Du Pont's Thermax mimics polar-bear hair in the way its hollow fibers insulate. Patagonia's Capilene is chemically treated to be hydrophilic (water loving) so that it can wick moisture from the body quickly and accelerate evaporation.

Most underwear fabrics are available in three or four weights to match various levels of exercise and weather conditions. Light Thermax is inappropriate for winter camping, while expedition-weight Capilene leaves the jogger or cyclist sweltering. If you waver between two weights, choose the lighter one and add layers of wool or pile. It's always easier to peel off an extra insulating layer than to roast in your own juices.

The thermal layer is the most straightforward. While wool and down are excellent thermal insulators, their disadvantages invite trouble: Wool takes forever to dry, and down is useless when wet. Synthetic pile and fleece garments made from such fabrics as Synchilla, Polarplus, and Armadilla are lighter than wool and cheaper than down. Like wool, they continue to insulate when wet; unlike wool, their polyester fibers absorb negligible amounts of water, and they can be dried simply by spinning them overhead.

A "miracle" fabric won't let you walk on water, only through it.

The outer shell, the final layer, protects your now warm and cozy body from the elements while still allowing moisture to escape. Types of outergear range from light, water-resistant windbreakers to high-tech, waterproof-and-breathable crossbreeds to completely waterproof sailing suits.

Any waterproof garment, such as a PVC-coated jacket or poncho, will keep rain out—but many will also lock sweat in. For sedate outdoor activities, this may be adequate. In contrast, highly breathable, water-repellent gear, such as Patagonia's H_2NO, offers sufficient pro-

tection in moderate conditions and is excellent for high-energy sports such as skiing, cycling, and running.

Designing waterproof fabrics that breathe takes a bit of alchemy. Since Gore-Tex was introduced a decade ago, dozens of coatings, laminates, fabrics, and finishes have been concocted. Besides Gore-Tex, familiar brand names now include Helly-Tech, Ultrex, and Entrant. You pay dearly for this modern technology; complete rain suits range in price from $150 up. Gore-Tex remains at the high end of the scale, while competitors like Burlington (manufacturer of Ultrex) claim equivalent protection at two thirds the cost.

Just as all three layers contribute to the effectiveness of the total package, so do the design and construction of each garment. A jacket with armpit zippers and back flaps provides the best ventilation and enhances breathability, while storm flaps along zippers and pockets help prevent leakage at stress points. Factory-taped seams are essential; expensive waterproof clothing is useless if water seeps through the needle holes.

It's important to know your destination's climate and your activity level and body chemistry when you select foul-weather gear. If you traipse through Alaska, you certainly need more than a featherweight pullover. If you cycle every Saturday afternoon come rain or shine, you'll prefer breathable, water-repellent gear that draws moisture away from your body as quickly as possible. If you chill easily, pay special attention to your thermal layer.

In any case, don't expect your outdoor clothing to drive off all the forces of nature. Some manufacturers may portray their products as unbeatable in the worst conditions, but even the most sophisticated waterproof-and-breathable garment won't keep you dry forever—it will simply keep you drier longer. As Karen Frishman, spokesperson for Patagonia, points out, "There has to be compromise. There is no miracle fabric." Even so, by carefully choosing layers of clothing made from natural and space-age fibers, you'll be able to weather the elements in style. ■

GREGG WILLIAMS *is a freelance writer in San Mateo, California.*

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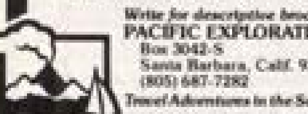

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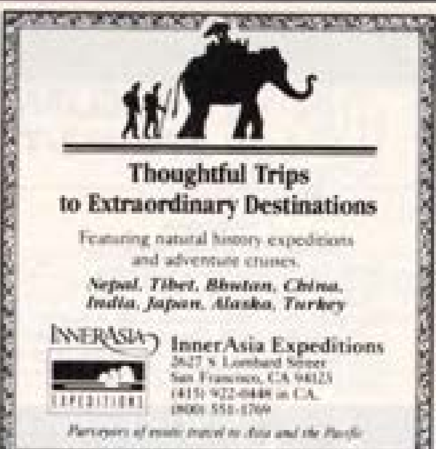

