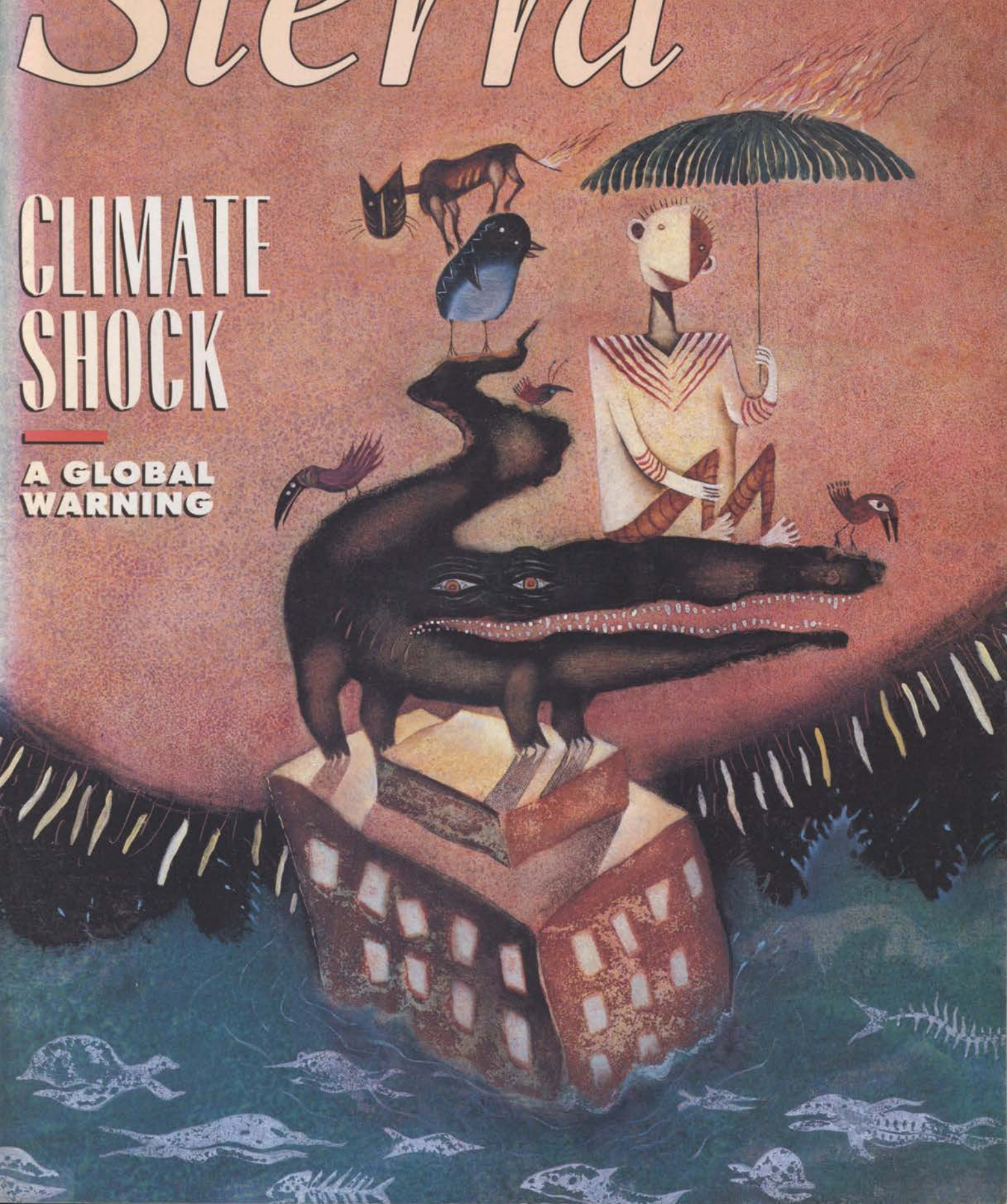


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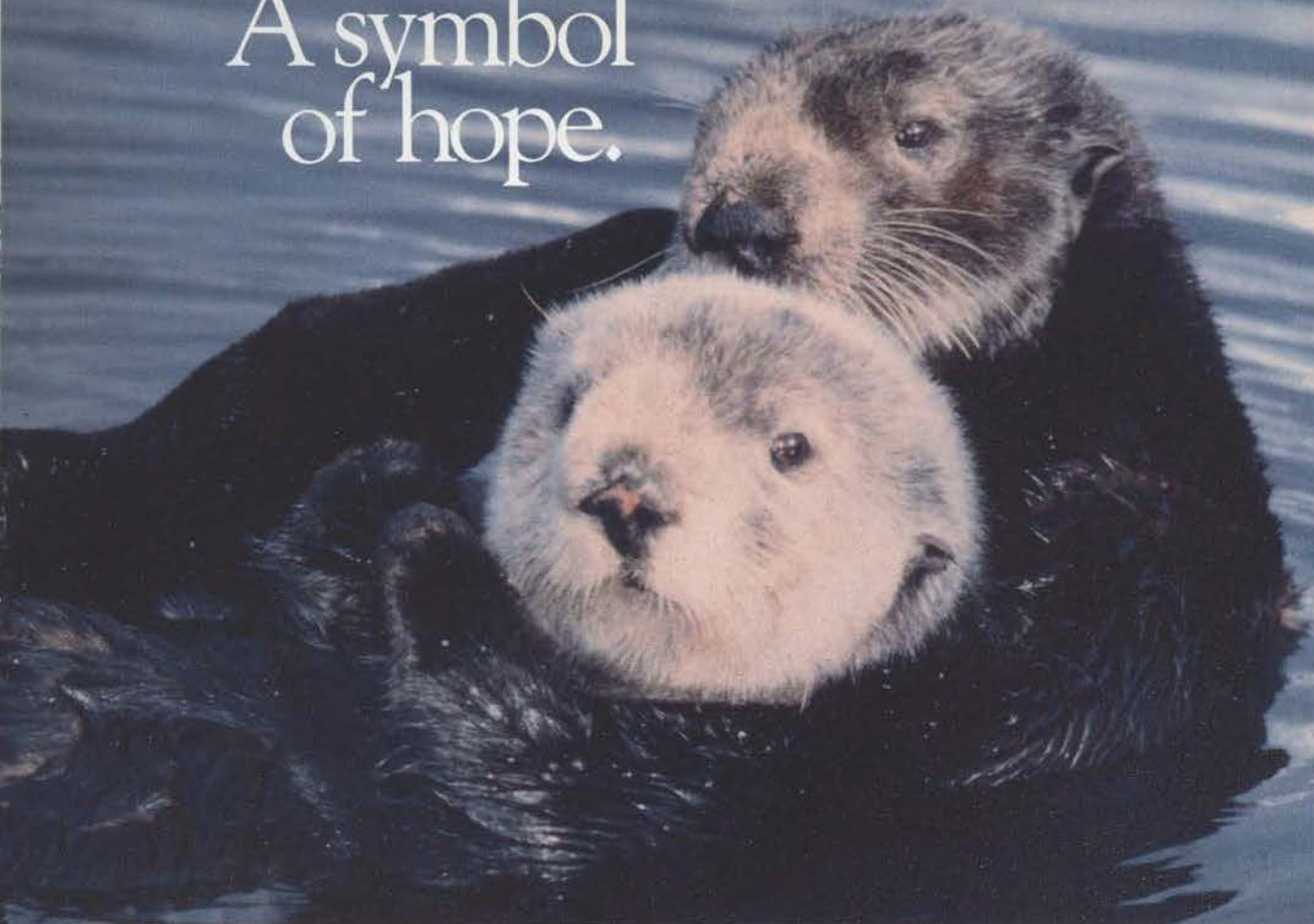
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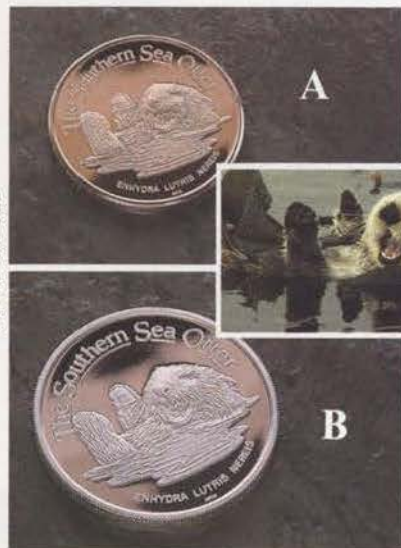
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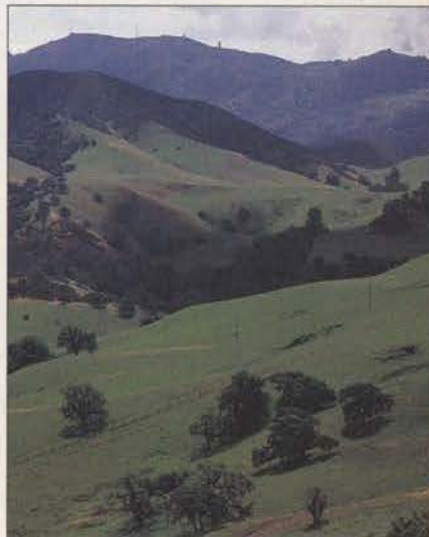
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THE SOUND AND OUR FURY

"WITHOUT YOUR HELP, THE CALL OF THE WILD
WILL REMAIN SILENT."

So ran the headline of a full-page Sierra Club ad in *The New York Times* on Sunday, April 16. We told that broad readership what it could do to help the people, the wildlife, the land, and the water of Alaska's Prince William Sound, ravaged by the March oil spill from the tanker *Exxon Valdez*.

Thousands of people clipped the ad's coupon and sent it to President Bush, asking him to mobilize federal resources for the cleanup, to hold Exxon responsible for the costs, and to protect the Arctic National Wildlife Refuge and other environmentally sensitive areas. Almost 3,000 people volunteered to work in the cleanup effort, and many contributed to the Sierra Club Foundation Alaska Cleanup Fund. These funds—more than \$100,000—are being used to support volunteer cleanup and rehabilitation efforts directed by local Sierra Club and other Alaska conservationists, and to monitor Exxon's and the federal government's efforts.

But there is much more to be done, and deeper lessons to be learned from this ecological tragedy:

■ Congress must permanently bar oil development inside America's greatest wilderness preserve, the Arctic National Wildlife Refuge. Oil companies and the Bush administration cover this area, just to the east of Prudhoe Bay (which provided the oil for the *Exxon Valdez*), and only a flat-out grassroots political lobbying campaign, involving thousands of Sierra Club volunteer activists, has blocked them so far.

We need *your* help to keep the oil industry from opening up the coastal plain of the Arctic Refuge. Now is the time to act, during the heat of anger over the spill. Write to your federal representatives today, urging them to cosponsor S.39 in the Senate and H.R. 39 in the House—bills that would designate the coastal plain off-limits to the oil companies. Urge them to oppose any legislation that would open the refuge to any kind of oil exploration or development. In addition, we must seek the buy-back of Reagan-era oil leases in Bristol Bay, and protect the waters off the Florida Keys, Georges Bank, and the California coast from oil operations. And, as events have made all too clear, oil-spill liability legislation and laws and regulations governing spill contingency plans and tanker safety must be improved.

■ Of equal importance, Congress and President Bush must take a longer view of America's energy needs. Current policy positions are skewed not toward increasing national security, but toward propping up industries that regularly foul our environment. Energy-conservation programs, including auto fuel-efficiency standards, have been gutted by the Reagan and Bush administrations; these programs need to be reinstated and strengthened, and thoughtful new policies and programs must be developed by elected officials at every level of government. Again, we need *your* help to wage an all-out campaign to make this nation more energy-efficient.

The lessons of Prince William Sound are ones we've learned at other times, in other places: We cannot sit idly back, or leave the fine details of protection and policy-making to other interests. Yes, Exxon's corporate reputation has suffered, and justly; a boycott by others is a reasonable reaction to the company's arrogant, irresponsible behavior. But too much energy devoted to these short-term details diverts attention from the most important actions we must now take.

As I recently stated before a U.S. Senate committee investigating the spill, when we are confronted with death, with destruction, it is common to feel grief, to mourn. We all mourn for Prince William Sound and the life that is no more. And it is also natural to feel anger. Anger over broken promises, anger over lies. Anger over greed, arrogance, ineptitude. Anger that so few can destroy so much.

Anger can be constructive, but only if we use its energy to undertake constructive tasks. We must never forget our grief or our anger; we must learn from this tragedy, and we must act on its lessons.

Michael L. Fischer
Sierra Club Executive Director

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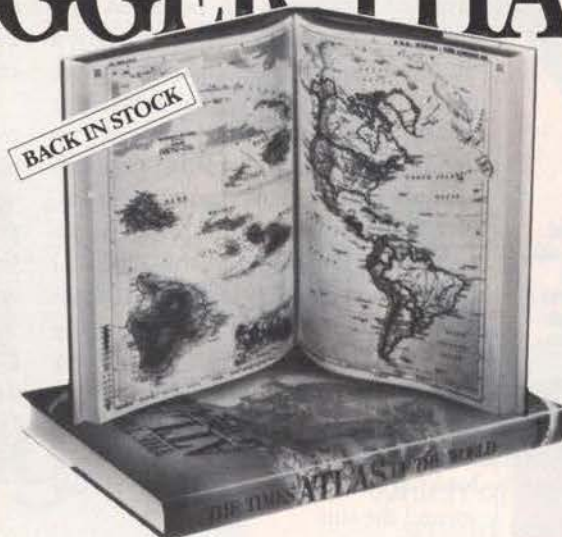
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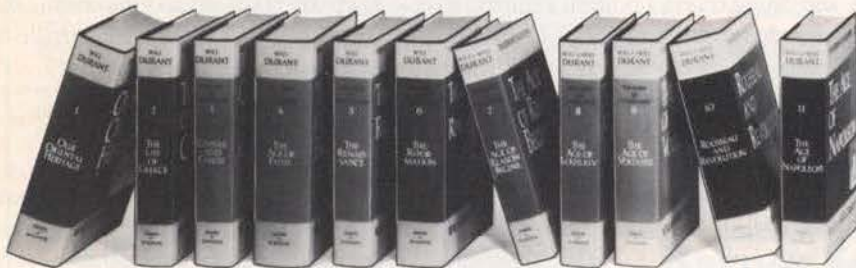
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LETTERS

RARER THAN RAINBOWS

In the spectacular aerial photo of the ocean off Madagascar printed on *Sierra's* May/June cover, Frans Lanting has not captured a rainbow—as noted on that issue's contents page. Apparently a much rarer event was recorded here: the reflected image of a "corona" around the sun. (This so-called corona, purely an optical phenomenon caused by clouds in Earth's atmosphere, has nothing to do with the sun's outer atmosphere, or corona, seen during a total solar eclipse.)

The photo shows a diffuse, overexposed, reflected sun, and overlapping arcs of color on the not-quite-glassy ocean surface. An observer on a boat positioned at the sun's reflection spot at that moment would have seen a similar-looking corona display in the sky around the sun.

Jerry Schad
El Cajon, California

INFERNAL COMBUSTION

Thanks for your special "Afield" section on the environmental impacts of the automobile (May/June). After five years of being hooted at for walking, busing, and riding trains, I bought a car and have been depressed ever since. Living autoless renewed my sense of well-being, relieved chronic neckache and freeway teeth-clenching, and let me see some earth through the eyes of the pedestrian.

Kathie C. Curtiss
Costa Mesa, California

The survey of car-ownership patterns among Sierra Club members reveals that we are really not much different from the "general population" in choosing convenience over commitment to conservation. Sad to say, but true, it ain't going to be easy for us to make the tough personal decisions we'll all have to make to save the Earth.

George E. Reed
San Francisco, California

In claiming that the congressional rollback of fuel-efficiency standards for the 1989 auto fleet resulted from pressure applied by General Motors and Ford,

you failed to mention that Chrysler Corporation was opposed to the reduced standards. Chrysler put up the money for the technology so that its cars indeed met the EPA fleet standard of 27.5 mpg for 1989. Give credit where credit is due.

It is also interesting to note that the ownership of Chrysler cars is only 8 percent of Sierra Club households, whereas 18 percent own GM cars and 15 percent own Ford products. Perhaps if your members would put their money where your mouth is, GM and Ford would comply with the EPA's mpg goals rather than lobby to have standards rolled back.

George W. Ashby
La Jolla, California

The true environmental heroes are not the yuppie Honda owners (with their 25 mpg average), but rather those who keep their 1972 Dodge Darts or VW Beetles on the road for years.

My car, a 1974 Toyota that I bought used in 1978, has 166,500 miles on it. It still shows proper compression, has never had a major repair, and all I do is keep the fluids up and the engine tuned. This is not because of who made it; it's because of who took care of it.

Jim Bennett
Washington, D.C.

Although I agree that we must get people back onto public transportation, making them pay at the pumps for systems that are nonexistent or at best pathetically insufficient is punishing the wrong people—those who are dependent on their cars to get to their low-paying jobs. The bigwigs can probably write off higher pump prices as a business expense.

William E. Burkhardt
Monterey, California

I was distressed to see you repeat the story that the General Motors-Firestone-Standard Oil conspiracy caused the downfall of public-transit systems in many American cities. While it is true that these companies purchased the

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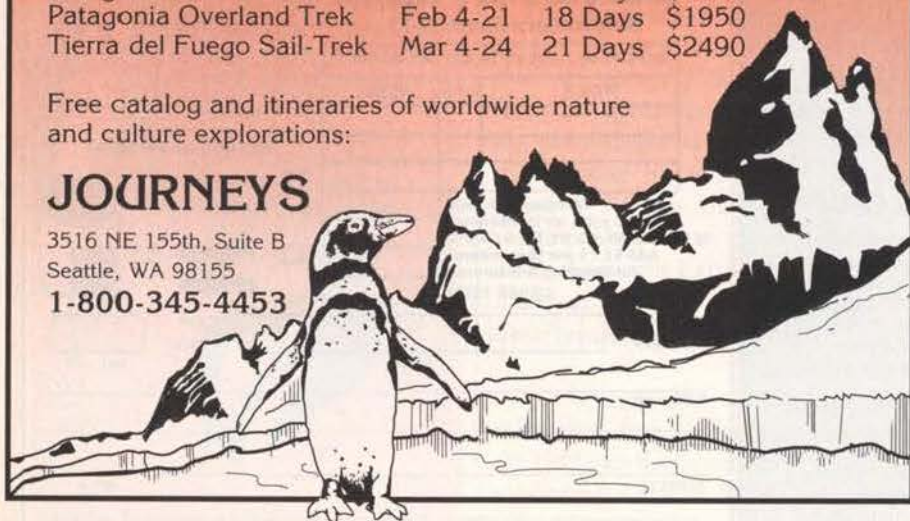
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transit systems and replaced trolleys with buses, it is also true that ridership on nearly all transit systems had been falling since the 1920s, and that many system managers were already planning to replace the trolleys. Believing that a conspiracy is the reason we do not have good public transit today prevents us from examining the real reasons for the decline of public transit worldwide.

The automobile has provided people with an excellent form of transportation. Its only failure is its success, even—as you point out—among Sierra Club members. We must learn what is attractive about the automobile and incorporate those features into the public-transit systems we advocate.

Andrew Butler Nash
Transportation Subcommittee Chair
Sierra Club San Francisco Group
San Francisco, California

In most cities, local zoning laws require that owners of shopping centers, residential complexes, and places of employment provide parking for their customers, tenants, and employees. The land and construction costs for these parking facilities can easily exceed the comparable costs of the buildings they serve. And everyone has to pay for these parking facilities, through higher prices and rents, whether they use them or not.

The secondary result of the zoning laws is that, with so much land consumed by parking, cities take on a low and sprawling character. Such sprawling cities are practically impossible to serve adequately with mass transit.

The zoning laws are a nearly perfect policy for encouraging automobile use. Since the subsidy never appears in a government budget, it is politically invulnerable. Yet the results make cars convenient and cheap, and deliver a knockout blow to public transportation.

Ralph Samuelson
Stanford, California

It was interesting, and painfully revealing, to note that advertisements for private vehicles and a special section lamenting the widespread use of same were between-the-covers companions in your May/June issue.

Sierra, well intentioned as it may be, is still forced to remain lashed to the yoke



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of the very political and economic system that has given rise to the need for the Sierra Club. It is precisely this system that must foment wars, level forests, and perpetuate a wasteful, throwaway society to guarantee its continued existence.

The choice is clear: We can continue to view our planet as a marketplace, amassing meaningless individual fortunes and suffering further depredations at the hands of the same legislators (and their corporate sponsors) who allowed mass transit to die; or we can start thinking of Earth as our home, irreplaceable and non-negotiable at any price.

Stephen L. Doll
Ormond Beach, Florida

INCITEFUL? NO, INSIGHTFUL

I had overlooked "Deep Ecology" (March/April) and probably would never have gone back to it but for the letters published in your May/June issue. My prurient interests led me to locate the story and lasciviously prepare myself for a most un-Sierran stimulation.

Alas! Page Stegner's article did nothing for my insidious desires, but did confirm my impressions of today's youth. The characterizations were superb and evocative. I'm a recently retired teacher, and I *know* such kids! How any reader could be offended by this satire is beyond me. What kinds of lives do such people lead? Are they all ostriches?

Bud Robbins
San Francisco, California

I found "Deep Ecology" funny and insightful (as opposed to inciteful). I hope those who couldn't see the forest (the point of the story) for the trees (four-letter words) are doing as much to help city-oriented youth find beauty in wilderness.





David Briscoe
Truckee, California

You have sinned, obviously. *Sierra* is intended for the humorless incantations of the apocalyptics. Don't you realize that the end of the world is at hand? Get serious! Stop this unseemly levity and—horrors!—bad language.

"Deep Ecology" was not only hilarious, it was *literature!*

Thomas H. Jukes
Berkeley, California

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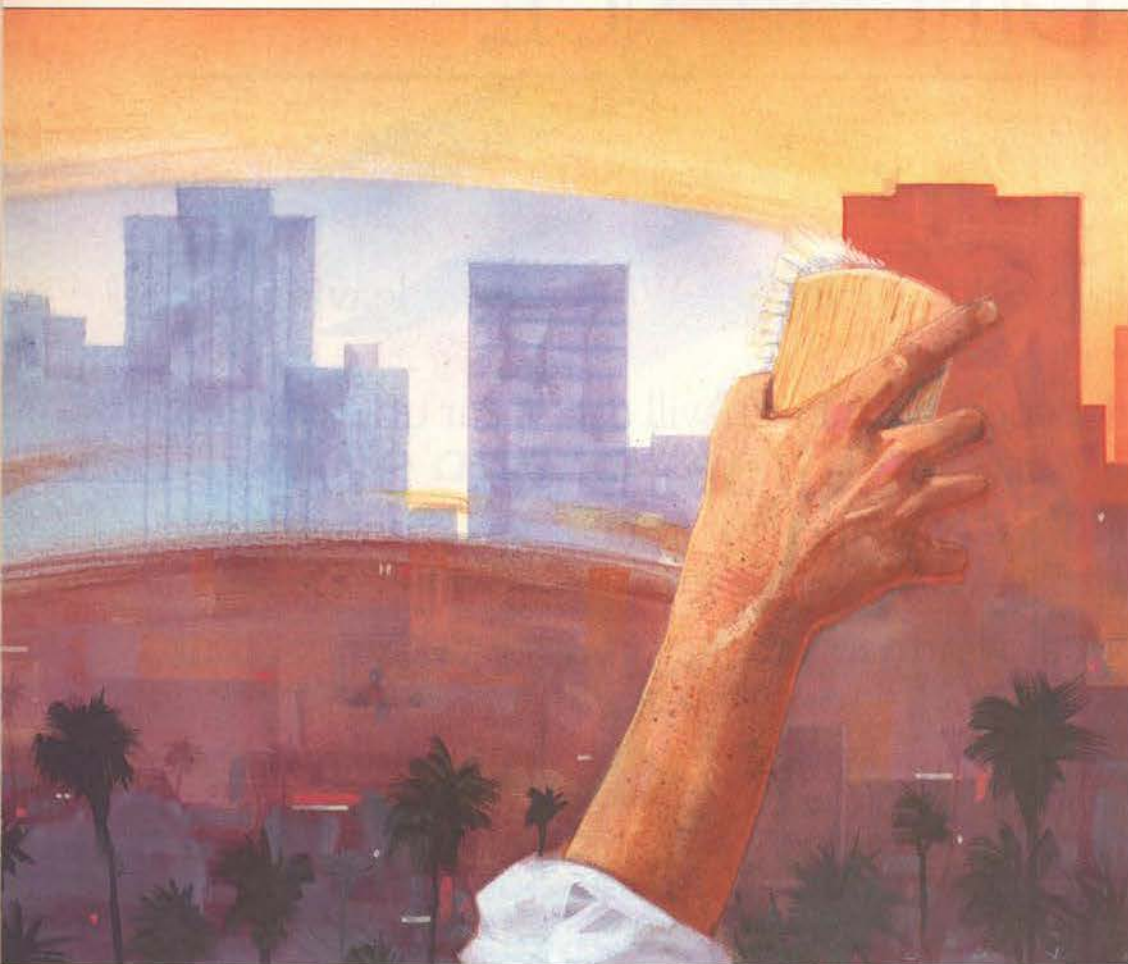
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Blueprint for Clear Skies

Los Angeles has adopted a sweeping plan to cleanse its acrid air. Is it prudently farsighted or hopelessly unrealistic?



WILLIAM CONE

erning board of the four-county South Coast Air Quality Management District, pitches the clean Los Angeles of the future: "You'll wake up in the morning and see clear skies, and they'll stay that way. You'll see the mountains every day. Fewer people will be sick from air pollution. You'll see methanol cars, or people plugging in their cars at night to recharge the batteries."

Under pressure from environmental activists, state leaders, and Congress, the district approved the far-reaching plan in March and has begun enacting regulations designed to cut air pollution by 80 percent.

The new generation of smog controls aims to wean Southern California motorists, industries, and government agencies from gasoline, fuel oil, and other high-polluting materials and get them using environmentally sound alternatives within 15 years. Within 20 years, all vehicles sold in the basin are to run on electricity or other clean power sources.

The plan delves deep into Angelenos' daily lives.

Household products that give off pollutants, such as charcoal lighter, paints, solvents, and hairsprays, must be reformulated or banned. Sales of bias-ply tires (which depress gas mileage and emit particulates) will be prohibited, and drive-through businesses will be regulated. Restaurants will have to install more efficient filters on charcoal broilers, and bakeries and dry cleaners will have to alter or replace equipment to reduce emissions.

California's industrial leaders say the annual price tag of the smog measures could be \$15 billion. The air-quality

Marla Cone

AS THE AIR turned a murky brown last month and mountain vistas became just a memory, Southern Californians began performing their annual summer rite: shutting windows, rubbing irritated eyes, and hibernating indoors on stifling afternoons, waiting for a day when it would again be safe to breathe outdoors. The summer smog season had begun for the 12 million residents of the Los Angeles Basin.

But this year there's hope hanging in the foul air. The region's pollution fighters have mounted an unprecedented attack on Southern California's smog, one that could reap clear skies by 2007. With controls proposed for virtually every pollution source—from oil refineries, utilities, and automobile engines to lawnmowers, barbecue starter fluid, and underarm deodorants—the plan is designed to enable the nation's smog capital to meet federal air-quality standards for the first time.

Henry Wedaa, who serves on the gov-

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agency estimates the plan's first phase (which will be implemented over the next five years) will cost about \$3 billion a year, or 60 cents per resident per day. The first stage will rely on existing means for controlling pollution; the costs of improvements over the remaining 15 years are difficult to calculate because they depend on technology not yet available.

Air-quality activists admit that the controls will be pricey, but say that clean air will revitalize the region's economy by making Los Angeles more livable and by generating jobs in pollution-control development. They're also betting that few companies will abandon the huge Los Angeles market, even with the added cost of pollution controls.

Reaction from Southern Californians is mixed. Wedaa, mayor of Yorba Linda, a smoggy community southeast of Los Angeles, says Southern California is committed to clean skies. "I can see why some people are doubtful, because it hasn't happened before. But it's going to happen. Period." State Assemblyman Tom Hayden, who represents coastal Santa Monica, agrees: "We cannot settle for more jobs at the price of more lung cancer." Mark Abramowitz of the Coalition for Clean Air is less convinced. The plan is "a wonderful blueprint," he says, "but parts of it are very vague and unenforceable."

Others are wary of clean air's lofty sticker price. One oil-refinery worker says it would be nice to see the high-desert mountains that ring the Los Angeles Basin more frequently—"but not if you're unemployed." The plan's most vocal critic, Los Angeles County Supervisor and air-quality-board member Michael Antonovich, says the blueprint will force companies out of business and make Southern California an economic wasteland. Its intrusion into everyday lives is "fascist," he says. "Use a barbecue—go to jail," Antonovich quipped at a press conference in March.

Environmental Protection Agency officials say achieving healthful air in a place like Los Angeles will succeed only if backed by unwavering political will. "Twenty years sounds like a long time," says David Howekamp, director of air management for the EPA's western region—but even with that schedule, he

believes, meeting the plan's goal will be "very, very difficult."