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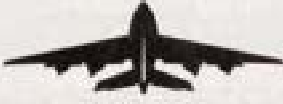

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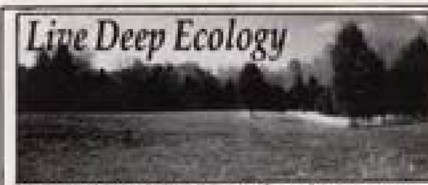

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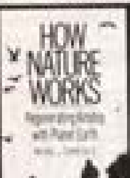

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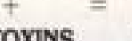

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One Inch	$240	$200	$180
Two Inches	450	380	340
Three Inches	680	560	515
Four Inches	885	740	675

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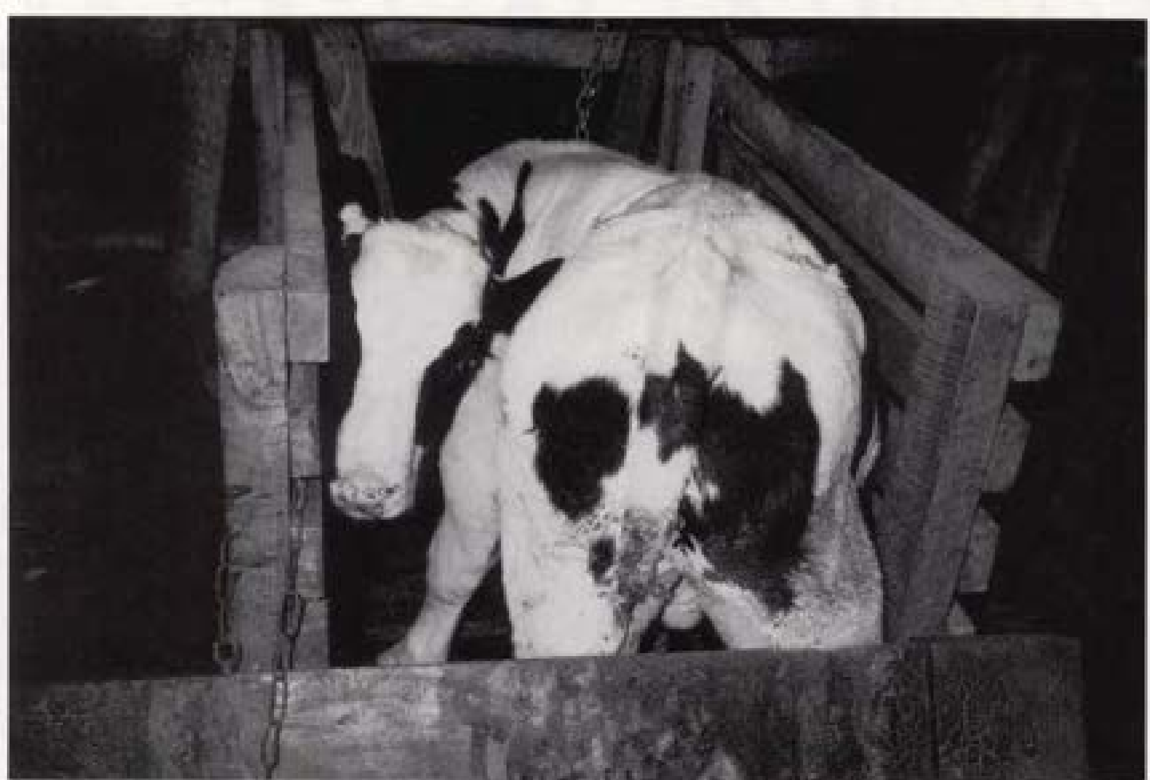
November/December Deadline: September 1

Call Lorraine Vallejo for information on AdVenture advertising at: (415) 923-5617 or send order and payment to *Sierra* AdVenture, 730 Polk Street, San Francisco, CA 94109.