Smog fighters face the challenge of sticking to their agenda while oil companies, manufacturers, and others try to persuade the air-quality board to delay or dilute the plan. Once enacted, the board's rules are enforceable by fines, but each regulation must run the gauntlet of a public hearing before being adopted. "The real work has just begun," says James Lents, executive officer of the South Coast district.

So far, the area's largest industries are open to the plan. "The kinds of measures being advocated are going to force lifestyle changes," says Ronald Sykes, senior Washington, D.C., representative for General Motors. "Not just industry, but everyone will have to take them seriously."

The effort is being watched throughout the country, especially by smog officials in cities such as New York and Chicago that face similar although less severe air-pollution problems. In all, 100 metropolitan areas violate the federal government's ozone standard and must submit anti-smog plans to the EPA.

"All eyes are on the South Coast plan," says William Becker, who heads a

national association of state and local air-pollution-control officers. "Parts of the plan, like use of methanol and regulation of consumer solvents and auto-emissions standards, will be applied in other areas."

If the switch to cleaner automotive fuels takes place in the center of America's car culture, it will occur more easily in other areas, Becker says. With luck, Southern California won't be going it alone. The California Air Resources Board was expected to adopt tough, new auto-emissions standards in June, and Congress may enact long-delayed amendments to the Clean Air Act this year.

In the heart of the Southern California summer, the air is so oppressive that people with lung or heart disorders are forced inside, athletes exercising outdoors suffer chest pains, and teachers are advised to keep schoolchildren indoors during recess. In the meantime, Angelenos must decide whether they want to continue paying the price of foul air, or support the cost of clean air.

MARLA CONE is a staff writer for the Orange County Register in Santa Ana, California.

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Jane Easter Bahls

AGROWING NUMBER of investors are putting their money where their mouths are, and it's paying off. Just a few years ago, only a handful of upstart mutual-fund managers asked whether a company had a reputation for keeping the environment clean and treating its employees well in addition to making money. Since then, funds that filter their investments through a social screen have proved that they can attract plenty of investors and do just as well as the big boys.

According to the Social Investment Forum, a Boston-based association of investment professionals, the \$40 billion invested according to social criteria in

1985 had exploded to \$450 billion by mid-1988. (That figure includes the investments of churches, universities, and pension funds.)

As more people examine a company's ethics as well as its finances, the opportunities for individual investors grow. "This is a consumer-driven movement," says Gordon Davidson, executive director of the Forum. Although the field is still small—social funds account for just \$725 million of the \$847 billion invested in 2,800 American mutual funds—there are about a dozen funds and nearly 100 financial advisers plying the waters of social responsibility.

Using social criteria to screen investments is nothing new. In the 1920s some

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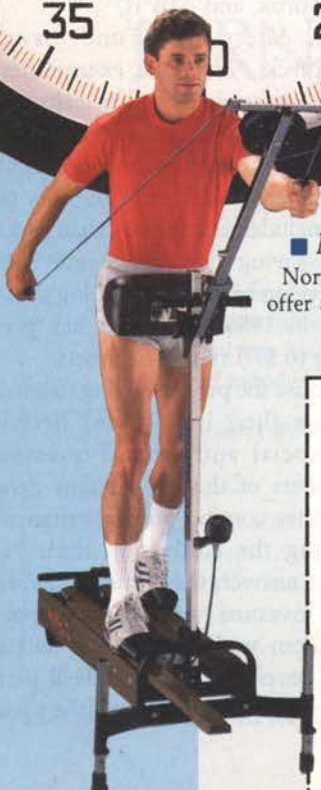
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churches started cleansing their portfolios of "sin stocks"—alcohol, tobacco, and gambling interests. Forty years later Luther Tyson, an investment adviser for the Board of Church and Society of the United Methodist Church, watched the growing interest in "peace portfolios" that avoided war-related industries. In 1970 he helped organize the Pax World Fund, which shuns sin stocks and military contractors.

But these days there's more to ethical investing than just avoiding bad apples. The South Africa divestiture movement sparked interest in the positive influence that portfolios can wield on social issues, and investors have prodded American companies operating in South Africa to become forces for positive change there. "The whole focus has shifted, from what *not* to invest in to what *to* invest in," says Patrick McVeigh, vice-president of investments for Franklin Research & Development, a social-investment house in Boston.

Most social-investment funds now consider some combination of a company's environmental record, its treatment of employees, its willingness to hire and promote minorities and women, and the safety of its products. (According to the Council on Economic Priorities, a public-interest research organization, big-name corporate good guys on environmental issues include 3M, Clorox, and AT&T.)

New Alternatives Fund, based in Great Neck, New York, exemplifies the change in focus. This "specialty" fund puts its cash into companies that are actively involved in conservation, alternative energy, and recycling. Its portfolio includes companies that produce energy-saving glass, cogenerate energy, and develop biomass technology. Established in 1982, the fund has grown rapidly to \$7.1 million in assets.

Who are the people willing to complicate their investment decisions with social and ethical questions? "Members of the baby-boom generation either coming into inheritances or climbing the ladders in their companies," answers the Forum's Davidson. These investors want to participate in the system without ignoring social issues. "People are saying, 'We'll participate, but we want to move [the system]

in a direction we feel it should go.'"

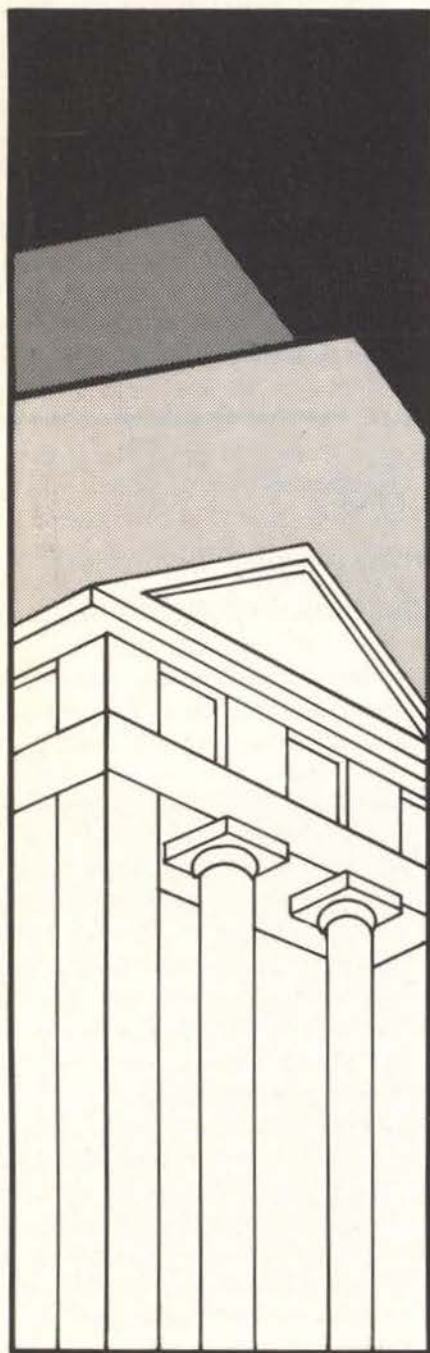
Although social funds share a commitment to judging investments by more than just red or black ink, fund managers don't agree on what constitutes worthy behavior any more than other people do. For example, Dreyfus Third Century invests in companies that provide equal employment opportunity, ensure occupational health and safety, and protect consumers and the environment—but does not reject investments in nuclear power or weapons. "We're not a politically oriented fund," says Dreyfus spokesperson Jeffrey Friedman. "We look for a consensus view of what it means to behave in an ethical manner." Working Assets Money Fund and the Calvert Group are considered to have the tightest screens of all social funds; Calvert recently toughened its environmental screening after a survey showed that the subject is its shareholders' leading concern.

But will your conscience clobber your chance of profiting from the stock market? Although some critics contend that social funds are too limited to prosper, most of the funds are performing better than the Standard & Poor's 500 stock index, a barometer of corporate health. "You can run a fund like this and do as well as any other," Friedman says. In 1988 Dreyfus grew 23 percent, finishing the year with \$184 million in assets. Two other social funds, Parnassus and Ariel Growth (one of five in the Calvert Group), were ranked among the top five performers of all mutual funds in the same period.

The success of these funds comes as no surprise to their proponents. "As companies become conscientious about how they treat the environment and their employees, they'll be more conscientious all around and be better companies," Davidson says. Likewise, fund managers who study the social bottom line gain a more complete picture of a company: "If a company is going to be slapped with a lawsuit over environmental problems," he says, "you can tell that it's going to be in trouble."

What can an individual gain by investing in a social fund? At the very least, a chance to make money on the stock market without tacitly supporting environmental carnage or sanctioning

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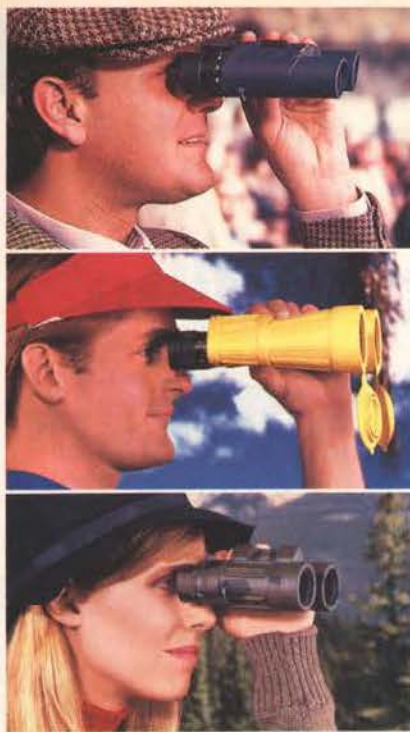
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retrograde employers. Beyond that, motivated investors can join others to try to influence corporate behavior. "Companies don't like bad press," Davidson says. "If a firm has a negative image, it's hard to employ high-quality workers." If for no other reason, businesses sometimes make decisions based on social concerns to avoid hassles with shareholders. Some corporations will change, but some won't, he says: "Over time you'll see these companies do less and less well. The era of dumping waste and hoping that no one notices is over."

Still there are skeptics. Socially responsible investing is "more a marketing scam than anything else," says Cheryl Pierce, assistant editor of the Mutual Fund Letter, a Chicago-based investment-industry newsletter. Pierce believes some funds are too loose with their definitions of social responsibility, and that ethical investments are too small to reform corporate behavior. "If you want to be socially responsible," she says, "you're better off giving blood."

Investors who want to go beyond the

blood bank need not go all the way to Wall Street. Increasingly, social mutual funds are putting their money in community-targeted programs sponsored by certain banks, credit unions, and loan organizations. For instance, Chicago's South Shore Bank, which was purchased by area residents concerned about the lack of loans available due to redlining, managed to stabilize its neighborhood by investing in such local projects as low-income housing and energy-conservation programs.

It is possible to earn interest on your principles by supporting "clean" companies and programs. As Susan Mecker-Lowry points out in *Economics As If the Earth Really Mattered* (New Society Publishers, 1988), "If we do not choose our own values, then we subscribe by default to the values of the prevalent system. Such acquiescence is always dangerous, but these days it's also suicidal. Business as usual is killing the Earth."

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

WILDLIFE

Please Don't Eat the Trees

Bears have found a tasty treat in the commercial forests of the Northwest—but the price they pay is often their lives.

Bryan Jay Bashin

EACH YEAR WHEN SPRING comes to the timberlands of the western United States, hungry black bears emerge from their long winter's sleep in search of nourishment. Often finding little to eat, some peel the bark from young trees to feast on the underlying cambium, a thin, sap-rich tissue. Thus satisfied, they may survive until other foods are available.

But not all the bears live through the summer. To save their trees and their profits, timber companies have made a regular practice of killing bears in the second-growth forests of California, Oregon, and Washington.

Over the past three decades, thousands of black bears have been trapped and shot under the authority of state depredation statutes, which allow the killing of animals that damage private

property. If a company says a bear is destroying its timber, it can obtain a state permit to have the animal killed. One popular option at that point is to call the Animal Damage Control (ADC) unit of the U.S. Forest Service, which will send a trapper without charge. After the animal is captured the ADC returns to shoot it, often leaving the carcass to rot in the forest. In 1987 Washington state reported 86 such killings; in 1986 Oregon and California reported at least 68 each. Despite recent attempts to limit the practice, the 1988 tri-state total reached perhaps a hundred.

The timber companies complain that bears lower their profits because trees can't survive when their flow of sap is interrupted. The amount of damage has not been documented, though studies are under way to determine the extent of the problem. Louisiana-Pacific's Shep

Tucker says damage varies from year to year; he doesn't have current statistics, but estimated in 1987 that the company's bear-related losses on California lands were about \$500,000.

Opponents of the killings argue that the damage is small compared with that caused by insects, for example—or with timber-company profits: Louisiana-Pacific had total revenues of \$2 billion in 1988. "The timber companies leave as much slash and waste when they cut as bears cause," says Wildlife Research Manager John Beecham of Idaho's Department of Fish and Game.

Only recently have scientists begun to understand why bears damage trees—and how the timber industry has exacerbated the problem. Because food was relatively scarce in the dark, virgin forests of the West Coast, bear populations in those regions were smaller a hundred years ago than they are today. But when loggers began cutting old growth, light intruded on a landscape that had been dim for thousands of years. In California, sparser second growth replaced millions of acres of lofty, ancient redwoods.

At first these young plantations were a paradise for black bear, which grew fat on summer berries and grasses as well as on salmon from nearby streams. But eventually erosion from logging choked the streams, which were also losing a battle with dam-builders. In recent decades herbicide spraying by timber companies has withered newly cut brushy areas, the bears' best springtime

foraging ground. Now, finding the bark of 25- to 40-year-old trees easy to peel—unlike that of the original old growth—some bears nourish themselves on cambium through May and June, until other foods ripen.

"In some ways, maybe it is human-caused," admits Gary Blanchard of Oregon's Starker Forests. "The heavy cutting of the '40s, '50s, and '60s has left us with very susceptible young forests. If the bears are there because we have these young stands of trees, then we did it."

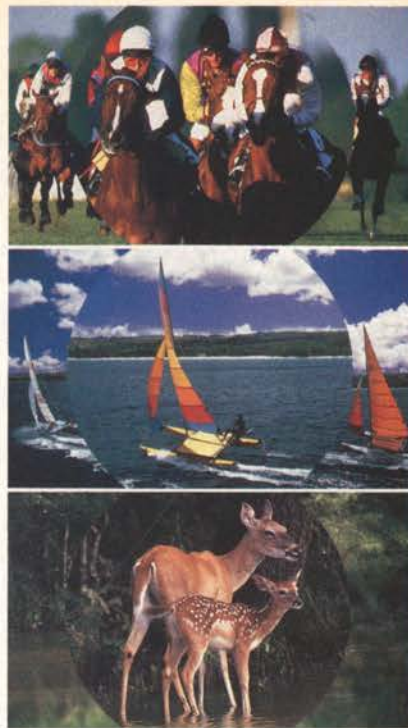
Last year public outcry pressured state agencies to seek alternatives to the depredation kills. For the first time California granted 250 private hunting permits in some of its hitherto-closed timberlands. While the hunts keep bears out of government traps and ensure that carcasses are removed, opponents say the animals should not be killed at all. Particularly disturbing is the fact that hunters are not selective in shooting—despite evidence from a 1982 study of the stomachs of animals shot on Louisiana-Pacific land that only about 30 percent of all bears feed on tree cambium.

Even if the animal is among that 30 percent, says Jim Moose, attorney for the Fund for Animals, "you shouldn't be allowed to shoot a bear just because it happened to cause some minor damage." After California's Department of Fish and Game announced in April that it would issue the special permits again this year, the Fund for Animals filed suit to ban the hunts.

Meanwhile, Washington state is ex-



Foresters find that it's easier to feed a bear than to shoot it for de-barking the wrong tree.



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TOM & PAT LEESEON PHOTOS

perimenting with an alternative that would allow both the trees and the animals to live. By combining hunting restrictions and a supplemental feeding program, it reduced bear kills to perhaps two dozen last year, a postwar low.

The feeding program was developed by Ralph Flowers, a former trapper who killed more than 1,120 bears during his 16-year career with the ADC in Aberdeen, Washington. "All the years I was hunting to control bears, I'd been searching for an alternative," he says.

Most offending animals seem to be females, often likely to leave orphaned cubs if killed. Flowers discovered in 1984 that female bears have very small home ranges. If given supplemental feed during critical spring months, he reasoned, they would not peel trees for the cambium. Last year Flowers filled five-gallon buckets with tons of his special feed mixture and attached them to trees, thus protecting more than 1,600 square miles of forestland throughout Washington.

"In many areas, the feed does a better job than the hunts," Flowers says. Damage to Douglas fir, hemlock,

spruce, and cedar trees is down 85 to 100 percent in some Washington forests where the technique is used. And at about \$2.50 per day, an animal can be nourished through an entire spring season for about \$140. "If you can feed the bear for \$100 to \$300 a year," Flowers says, "you've still got the bear, you've still got the trees, and the public is happier with you."

"It's the most effective tool we have to reduce bear damage," says Norm Vogt, assistant area forester for the Weyerhaeuser Company, which uses the feed on its 200,000-acre Snoqualmie Tree Farm near Seattle. "We're overjoyed to have it."

The method isn't trouble-free, says Mark Palmer of the Sierra Club's Wildlife Committee. It makes the animals dependent on humans and can encourage them to concentrate in unnatural areas. "But it's an interesting way to avoid the bear kills and still have the tree farms," he says.

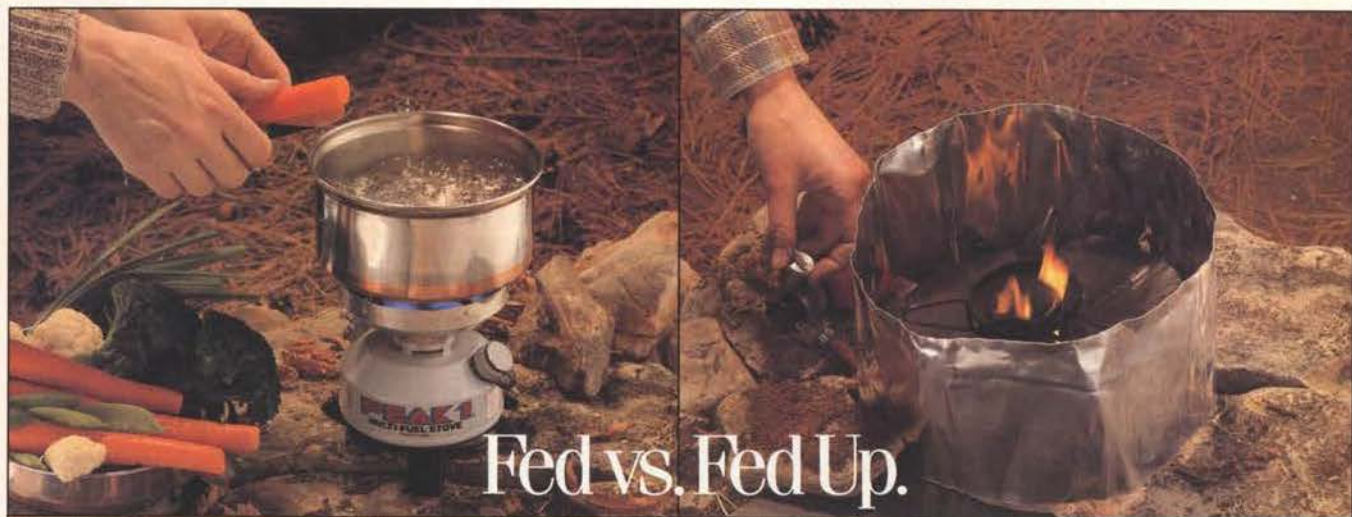
Biologists have proposed another simple, nonlethal solution: planting native grasses and legumes that would ripen in May and June. "There's a shortage of these plants," says Gary Monroe, a Cal-

ifornia wildlife biologist. This idea hasn't been tried yet, largely because timber companies routinely spray most open land with herbicides. But Monroe and many of his colleagues say the foods could be planted along roads and log landings—places where companies aren't likely to grow trees.

Other ideas go begging for research dollars. Perhaps benign, bitter-smelling chemicals could be used to make trees unpalatable, or timber companies could thin trees earlier, forcing their sap-laden growth spurt to occur when they're too young to interest the bears. Another possibility, which Oregon's legislature is considering, is to issue depredation permits only to corporations that can prove a certain amount of timber damage.

Finally, timber companies may simply have to learn to share the land with the animals. "This is part of the cost of doing business," the Sierra Club's Palmer says. "It's just one of the timber companies' expenses." ■

BRYAN JAY BASHIN is the director of the Center for Science Reporting in Sacramento, California.



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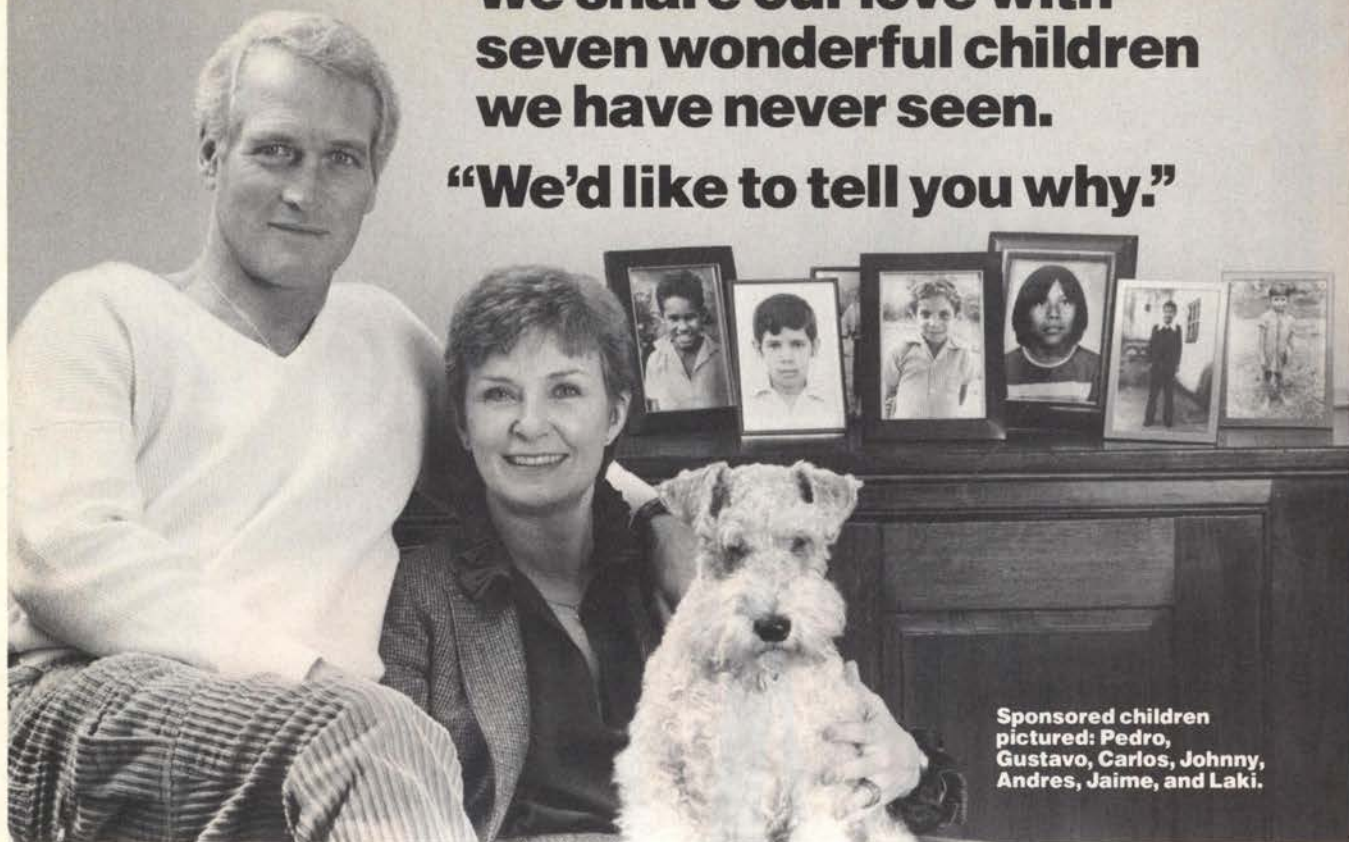
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Photo by Michael Fitz

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**CLIMATE
SHOCK**

T URNING DOWN THE HEAT

By
**James R.
Udall**

IN SCIENTIFIC CIRCLES, Columbia University geochemist Wallace Broecker is regarded as a "big thinker," someone who, in the words of a colleague, "has more ideas in a week than most people have in a lifetime." Recently Broecker has been pondering global warming. In scientific journals and congressional testimony, he has stated that the phenomenon represents a "gigantic and dangerous experiment" and "a form of Russian roulette." ■ Broecker is hardly alone. The National Academy of Sciences recently warned President Bush that "global environmental change may well be the most pressing international issue of the next century," adding, "the future welfare of human society is . . . at risk." ■ Their alarm is based on hard, cold data. In February, British scientists reported that the six warmest years in the last hundred have been, in descending order, 1988, 1987, 1983, 1981, 1980, and 1986. This finding is consistent with the greenhouse-effect theory, which holds that a buildup of heat-trapping gases in Earth's atmosphere is warming the planet. Irrefutable evidence of global warming may be available within a

**With
temperatures
rising
worldwide,
climatologists
predict a
planetary
emergency.
We have the
means to
avert the
crisis, but do
we have the
political will?**



GENE GREIF



decade, according to climatologist Stephen Schneider of the National Center for Atmospheric Research. If such evidence turns up, it could be a turning point in a long series of events that began in 1769, the year a Scottish inventor named James Watt perfected the coal-fired steam engine and sent the Industrial Revolution chug-chug-chugging on its way.

Absent a worldwide effort to reduce greenhouse-gas emissions, an average temperature rise of 3 to 9 degrees Fahrenheit is likely by 2050, according to Schneider and other scientists. Such a radical increase is guaranteed to trigger economic and social upheaval on a grand scale. Its ecological impacts—farms turning into deserts, ice caps melting, sea level rising, entire forests dying—will be catastrophic. Global warming could also be the last straw for untold thousands of species already stressed by habitat disruption, as well as others that now seem secure. A planet without polar bears? The thought may be distressing to contemplate, but it's a real possibility.

Global warming seems destined to become a genuine planetary emergency, a crisis born of one ineluctable reality: Modern societies have been forged from, and are sustained by, fossil fuels—oil, coal, and natural gas. Burning these fuels releases immense quantities of carbon dioxide (CO₂). Not a "pollutant" that can be scrubbed, trapped, or otherwise eliminated, CO₂ is a fundamental by-product of the combustion process. Thus, global warming has been simmering for a long time. Until recently, though, it has been one of the hidden costs of progress.

Devising a strategy to combat global warming is not like finding a cure for cancer. The ailment's causes are known. Coming up with a prescription for a cure is child's play; filling it, though, is a Herculean task. Any attempt to halt climatic change must be global in scope and must persist for decades, even centuries. In one fashion or

another, these efforts will affect the lives of nearly everyone on the planet.

In recent months the Beijer Institute in Stockholm, United Nations Environment Programme, World Meteorological Organization, Worldwatch Institute, World Resources Institute, Environmental Protection Agency, Sierra Club, and Woods Hole (Massachusetts) Research Center have outlined strategies for combating climatic change. Each group independently concluded that the threat of global warming is so grave that action should be taken immediately.

If the computer models are right, we are irrevocably committed to some measure of change; one to three degrees of warming are "in the bank" from past greenhouse emissions. To this, add four-tenths to one degree for each decade that emissions continue at current rates. "If our projections are correct, during the next century Earth may warm 10 to 40 times faster than it did after the last ice age," Schneider says.

Greenhouse expert George Woodwell, director of the Woods Hole Research Center, believes the immediate goal should be to slow the rate of warming as a first step toward halting it. This will buy precious time—to do more research, to anticipate problems before they occur, and to devise mitigation projects, such as breeding drought-resistant wheat, building sea walls, and transplanting endangered species.


Woodwell, Schneider, and other prominent scientists agree that we should begin by taking steps that make sense for their own sake—things we wouldn't regret even if global warming doesn't occur. "There are certain initiatives we can take that will buy us some planetary insurance and that will have other, ancillary benefits as well," Schneider says.

Such initiatives include launching a crash program of greenhouse research; banning chlorofluorocarbons (CFCs), another greenhouse gas; implementing an ambitious national energy-efficiency plan; redoubling efforts to use renewable energy sources; starting a worldwide reforestation campaign (trees sponge CO₂ from the air); and doing everything in our power to help other countries achieve their development goals with renewable rather than fossil fuels.

Today's greenhouse research efforts are woefully underfunded. "Only a trifling percentage of the federal budget is spent on global-change research," Woodwell says. "Given the stakes, this is immensely shortsighted."