Q: Why can't this veal calf walk?



A: He has only two feet.

Actually, less than two feet. Twenty two inches to be exact. His entire life is spent chained in a wooden box measuring only 22 inches wide and 56 inches long. The box is so small that the calf can't walk or even turn around.

Most people think animal abuse is illegal. It isn't. In veal factories, it's business as usual. "Milk-fed" veal is obtained by making a calf anemic. The calf is *not* fed mother's milk. He's fed an antibiotic laced formula that causes severe diarrhea. He must lie in his own excrement —choking on the ammonia gases. He's chained in a darkened building with hundreds of other baby calves suffering the same fate. They are immobilized, sick, and anemic.

Toxic Veal

The reckless use of oxytetracycline, mold inhibiting chemicals, chloramphenicol, neomycin, penicillin, and other drugs is not just bad for calves. It is toxic to you.

But doesn't the USDA prevent tainted veal from being sold? Absolutely not. The USDA itself admits that most veal is never checked for toxic residue.

Antibiotics in veal and other factory farm products create virulent strains of bacteria that wreak havoc on human health. *Salmonella* poisoning is reaching epidemic proportions.

Veal factories maximize profits for agribusiness drug companies because they are a breeding ground for disease. To keep calves alive under such torturous conditions, they are *continually* given drugs which are passed on to consumers.

It doesn't have to be this way. And with your help, it won't be. Please, don't buy veal!

Campaign Against Factory Farming

YES! Factory farms must be stopped from misusing drugs, abusing farm animals, and destroying America's family farms. Enclosed is my tax-deductible contribution of:

☐ $20 ☐ $50 ☐ $100 ☐ $500 ☐ Other________

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A free Consumer Alert pack is available upon request.

THE HUMANE FARMING ASSOCIATION

1550 California Street • Suite 5 • San Francisco, CA 94109

QUESTIONS & ANSWERS

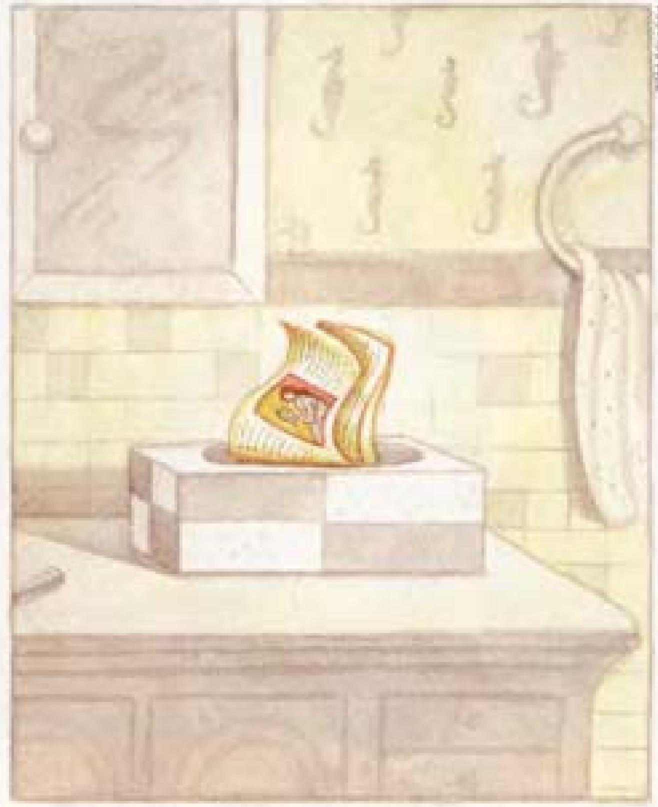
Are glossy magazines like* Sierra *recyclable? I hate to toss them out if there's a way to reuse the paper. (Beverly Sampson, Antioch, Ohio)

Most kinds of paper can be recycled to make a variety of products, but the economics of the industry favor newsprint and office paper over the coated stock used in many magazines and books.