In particular, scientists say, we must improve existing climate models. We have a compelling need to know with more certainty how fast the warming will occur and what its specific impacts will be on various parts of the globe. Will the Colorado River shrivel up? Is the Midwest a bull's-eye for droughts? Will the sea-level rise be feet—or yards?

Investigating the interactions between global warming, the climate, and the biosphere is also imperative. A bewildering variety of climatic and biotic feedbacks could amplify—or reduce—the warming. For example, climate models predict that the greenhouse effect will increase the world's cloud cover. But whether more clouds will exacerbate or alleviate the warming is unclear. Global warming also has the potential to affect plankton populations. Since these microscopic aquatic plants and animals now utilize huge amounts of CO₂, even minor changes in their numbers could have a dramatic



■ Logging, shown at left amid the temperate rainforests of Alaska, eliminates one of nature's most effective CO₂-trapping devices. Conservationists are calling for curbs on cutting and for increased tree-planting worldwide. Below: seedlings in a Philippine nursery.



impact on the rate of warming. In a recent *Scientific American* article, Woodwell suggested a third possibility—that global warming could feed on itself by, for instance, speeding up the decay of organic matter, increasing the amount of CO₂ released in that process. In short, the range of uncertainty remains disconcertingly broad.

“We’ve got to get the planet into intensive care, start to monitor its vital signs,” says John Eddy of the University Corporation for Atmospheric Research. A National Institute for the Environment is needed to coordinate scientific initiatives, says Columbia’s Broecker: “We must get the best people together, identify the problems, brainstorm a research program, and fund it.”

Scientists believe that CO₂ will be responsible for half the expected warming. The other half is expected to come from methane (emitted by termites, rice paddies, livestock, and coal deposits), nitrous oxide (from coal combustion and fertilizers), CFCs, and other greenhouse gases. Any control strategy must target these gases as well as CO₂.

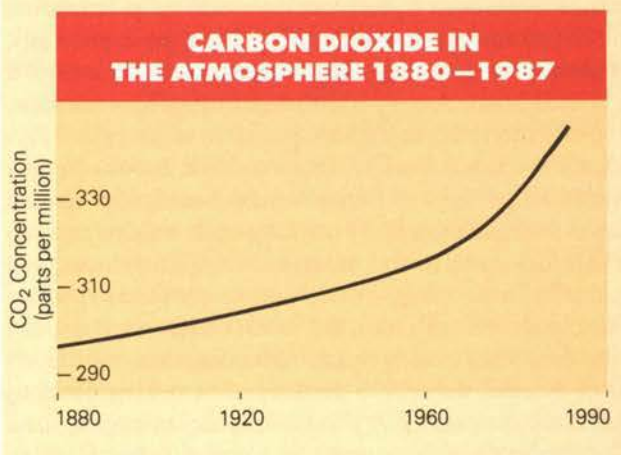
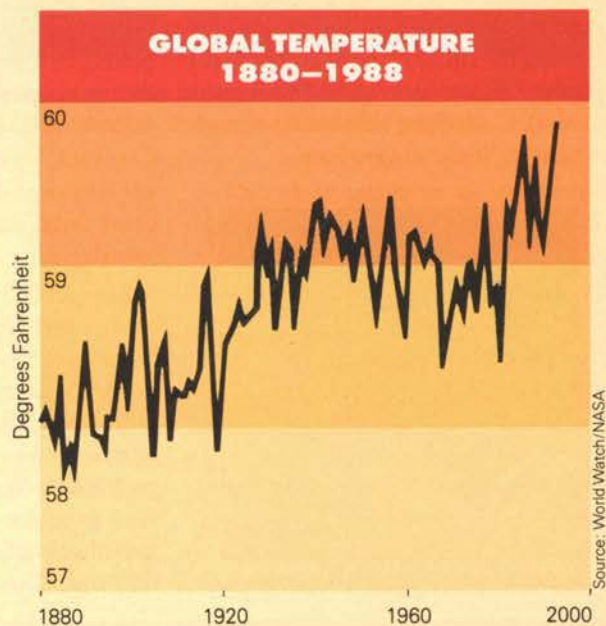
Of all the second-string culprits, CFCs, most commonly used as refrigerants and as blowing agents for foam insulation and packaging, have received the most public attention. Not only are CFCs volume for volume a greenhouse gas 10,000 times more potent than CO₂, they destroy the ozone shield that protects Earth from harmful ultraviolet radiation. The 1987 Montreal Protocol, signed by 46 nations including the United States, mandates 50-percent reductions in CFC production by 1998. Recently, however, scientists have discovered that we have already destroyed as much ozone as the treaty-makers assumed we would lose by the year 2050. Since substitutes exist, many experts are now saying CFCs should be phased out completely.

Global warming is that familiar nemesis, the energy crisis, recurring in a new guise. For decades the prevailing assumption has been that a fossil-fuel-based economy would be constrained by oil, gas, and coal depletion. Logical enough. But global warming has turned that paradigm on its head: It now appears that the atmosphere’s ability to assimilate fossil-fuel wastes will be the limiting factor. The question is no longer how much oil, gas, and coal we have, but how much we can afford to burn.

At a Hawaiian field station Charles Keeling of the Scripps Institute of Oceanography has measured the annual increase in atmospheric carbon dioxide since 1958. Extrapolating from his findings, experts conclude that to slow global warming would require a 20-percent cut in worldwide fossil-fuel combustion; to stop it would require at least a 50-percent reduction, back to the levels of the early 1960s. At the moment trends are headed pell-mell in the opposite direction: According to United Nations figures, worldwide fossil-fuel consumption may double by 2040. Trend is not destiny, but bucking this momentum is an enormous challenge.

Realistically, we will not be able to wean ourselves from fossil fuels overnight. But there are two ways to shrink CO₂ emissions while we make the transition to renewables. First, we can switch power plants from coal to natural gas, the cleanest-burning fossil fuel. Jack Lillywhite of Bechtel Power

As carbon dioxide levels have risen, global temperatures have crept upward by about one degree Fahrenheit over the past 100 years. Climatologists predict a hike of between 3 and 9 degrees over the next 60 years. Although that rise may sound small, the temperature change from an ice age to the warmest interglacial period was only about 7 degrees over thousands of years.



Corporation says, “Because natural gas produces only half as much CO₂ for a given amount of energy, it is the sexy fuel of the 1990s, a good short-term solution.”

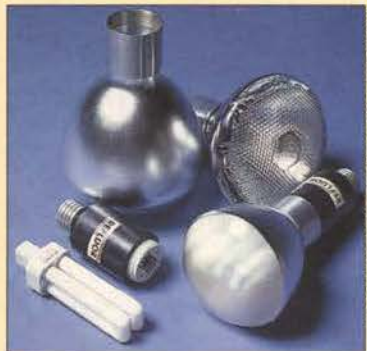
The second and far more potent way to reduce CO₂ emissions is to wring more work out of fossil fuels, to burn them more efficiently. Efficiency improvements could slash CO₂ emissions dramatically. A recent World Resources Institute study concluded that developed countries could halve fossil-fuel usage by embracing new conservation and efficiency initiatives.

The United States has a special responsibility in this regard:

A CLIMATE CHECKLIST

We've got the whole world in our hands.

WHILE WAITING for the world's governments to adopt a strategy for stabilizing the climate, individuals can do many things to slow global warming. Basically, anything that saves energy will help. Some suggestions:



Lighting lightly: compact fluorescence.

■ Drive fewer miles. The average (20 mile-per-gallon) car exhausts one pound of carbon dioxide (CO₂) for each mile it travels. If you drive 10,000 miles a year, that's five tons of CO₂. Cut back by walking, riding a bike, or taking a bus to work. If you must drive, carpool in a fuel-efficient vehicle.

■ Replace incandescent light bulbs with compact fluorescent ones. An 18-watt screw-in fluorescent bulb produces as much light as a 75-watt incandescent bulb and lasts ten times longer. Unlike fluorescent tubes, compact bulbs don't hum or flicker, and they produce a light comparable to that of an incandescent bulb. Although they cost \$15 to \$18, they will save you



TONY PLEWIK, COURTESY FRIENDS OF THE URBAN FOREST

Prudent planting: Trees can reduce fuel consumption by shading buildings.

\$25 to \$40 in electricity over the life of the bulb. More important, each compact bulb will reduce CO₂ emissions from a typical coal-fired power plant by one ton over the bulb's lifetime.

■ Be an energywise shopper. Before buying a new home, car, furnace,

Americans constitute 5 percent of the world's population, but emit 23 percent of the world's CO₂. On a per-capita basis, they each spew out a staggering 18 tons of CO₂ annually. "If the United States doesn't take the lead to reduce emissions, no other nation has the slightest incentive to cut back," says National Audubon Society Vice-President Brooks Yeager.

Increased energy-efficiency would benefit the United States in other ways, too, by reducing trade deficits, enhancing national security and industrial competitiveness, and minimizing such vexing environmental problems as urban smog and acid rain. To start, the nation merely needs to build on progress it has already made. According to energy expert Amory Lovins, since 1973 the United States has obtained seven times as much energy from efficiency savings as from all increases in energy supply. A paltry 5-mile-per-gallon improvement in the auto fleet helped lessen U.S. dependence on the OPEC nations; if the superguzzlers of the early 1970s still ruled the road, we'd be importing nearly 13 million more barrels of oil a day.

For efficiency to play a major role in reducing U.S. CO₂ emissions, however, its citizens will have to address a perverse outcome of past successes: Energy is again cheap enough to waste. As a result, new cars are becoming less fuel-efficient. (Chrysler recently announced plans to build an eight-liter, ten-cylinder engine for its new muscle car, the Viper.) Net energy demand, flat for 15 years, has begun to increase.

Why the backsliding? The United States, unlike most

other industrial nations, hasn't harnessed market forces with an energy plan. Gasoline is precious, polluting, and non-renewable. When it is half the price of milk, consumers get the wrong message. "Our failure to formulate an energy plan is just awesomely stupid, no matter how you look at it," says Broecker.

This governmental failure may finally be rectified if Congress passes either of two landmark bills: Colorado Sen. Tim Wirth's National Energy Policy Act or Rhode Island Rep. Claudine Schneider's Global Warming Prevention Act. While slightly different in approach, both bills mandate a 20-percent reduction in the country's CO₂ emissions by the year 2000. Adopting either bill would send an unmistakable signal to the rest of the world that the United States is serious about combating global warming.

If, on the other hand, the signal is not sent, and developing countries continue to emulate Americans' thriftless practices, worldwide CO₂ emissions will unquestionably spiral upward. One bellwether is China. To power its ambitious industrialization program, China plans to nearly double coal consumption in the next decade. By 2025 it may be the world's largest emitter of CO₂.

Part of the problem is China's reliance on outmoded technologies. A few years ago, Lovins says, the Chinese government built more than 100 refrigerator factories. Unfortunately, an inefficient refrigerator design was chosen, committing the nation to billions of dollars' worth of power plants to

water heater, or refrigerator, be sure it's energy-efficient. If your utility gets its electricity from coal-fired plants, use natural-gas appliances where you can; you'll cut that portion of your CO₂ output by half.

■ Plant trees. Because a fast-growing tree can recycle 48 pounds of CO₂ each year, planting trees is one of the most cost-effective, immediate, and gratifying steps you can take to fight climatic change.

■ Avoid purchasing products containing chlorofluorocarbons (CFCs). Leaky air conditioners in cars are the single largest source of CFC emissions; if you have an auto air conditioner, make sure it is leakproof. If it needs to be recharged, have its CFCs recycled. Other CFC sources include cleaning sprays for sewing machines, VCRs, and electronic equipment; aerosol dust-removers used by photographers; rigid insulation; and foam packaging. Substitutes are being developed for most of these applications. Seek out and use them where possible.



Chlorofluorocarbons, a greenhouse gas, also destroy Earth's vital ozone layer. This public-service billboard in Grand Rapids, Michigan, underscores that double jeopardy.

■ Educate your friends and neighbors. In a recent poll, Americans rated global warming as only slightly more hazardous than microwave ovens. Public awareness must be heightened; help get the word out.

■ Recycle newspapers, aluminum, glass, and other materials.

■ Make sure your home is tight and well-insulated. Each year Americans lose half as much energy through their windows as is contained in the oil that flows through the Alaska pipeline.

■ Write state and national legislators. Communicate your concerns and ask your representatives to sponsor bills aimed at curbing global warming. (For information on pending legislation, see "Can Congress Cool It?" page 36.)

■ Organize, don't agonize. If climatologists' predictions come true, global warming will be a huge problem, one that won't disappear in our lifetimes. Some people will see this as an excuse to be apathetic—but it's really a call to action. —J.R.U.

serve those appliances—and millions of tons of unnecessary CO₂ emissions.

The situation is much the same throughout the Third World and the Eastern bloc. The Soviet economy is almost twice as energy-intensive as the United States', for example, and coal burning threatens to make much of Eastern Europe uninhabitable. East Germany is the only country to produce more CO₂ per capita than the United States.

These political, cultural, and economic realities underscore how difficult it will be to implement an international plan to reduce global warming. Before the world's leaders can reach agreement on a unified strategy, they must grapple with a number of thorny questions: How should CO₂ reductions be apportioned? Which countries should bear the largest burdens? How can efficiency technologies best be disseminated? And, most critical, how can international agreements to reduce CO₂ emissions be policed?

Because the atmosphere is a commons, no country has an incentive to control its CO₂ emissions—unless it has ironclad assurances that other countries will also control theirs. This dilemma has prompted scientists and international leaders to call for an international CO₂ treaty, enforced with trade sanctions and a fossil-fuel levy, or "climate-protection tax."

Most Third World countries regard this proposal as grossly inequitable. "Seventy-five percent of CO₂ emissions come from industrialized nations—they have caused the problem," says Noel Brown of the United Nations Environment Pro-

gramme. "Why should poor countries, which haven't shared the benefits of fossil-fuel use, now be asked to share the burdens?" Such disputes could easily torpedo attempts to negotiate a CO₂-reduction treaty.

Amory Lovins maintains that the coercive approach is not only unwise but unnecessary. "Developing countries can achieve their economic goals only by building energy efficiency into their infrastructures from scratch," he says. "It's in their interest to adopt these technologies, and it's in our interest to make them widely available."

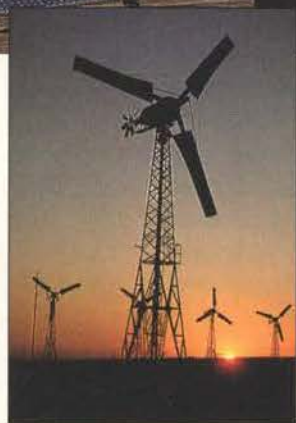
Clearly everyone would benefit if Third World countries moved toward sustainable economic development based on renewable rather than nonrenewable fuels. Why build coal-fired generating plants and power lines to send electricity to rural villages that could be more cheaply served with solar energy? Why divert precious capital to automobiles when mass transit is more economical? After all, economic progress is no longer inextricably linked to fossil-fuel use, air pollution, and acid rain. Recent advances in renewable technologies could allow Third World countries to leapfrog the dirtiest stages of the industrialization process.