Despite the fact that book and magazine publishers use a huge quantity of coated paper (almost 7 million tons in 1986), only a small magazine-recycling industry exists in the United States. Most magazines collected here are shipped to Asian mills along the Pacific Rim that produce a shiny type of paper not used in this country. Check with your local recycling operation; some centers will accept magazines, but others will not.

One of the problems is that magazines are so low in salvage value that centers do not necessarily earn money from them. In addition, it takes a center a long time to amass a truckload of magazines—the minimum amount required to interest the salvage companies—from residential customers. These firms usually rely on newsstand distributors to supply them with bulk quantities. The salvage companies then bale the magazines and sell them to paper mills for repulping.

The main obstacle facing magazine recyclers is clay—the substance that produces the glossy finish that publishers prize. Clay makes magazines less attractive to mills from the beginning: Mills buy used paper by weight, and they want to get usable fiber—not some other heavy substance—for their money.


TOM BONACCI

Later, after the clay is separated from the fiber, it poses a disposal problem. Because clay can kill the algae that break down wastes in sewage ponds, mills that recycle must either invest in their own disposal systems or keep their recycling of coated paper to a minimum.

In the end the mill has usable pulp, but the fibers are generally too weak to produce high-quality printable paper without substantial amounts of additional virgin wood.

While only a small number of mills in the United States accept coated stock because of these factors, the industry is nonetheless growing. Mills around the country regularly repulp glossy magazines to obtain fiber for shoe boxes, donut boxes, toothpaste cartons, toilet and facial tissue, paper towels, drywall, and roofing materials.

The Jefferson Smurfit Corporation, together with its affiliates (Container Corporation of America and Independent Paper Stock), is the largest paper recycler in the United States. Recently it began operating a mill in Oregon that uses recycled magazines to produce newsprint.

There's more than one way to recycle a magazine, of course. As the Connecticut Fund for the Environment points out, one can "share magazines with a friend, give them to children for 'cut-and-paste' play, or donate them to a doctor's office, convalescent home, or hospital."

Even with my member discount I find that I can purchase Sierra Club calendars most cheaply from discount stores. Where do you suggest I shop? (Gail W. Hanna, San Diego, California)

People buy about a million of our calendars through bookstores and retail outlets each year, and the Sierra Club receives a royalty on each sale. Some large discount chains sell our calendars at low prices as a way to build store traffic.

Sierra Club chapters and groups also sell calendars at meetings, outings, and special events. Their publications representatives usually offer purchasers delivery and mailing services. These sales support both national and local conservation and outdoor programs.

"Ask your chapter, group, or activities section what good cause you will be supporting if you purchase your calendars from them," suggests Alan Weaver, chapter and group sales manager for Sierra Club Books in San Francisco. "Sales through local Club organizations offer a good mix of convenience for members and support for the Sierra Club."

Sierra Club calendars are also available directly from the national office through the Club's mail-order service. (For the address, see "Sierra Notes," page 96.) Members will receive a 10-percent discount.

Any way you choose to purchase your calendars will benefit the Sierra Club—so pick your own best combination of support, personal convenience, and price. ■

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*Suggested retail price for our FWD DL, 5 speed manual transmission model. Dealers actual price may vary. Price does not include dealer prep, inland transportation, taxes, license and title fees. **Use Est. Mpg. for comparisons. Your actual mileage will probably be less. Subaru reserves the right to change price at any time without notice.

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Close your eyes and you'll realize just how little light was available to shoot this picture.

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PENTAX SF1