Although U.S. funding for renewables was slashed during the 1980s, solar, wind, and biomass technologies are coming on strong both in the United States and abroad. Renewables currently supply 9 percent of the nation's energy, a number that is projected to double by the year 2000. Renewables are also the only energy source whose production costs are fall-



VINCE STREANO/ALLSTOCK

■ **Solar and wind power would play increasingly important roles in a world devoted to stabilizing the climate. The solar-power station above and the wind machine at right are both in California, where sun and wind provide 3.25 percent of the state's electrical generating capacity.**



KEVIN SCHAFER/ALLSTOCK

ing, despite much larger federal subsidies for fossil fuels and nuclear power.

Zoltan Kiss, chair of Chronar Corporation, a leading manufacturer of solar cells, believes that with modest government support solar power could displace up to 50 percent of the fossil fuels used in the United States within 25 years. Technical advances have made it possible to get as much energy from the sun and a ton of sand (made into solar cells) as from a ton of uranium in a nuclear power plant.

And what about nuclear power plants? *Time*, *Newsweek*, and *The New Republic* have suggested that these facilities may be one answer to global warming because they emit no CO₂. Even if that virtue outweighed the plants' environmental shortcomings, it is unlikely that nuclear power has a role to play. A recent study by two of Lovins' associates, Bill Keepin and Gregory Kats, indicates that if the world's nations were to undertake a crash nuclear program, building one nuclear power plant per week for the next 37 years, CO₂ emissions would be reduced by only 11 to 19 percent. Far better, say Keepin and Kats, to emphasize renewable and efficiency technologies, which can displace seven times more CO₂ than nuclear per dollar invested. (See "Reactors Redux," March/April.) Lovins, too, insists that efficiency is the better buy: "The United States has spent a trillion dollars on nuclear, which now provides half as much energy as wood. Let's back winners, not losers."

Developing new efficiency and renewable technologies will do little good, however, unless they can be widely deployed in poor countries. To halt global warming, Japan, the United States, and the European Community may have to forge a new ecological alliance with hand-to-mouth countries like India, China, Brazil, Mexico, Kenya, Poland, and

the Soviet Union to help them create a sustainable-energy future. A mind-boggling task on the order of a new Marshall Plan, this effort will take money—lots of it.

The Worldwatch Institute suggests that we redefine security in ecological rather than military terms, and divert \$150 billion (one-sixth of the annual global military budget) to environmental defense. But why stop there? If, as it sometimes seems, nations require an adversary to maintain their cohesiveness, let global warming be the foil—it's the common enemy. Though ancient antagonisms won't vanish overnight, armies are vestigial from an ecological perspective: The globe needs tree-planters more than soldiers.

"Plant a tree, cool the globe." That's the slogan of Global ReLeaf, a reforestation program launched last year by the American Forestry Association (AFA). As trees grow, they recycle CO₂; a fast-growing tree can "fix" as much as 48 pounds of CO₂ each year. A tree's ability to shade buildings, particularly in urban concrete jungles, can save 15 times that amount indirectly in avoided energy costs.

Although there is more than a whiff of expiation about it, a global tree-planting program is among the most sensible of the many imaginative schemes advanced to abate global warming. (Some crackpot examples: unfurling a gigantic foil-faced "sun shield" in space; using a laser to blast CFCs out of the sky; covering oceans with Styrofoam chips to increase their reflectivity; and detonating nuclear bombs to create a limited "nuclear winter.") George Woodwell of Woods Hole has proposed a worldwide reforestation program. According to his calculations, a 667,000-square-mile tract (an area bigger than Alaska) would remove about 15 percent of the world's annual CO₂ emissions. Even if a program of this scope could be implemented, stabilizing the climate would still require steep cuts in fossil-fuel use, Woodwell cautions. Planting trees is a stopgap, not a panacea.

Halting deforestation is another vital task. When a tree burns or decays it releases the carbon it has absorbed over its entire lifetime. The deforestation of tropical rainforests—now ongoing at a rate of 50 acres per minute—accounts for about 20 percent of the world's CO₂ emissions. The United Nations' Noel Brown argues that developed countries should relieve Third World countries of the \$1.3-trillion debt that is driving much of this headlong destruction: "The debt crunch

CARBON DIOXIDE EMISSIONS FROM FOSSIL FUELS, 1987

Source	CO ₂ (million tons)	CO ₂ Per Capita (tons)	CO ₂ Per Dollar GNP (grams)
USA	4480	18.37	1010
USSR	3711	13.07	1563
W. Europe	2899	7.61	651
China	2031	1.90	6925
Japan	908	7.43	564
India	549	.70	2386
Canada	388	14.93	875
World	19438	3.88	1138

Source: Oak Ridge National Laboratory/World Watch

DOMESTIC CALCULATIONS

Adding up the CO₂ you spew.

I CARE ABOUT the environment. I'm concerned about global warming. So I decided to calculate how much carbon dioxide (CO₂) my wife, two small children, and I released into the atmosphere last year.

I started with gasoline. We did a lot of driving during the year, including long trips from our home in western Colorado to Seattle and Mexico. That's 22,500 miles at 30 miles per gallon, or 750 gallons total. Burning that much gas generates about 15,000 pounds of CO₂.

Next I looked at electrical consumption. We used about 12,000 kilowatt-hours last year, which is not unusual for families in our area with all-electric houses. Our power comes from coal-fired plants that burn about a pound of coal for each kilowatt-hour delivered. So roughly 12,000 pounds of coal were burned at our behest—sending 24,000 pounds of CO₂ wafting skyward.

I flew 12,000 miles on business. Because airplanes' fuel-efficiency varies, it is difficult to calculate my exact share of the CO₂ produced, but a ballpark figure is 6,000 pounds.

That put my family's contribution

to global warming at 45,000 pounds of CO₂, not including the CO₂ generated in the production of the food, goods, and services we purchased. According to energy experts, such indirect releases are typically equal to direct releases—which would double our family's emissions to 90,000 pounds, or 11.25 tons per person.

To put this in perspective, worldwide releases of CO₂ from fossil-fuel



PAMELA PRICHETT

combustion are currently 22 billion tons per year. Experts think that stabilizing the climate will require slashing that in half, to 11 billion tons. Because the planet's population is now slightly more than 5 billion, each person's rightful share of CO₂ emissions is about two tons annually.

I tithed to the right organizations. I turn out lights. I recycle. And I've al-

ways believed that if you pack it in, you pack it out. Yet last year my family produced more than five times what our allowance would be if CO₂ emissions were rationed out fairly to each of the world's citizens in an effort to halt global warming.

If you'd like to make a rough calculation of your own emissions, here are the key formulas:

- Burning a gallon of gasoline produces 20 pounds of CO₂.
- Using one kilowatt-hour of electricity generated in a coal-fired power plant produces two pounds of CO₂. (Hydropower and nuclear electricity are CO₂-free; your local power company can tell you how your electricity is generated.)
- Burning a hundred cubic feet of natural gas (1 ccf) produces 12 pounds of CO₂ (1 ccf is equal to 1 therm or 100,000 BTUs).
- Flying one mile in an airplane generates approximately one-half pound of CO₂ per passenger.

After you've calculated your direct production of CO₂, double it to account for the CO₂ you produce indirectly through the purchase of goods and services.

Americans generate 18.4 tons of CO₂ per capita each year, but that figure is misleading because it lumps together government, industrial, corporate, and personal production of CO₂. Unless you are Donald Trump, your total should be significantly less.

—J.R.U.

gives many countries a financial incentive to clearcut. Swapping that debt for rainforest preservation would be an investment in the future of the planet."

A century from now historians may conclude that the threat of global warming was the best thing that ever happened to the environment. Humanity has an enormous investment in a stable climate, and global warming gives us a compelling, selfish economic incentive to change patterns of energy use that have proved so harmful to Earth's beauty and biodiversity.

But will global warming galvanize us? Can mankind, in Noel Brown's words, "make a quantum conceptual leap, look beyond our paralyzing manias, and mobilize human

energy and creativity in defense of Earth?" Can we resolve the growing dissonance between natural laws and human laws? Can we break our addiction to fossil fuels?

If we meet these challenges, we will solve many other heretofore intractable environmental problems—everything from acid rain to urban smog. If, however, the human response falls short, these problems will mount until they overwhelm the biosphere. From an ecological perspective, only two outcomes are possible: a big win . . . or an even bigger loss. ■

JAMES R. UDALL has covered Utah wilderness, water marketing, and the Arctic National Wildlife Refuge for Sierra. He also writes for Audubon, National Wildlife, and Outside.

NATURE UNDER GLASS

By
James R.
Udall

**A gaseous
greenhouse
threatens
nearly
every park,
plant, and
animal that
conservationists
have worked
to save.**

LAST SUMMER'S SCORCHING DROUGHT spawned a firestorm of articles analyzing the potential impact of global warming on humankind. But few of these starve-drown-and-swelter pieces paid more than passing attention to how species and ecosystems might fare. If rapid climatic change could cause a disruption equivalent to a nuclear war for *Homo sapiens*—one of the world's most adaptable species and, moreover, the only one that will have been forewarned—what unfathomable decimation might it wreak on the rest of Earth's creatures?

■ Climatologists believe Earth will warm 3 to 9 degrees Fahrenheit by 2050 if current trends in greenhouse-gas emissions continue. Biologists are more than alarmed by these figures—they are spooked by the possibility that global warming, if and when it occurs, may cause a biological apocalypse. Their fears might be hard to understand. Spooked? Why? A warming of a few degrees—won't that just mean less snow, more Coppertone? ■ George Woodwell, a greenhouse expert who is director of the Woods Hole Research Center in Massachusetts, doesn't see it that way. "Rapid change is, almost by definition, the enemy of life," he says. "Great caution seems appropriate before committing the world to irreversible changes of unknown magnitude and effects." ■ According to ecologist Norman Myers, there's a striking correlation in the fossil record between previous mass extinctions and climatic



CAN CONGRESS COOL IT?

The climate on Capitol Hill.

GLOBAL WARMING has moved off the back burner in our nation's capital. "In 20 years in politics I have never seen an issue move as rapidly," says Sen. Tim Wirth (D-Colo.), who chaired last summer's Senate hearings on the greenhouse effect.

Since the hot, dry summer of 1988, nine global-warming bills have been introduced. Although the policy debate is just beginning, "politicians have started to take the issue seriously," says the Sierra Club's energy

and climate lobbyist, Dan Becker.

The two most comprehensive bills are the Global Warming Prevention Act by Rep. Claudine Schneider (R-R.I.) and the National Energy Policy Act by Sen. Wirth. Both bills call for a 20-percent reduction in the nation's carbon dioxide emissions by the year 2000, placing heavy emphasis on increasing energy-efficiency and accelerating the development of renewable-energy technologies.

"Efficiency is not a panacea,"

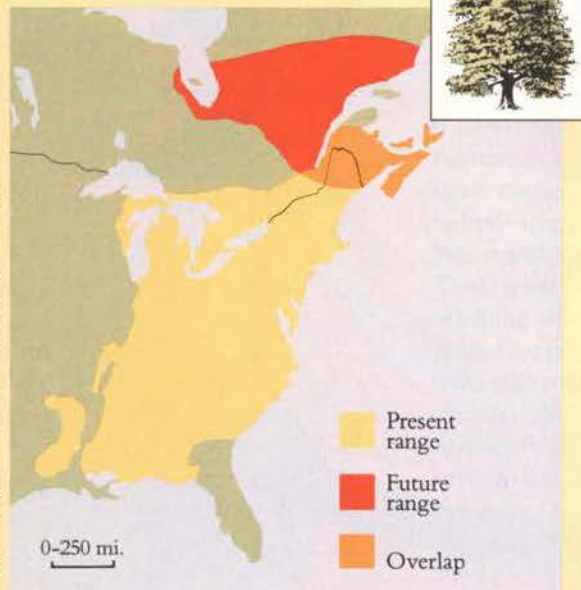
Schneider says, "but it will reduce greenhouse gases and spur economic productivity while saving American consumers billions in energy costs."

By early May the Schneider bill had 111 cosponsors and the endorsement of more than three dozen organizations, including the World Wildlife Fund, the Worldwatch Institute, Environmental Action, the Union of Concerned Scientists, and the Sierra Club.

Wirth's bill, with 33 Senate cosponsors, is more controversial among environmental groups because it attempts to redirect existing nuclear-power subsidies toward development of "safer" and more cost-effective reactors. "The bill has strong, far-reaching provisions promoting energy conservation, renewables, and population stabilization," says Sierra Club Conservation Director Douglas Scott.

THE FLIGHT OF THE BEECHES

University of Minnesota researchers Margaret B. Davis and Catherine Zabinski warn that a doubling of carbon dioxide emissions by 2090 could play havoc with forests. According to one climate model they used, the East's ubiquitous beech (present range shown in yellow and orange) would nearly vacate the United States, moving into a shrunken range to the north (shown in orange and red).



Source: Proceedings of the World Wildlife Fund conference "Consequences of the Greenhouse Effect for Biodiversity," October 4-6, 1988

change. Habitat destruction has already put hundreds of thousands of species at death's door, Myers says. Global warming may well open it and shove them through.

Michael Oppenheimer, an atmospheric scientist with the Environmental Defense Fund, says that by fundamentally altering the composition of the atmosphere we are venturing into uncharted, risky terrain. "Remember," Oppenheimer cautions, "nobody predicted the ozone hole. This suggests that we ought to be extremely skeptical of our predictive capabilities regarding global warming—and we ought to expect further nasty surprises."

So much for the generalities. But how will warming affect polar bears? Turtles? Redwoods? Plankton? Alligators? Oceans? The Arctic National Wildlife Refuge?

Last October, at a conference organized by the World Wildlife Fund, nearly 400 scientists and environmentalists met to compare notes on these and similar questions. Using a West African term for magic, conference organizer and conservation biologist Robert Peters summarized the grim take-home message succinctly: "Lots of bad juju."

"If the climate models turn out to be right, the new world will be biologically less rich and less stable," said Dennis Murphy of the Center for Conservation Biology at Stanford University. "As climatic zones move north and south, away from the equator, species will have to move too, in order to survive. Some will fail and become extinct."

Peters warned that when it comes time to move, many species will find themselves "man-locked," their escape routes blocked by highways, cities, and "agricultural deserts." According to Peters, types of species and communities particularly at risk include poor dispersers (snails and most trees, for example), peripheral populations (plants and animals now found at the edges of their ranges), geographically

"But we believe that its nuclear provisions are undesirable. Nuclear subsidies should be abandoned, period. Nuclear power, with its huge costs, its intractable waste problem, and other hazards, is no part of the answer to global warming."

Both bills are so comprehensive that they could easily get bogged down making their way from committee to committee. To keep the clock from running out in this congressional session, legislators are planning to break off provisions and move them separately through Congress. "This approach means that there is a good chance that parts of the Schneider and Wirth bills will be enacted this session," Becker says. "The Sierra Club will be lobbying to enact the most urgently needed measures."

Schneider predicts that Congress

will at least approve new scientific research on the causes and consequences of the greenhouse effect, mandate phaseout of CFCs, boost funding for renewable-energy and efficiency technologies, alter foreign-aid programs to discourage tropical deforestation, launch a national tree-planting program, and require utilities to meet customers' needs with a "least-cost" approach. (Conservation and efficiency improvements can usually meet those needs more cheaply than additional power can.)

Much—perhaps too much—depends on the weather. Another scorching summer would increase the momentum of global-warming bills; a cool summer, which meteorologists say is due, would lessen it—and heighten the need for outside pressure to keep Congress focused on the issue.

Schneider says people need to "take personal responsibility for bringing about change. My colleagues in Congress need to receive tens of thousands of letters. It's no longer acceptable for concerned citizens to sit by the sickbed of ailing Mother Earth."

"The political task is daunting," admits Wirth, who has been barnstorming the country explaining the greenhouse effect to often-skeptical business audiences. "But next to nuclear disarmament, I believe that global warming is the single most important challenge mankind faces. The nations of the world must adapt their behavior to protect the stable climate on which so much human endeavor depends. How we deal with this challenge may determine whether our children and grandchildren inherit a livable world."
—J.R.U.



PAT O'HARA



DAVID J. CROSS

Global warming could push mountain dwellers upward in search of a compatible climate. The shift could decimate certain species at the highest elevations in alpine communities (above left). Climatic change could also tear apart rare, fragmented communities such as the remnant old-growth redwood forest in California's Humboldt County (above right).

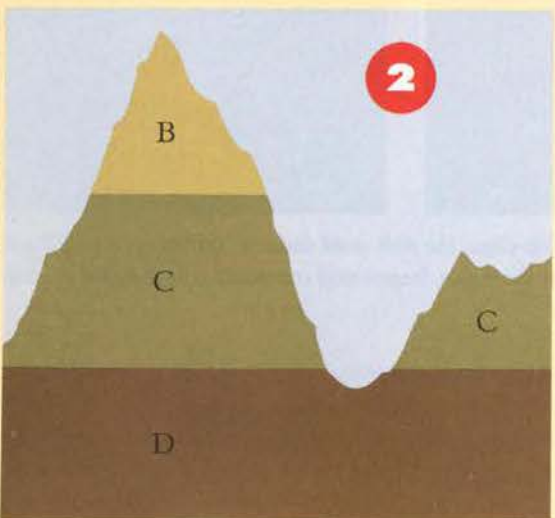
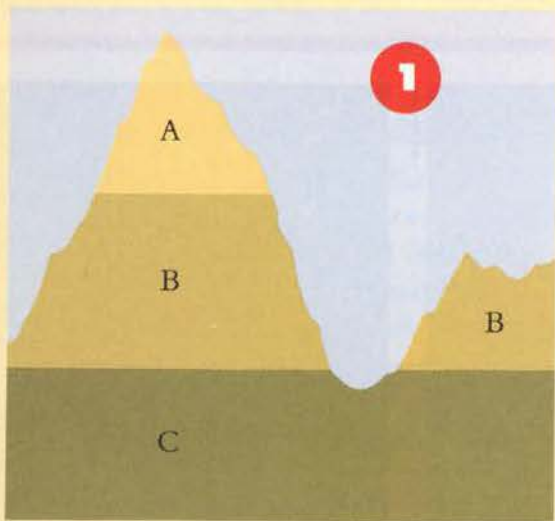
localized species (redwoods), genetically impoverished species (any currently endangered), specialized species (the Everglades kite, which is dependent on the apple snail as its single food source), annuals (which would suffer reproductive failure due to droughts and heat waves), montane and alpine communities (butterflies and wildflowers isolated on mountaintops), Arctic communities (where temperatures are pre-

dicted to increase most), and coastal ecosystems (which would be devastated by sea-level rises).

Of course, not every species would see its range shrink. Environmental disruption would usher in a heyday for plant and animal pests. Tropical insects, parasites, and diseases would migrate to more temperate regions. The range of the African tsetse fly, for example, would shift southward, bring-

NO ROOM AT THE TOP

A modest increase in temperature could alter mountain landscapes dramatically. Figure 1 shows the current habitat of species A, B, and C; Figure 2 shows how their range might be affected by a rise of 5.4 degrees Fahrenheit. Such a rise would push vegetative communities approximately 1,600 feet upward, says World Wildlife Fund biologist Robert Peters. That shift could mean habitat loss and local extinction for species A living at the top of the mountain. Because mountain peaks are smaller than their bases, it would also mean reduced habitat for species B and C as they moved up, and possibly colonization by an entirely new species (D) at the base of the mountain.



Source: Robert Peters and Joan Darling, *BioScience*

ing sleeping sickness with it. Hookworm infestations could become rampant throughout the Northern Hemisphere.

Because global warming is projected to be greatest at high latitudes, polar regions would likely show the first signs of ecological damage. The Arctic and Antarctic oceans currently harbor the world's most productive fisheries. At the base of these fertile food chains are plankton—microscopic plants and animals that thrive beneath the ice covering these waters for much of the year. Declines in the extent of sea ice, however, could cause a plankton crash that would topple a huge biomass of fish and seabirds. And if the sea ice vanishes, as some climate models predict, polar bears, seals, walrus, and other animals that depend on it will vanish, too.

Research by Margaret Davis, an ecologist at the University of Minnesota, indicates that forests throughout the United States would shrink like cheap T-shirts along their warmer and drier margins, with the Southeast's forests vanishing entirely over a period of decades. By the year 2090, climate zones in the East would have shifted 300 miles to the north—at rates ten times faster than most tree species can migrate. "Trees aren't very good at picking up and walking north," notes Deborah Jensen, an ecologist at the Pacific Institute. "Acorns get carried around by birds and squirrels, so oaks may have a chance to track the changing climate. But many other tree species will be left behind."

Sea-level rises would devastate coastal wetlands. For example, a three-foot rise, possible by 2050, would drown most of Everglades National Park and the already endangered Louisiana coastal wetlands. Attempts to protect buildings and roads with sea walls would only compound the biological loss by directing the full force of storm surges onto adjacent wetlands.

Because temperature has ceased to be a major constraint on human activities, it's easy to forget that it governs many aspects of plant and animal reproduction. For example, the gender of some reptile offspring is controlled by the eggs' incubation temperature. Alligator eggs incubated at 93 degrees or above produce males; temperatures below 86 degrees produce females. (In sea turtles, it's just the reverse: Warmer temperatures produce females.) "It's conceivable that we could end up with a total absence of one sex," says biologist Daniel Rubenstein of Princeton University.

University of California at Berkeley ecologist John Harte fears that an altered climate will have ripple effects that could be far more damaging than the more obvious direct impacts. For example, a melting of permafrost in Alaska's Arctic National Wildlife Refuge would destroy its tundra ecosystem. These windswept plains are the main calving grounds for 180,000 caribou and a critical staging area for snow geese and other birds. As the tundra thawed, the underlying peat would begin to decay. This would release immense quantities of carbon dioxide, leading to even more warming.

Oceans are the largest Pandora's box in the global-warming scenario. The greenhouse effect has the potential to change the upwelling patterns that sustain world fisheries as well as the rainfall patterns on which agriculture depends. If oceans warm and rise, coral reefs, which currently harbor



ART WOLFE

two thirds of the fish in tropical waters, may shrivel. Even ocean currents could switch—a nasty surprise whose impacts, says Oppenheimer, “would dwarf those of the ozone hole.” If the Gulf Stream stopped carrying warm water from the Caribbean northward, for instance, temperatures in Northern Europe could fall 8 to 15 degrees, ushering in a new ice age.

The implications of global warming for conservation policy could not be more profound. The warming is expected to be more rapid than any in human history; yet all preservation efforts to date have assumed a stable climate. If climatic upheaval yanks the habitat “rug” from beneath national parks, forests, rangelands, and wildlife refuges, we can expect a wholesale reshuffling of biotic communities, disruption of predator-prey relationships, and the loss of many species. The conclusion is inescapable: The specter of global warming puts everything conservationists thought they had saved at risk once again. We’re back to square one.

In a world where rapid climatic change became the norm, conservationists would have to consider not merely how to preserve a species in a place, but also how to preserve it through time. UC Berkeley’s Harte thinks we should hedge our bets, by diversifying the number, location, and size of the parks in our portfolio, and by making conservation of biodiversity a higher priority on the 95 percent of the planet not dedicated to parklands.

“If we are concerned with maintaining biological diversity—not just to eke out another 50 years or so of species survival but to preserve some remnants of the natural world for the year 2100 and beyond—we must begin now to incorporate information about global warming, as it becomes available, in the planning process,” Robert Peters says.

This would mean different things in different places. For



STEPHEN J. KRAEMANN / DRK PHOTO

■ While some species might prosper in the face of rapid climatic change, the Arctic caribou could suffer—its coastal-tundra calving areas shrunken by rising seas and invaded by trees, its finely tuned migration patterns disrupted. Alligators would likely lose habitat too, and might find themselves unable to produce female young, whose eggs incubate only below 93 degrees Fahrenheit. The endangered Everglades kite (at right), already on a precarious perch in Florida, could disappear entirely if the temperature rises.

M. P. KAHL / DRK PHOTO



THE SIERRA CLUB'S CLIMATE CAMPAIGN

"TO DEAL WITH human-caused climate change requires nothing less than a top-priority, comprehensive campaign," says Warren Liebold, chair of the Sierra Club Energy Committee.

Liebold, along with Club volunteers and our energy and climate lobbyist, Daniel Becker, has recently helped formulate and mobilize the Sierra Club's four-part climate campaign, focusing on local, state, federal, and international action.

Working locally, we will try to develop a broad constituency for strong climate-protecting actions. Sierra Club chapters and groups will ask local governments to embrace such policy goals as achieving a 20-percent reduction in carbon dioxide emissions by the year 2000, and to take specific actions, such as buying only fuel-efficient vehicles and using energy-efficient lighting. They will also urge governments to establish study commissions composed of local officials, scientists, and environmentalists to identify local causes and effects of global warming.

At the state level, Sierra Club chapters will lobby for legislation to reduce emissions of greenhouse gases. Some states have already taken the initiative: Both Vermont and Hawaii have decided to ban the sale of certain CFC

products within their borders. To encourage more of these efforts, Sierra Club California (1014 Ninth St., Suite 201, Sacramento, CA 95814) has published "The Greenhouse Effect: The Need for California Leadership," which includes a ten-point plan for state action. (Copies are \$5.) "Many of the handles for gaining energy-efficiency lie in state policy, so assisting our chapters in lobbying states will be a major focus of the Sierra Club campaign," Liebold says.

At the federal level, the Sierra Club will work with other national groups to shape constructive legislation. Club volunteers from key states will travel to Washington for lobbying drives on issues that need strong grassroots support: banning CFCs, dramatically increasing auto fuel-efficiency, and enlarging budgets for energy-conservation and renewable-energy research and development. The Club will also try to convince President Bush to provide strong leadership on this issue. We would like to take heart from his campaign statement that "those who think we can do nothing about the greenhouse effect are ignoring the White House effect." But Bush operatives appear to be trying to sabotage any real presidential leadership. The Office of



Management and Budget's censorship of a top government scientist in May was only one indication of the administration's ambivalence.

International action is crucial as well. Third World and Eastern European countries will need both financial and technological support to develop energy systems that don't rely on fossil fuels. Deforestation can be stopped too, but only when nations realize it is in their own best interests. The Sierra Club is already working to protect rainforests and to discourage unwise development projects funded by the U.S. Agency for International Development, the World Bank, and similar institutions. Club leaders will also collaborate with environmental groups in other nations to lobby for strong international agreements to reduce emissions of carbon dioxide and other greenhouse gases.

The Sierra Club has produced a poster on global climate change that activists will use in lobbying local, state, and federal governments. (Copies are \$5 for nonmembers and \$4.50 for members; add \$1 for shipping from Sierra Club Public Affairs, 730 Polk St., San Francisco, CA 94109.) In September the Club will publish a book, *Global Warning*, written by climatologist Stephen Schneider.

Global climate change is a deadly serious issue, demanding a response from both government and business that fundamentally and rapidly alters the fossil-fueled engines of the world economy. We can be encouraged by the concern that has already been aroused. But with so much more to be done, greater public awareness and political activism are urgently needed.

—Douglas Scott
Sierra Club Conservation Director

instance, coastal preserves might be expanded inland to include terrain at a variety of elevations. "That way," says biologist Larry Harris of the University of Florida, "whatever the sea-level rise, you'll have something left."

Climatologists believe that we're already committed to one to three degrees of warming due to past greenhouse-gas emissions. Beyond that, however, additional warming is *not* inevitable—the planet's destiny is cradled in human hands.

More than a few ecologists think this may be the spookiest

thing of all. Placing the challenge in a cultural context, George Woodwell says, "Until now Western civilization has assumed that the world would take care of itself. But Earth is no longer large enough to accommodate the assaults of contemporary civilization. . . . The world is life itself, and we need to provide a new stewardship that we have not yet been willing to provide. That stewardship must bring about a revolution in the world's governments—or we face a crippling, global biotic impoverishment." ■



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UNCOMMON PERCEPTIONS

A GALLERY OF CONTEMPORARY LANDSCAPE PHOTOGRAPHY



BRAVO 20 BOMBING RANGE NEAR FALLON, NEVADA, 1986
PUBLIC LAND SUBJECTED TO 33 YEARS OF UNAUTHORIZED BOMBING BY THE MILITARY

RICHARD MISRACH

SELECTED AND INTRODUCED BY REBECCA SOLNIT



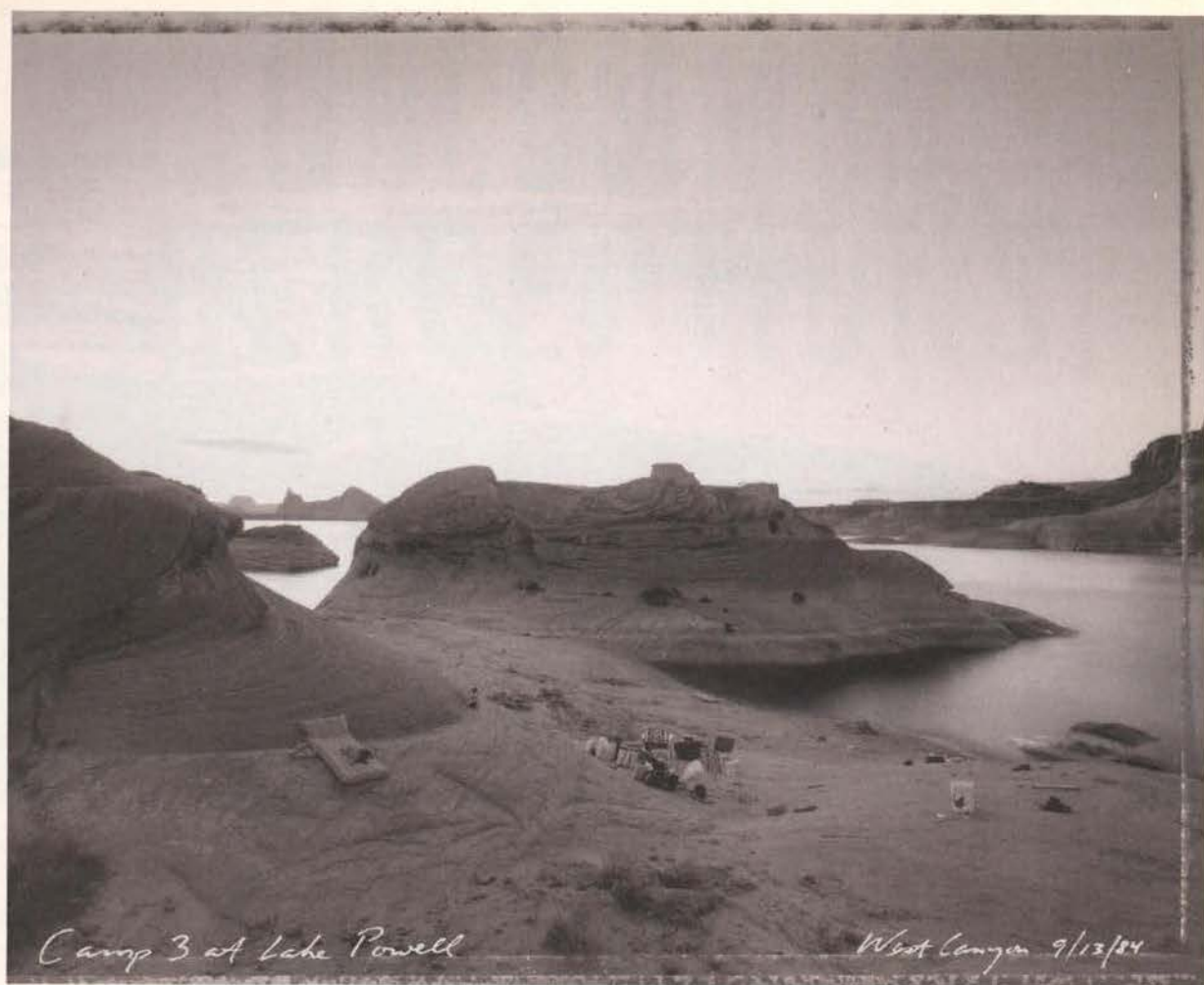
HORSESHOE FALLS WITH SPRING ICE, 1985

JOHN PFAHL

"THE WHOLE WORLD IS GOING TO PIECES, and Adams and Weston are photographing rocks," spluttered French photographer Henri Cartier-Bresson in the 1930s. For decades that sentiment prevailed among artists, who saw the landscape as irrelevant to the issues and crises of our time. Indeed, usually framing a formal beauty, traditional landscape photography implied that landscape was an escape.

In the early 1970s, however, a new generation of photographers began to examine the land with the intimacy of portraiture and the passion previously reserved for documentary photography.

Many of these artists occupy themselves with impositions on the landscape: the flimsy, sterile structures, the dams, the mines, the tawdry recreational resorts. Their work is, for the most part, deeply pessimistic, and the beauty that photographers such as Lewis Baltz find in rubble heaps and roadside foliage does little to mitigate the gloom. Other artists, such as Richard Misrach, who moved from socially concerned work into what he thought would be the neutral territory of remote landscapes, have rediscovered politics in the ►



CAMP 3 AT LAKE POWELL

MARK KLETT

► land. Over the past several years Misrach has made increasingly troubling images of the California-Nevada desert, of human follies and brutality that not even the desert's vastness can swallow up.

Another group of photographers explores the conventions that influence our perceptions of the natural world. Mark Klett spent years visiting and photographing the sites that the 19th-century U.S. Geological Survey photographers had documented, in the process discovering much about those photographers' visual values. Since then Klett's work has both paid homage to and blasphemed the aesthetic rules his predecessors established. Many of Klett's deep-shadowed canyonlands recall their work, but images of a campsite by Lake Powell or a car disappearing in a blur past a sunning rattlesnake record a West they could not have imagined. John Pfahl started out creating optical illusions in the landscape and moved on to question not our perceptions of the land but the preconceptions we bring to it. Pfahl's most recent series examines that icon of 19th-century American romanticism, the Niagara River Valley, which is now the ►

• UNCOMMON PERCEPTIONS •



STONES OF STENNESS, ORKNEY, 1979

FAY GODWIN

• UNCOMMON PERCEPTIONS •



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SHEEP CAMP AT LAGUNA PUEBLO, 1983

MERIDEL RUBENSTEIN

high sight for the blind

To make a long story short we had just dropped down thirty eight hundred

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GENERAL
TERMS

linear
lance
oblong
elliptical
ovate
wedge
arrow
heart
round

types of
leaves



DIAGRAM OF A
REGULAR
FLOWER



feet of talus from an absolutely freezing 11,000' + tooth rattling son of a bitchin monkey ball wind - to this pleasant meadow type area known as Kennedy Lake. Spots of sun patched the flower quilted land as I picked what I think is a Mariposa Lily. We then went down to edge of creek you see yonder & watched some fishermen, drank a fifth of Jack Daniels & shot the shit about life in general.

HIGH SIGHT FOR THE BLIND

JACK FULTON

► site of intense development and industrial pollution.

Still other contemporary photographers focus on what traditionalists chose to ignore: the artist's journey through the landscape. Californian Jack Fulton documents his adventures in the Sierra Nevada effusively, his snapshots serving as a mere backdrop for puns, quotations, reflections, line drawings, and pressed flowers.

Linda Connor's work deals with the more ancient and gentle traces of human life upon the land, with standing stones, petroglyphs, shrines, and other creations that have become part of the landscapes of Ireland, Tibet, Peru, Arizona, and Hawaii. One notion that comes across powerfully in Fay Godwin's British landscapes is that over the millenia culture and nature have become all but inseparable, that the natural rhythms of the seasons, the weather, and the geologic cons meld with the cyclical and linear movement of human history. Meridel Rubenstein depicts New Mexico's landscape as home not only for the Native Americans who have been there for centuries, but for all its rural people. With multiple images and collaged ►



SAN QUENTIN POINT #8, 1985

LEWIS BALTZ

► photographs, she shows the ways that our own identities are rooted in the places we come from and settle in, and that we add to the significance of those places with the ghosts and traces we leave behind.

Perhaps one of the most important ideas to emerge from the new landscape photographers is that the relationship between human and land need not be adversarial, that touched landscape is as beautiful and meaningful as untouched landscape, though in a profoundly different way. Whether celebratory or indicting, these photographers depict a land as dependent upon us as we are on it. ■

REBECCA SOLNIT, *an artist-in-residence at the Headlands Center for the Arts in Sausalito, California, is an art critic and environmental activist.*



PETROGLYPH, PUAKO, HAWAII, 1993

LINDA CONNOR

Reaching Out From the Inner City

Barbara Fuller

IN A SMALL dirt parking lot at California's Butano State Park, ten teenagers rummage through gear in the back of a Chevy truck. The chaos is good-natured as they shove cooking utensils, tarps, and plastic bags filled with gorp into their backpacks.

"Somebody take the kites."

"I need a Sierra cup."

"Who'll take lunch?"

"My pack's too heavy."

"Where's the hoopie?"

"Hoopie," corrects Madelyn Pyeatt, the group's adult leader. She hands over the long pieces of striped webbing. "Are we ready?"

Distribution accomplished, the group starts up the trail, beginning a five-mile hike that will end at a campsite deep in the woods of the Santa Cruz Mountains, some 50 miles south of San Francisco. This is a Sierra Club outing—but if other Club members were to pass it, they likely wouldn't recognize the group of black, white, Asian, and Hispanic kids as part of their organization.

Pyeatt, a small woman with long, white ponytails clipped in homemade beaded barrettes, keeps to the rear. A teacher at Oakland Technical High School and a leader in the Club's Inner City Outings (ICO) program for some 15 years, she's well in tune with her adolescent charges. "Little old white-haired ladies and teens have a lot in common," she says. "Both have trouble projecting an image of competence in the wilderness."

Though she is only five-foot-one, Pyeatt is hardly the stereotypical little old white-haired lady. Wielding a walking staff topped with a beaded owl's head, carrying a backpack that sometimes weighs 80 pounds, she hikes steadily, deftly crouching under fallen logs or stepping over them. She looks so

comfortable on the trail that it's hard to imagine her living in the heart of urban Oakland.

Pyeatt has been the powerhouse behind the San Francisco Bay Chapter's ICO program, leading hundreds of wilderness trips for urban kids, disabled people, and senior citizens. She leads backpacking or snowcamping trips two weekends a month throughout the school year, and in the summer, during river-rafting season, she's more than likely to be out on California's Ameri-

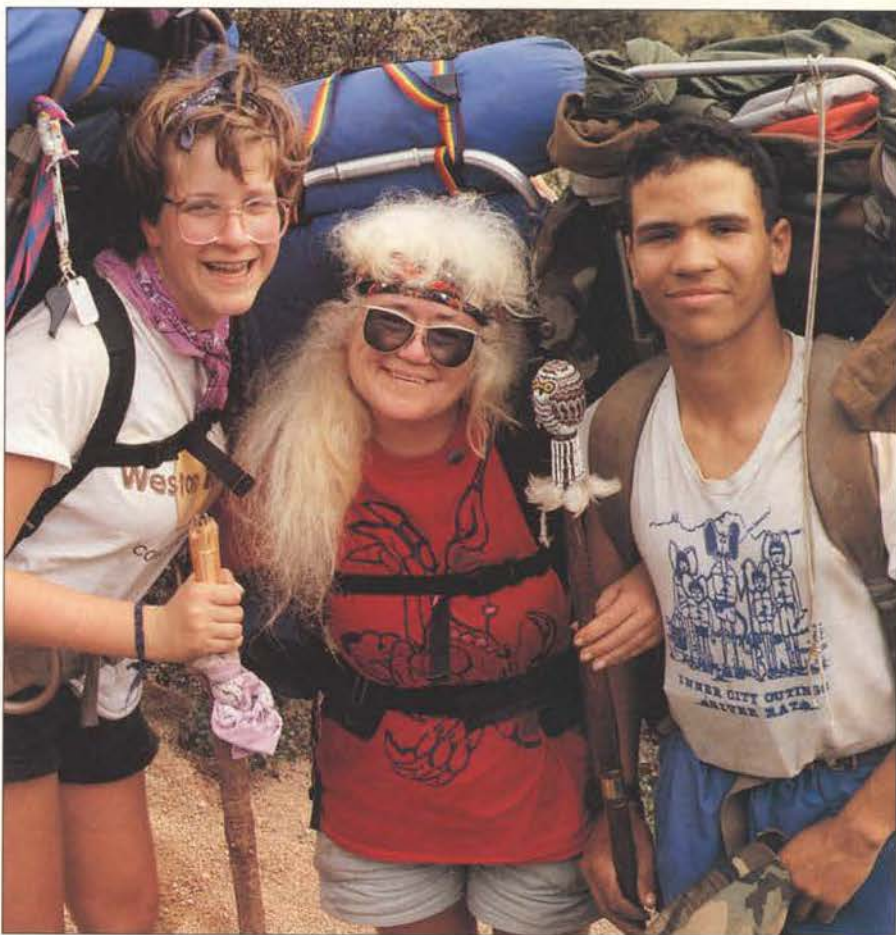
can or East Carson River, paddling with gusto and belting out commands to her crew.

"If we want to save the wilderness, we need the votes of the minorities and the inner-city population," she says, explaining her dedication to the program. "We need the people from the inner cities to love the wilderness, too. We can't make them love it, but it'll sell itself if we can provide some experience. If we can't find allies from the cities, we're lost."

In its search for allies, ICO brings in

"We need the people from the inner cities to love the wilderness, too. We can't make them love it, but it'll sell itself if we can provide some experience. If we can't find allies from the cities, we're lost."

—Madelyn Pyeatt



BARBARA FULLER

Two wilderness converts flank their mentor, Inner City Outings leader Madelyn Pyeatt.

people who have no concept of what lies beyond city streets—or why they should want to preserve it. Leading an outing for a group of city-raised Girl Scouts or church kids, or for mentally or physically disabled people, Pyeatt says, is different from leading other groups: Rarely have they even slept in their own backyards before, and they are often afraid of the night, of snakes, of pit toilets. In addition to confronting those fundamental fears, “they have to learn their wilderness manners,” Pyeatt says. That includes things like picking up litter and not shampooing in a hot spring. Few have explored beyond their neighborhoods, because they lack the know-how, the proper equipment, and the low-cost opportunity—the very things that ICO and its leaders provide.

Pyeatt, who is three-eighths Cherokee, has wandered the woods and rivers of the world since she was born in 1939 in a log cabin in Wyoming. Hers was the topsy-turvy life of an army officer's daughter: By the time she went to college she had attended fifty-two schools, lived in all but three states, and spent several years in Japan.

Pyeatt reaped the benefits of her many homes. “I could skin a squirrel by the time I was six, learned Japanese as a preteen, and built igloos in Alaska when I was in high school,” she says.

As the group moves along the trail, she points out a rare white coral mushroom; during a snack break she lauds the tastiness of miner's-lettuce and wild strawberries, but cautions against dining on the local mushrooms. If she's asked a question she can't answer, she looks the information up. Encouraging others to do the same, she hands out field guides and explains how to use them, then tells each pair of hikers to identify at least five species of trees before day's end. Immediately they begin comparing pictures to particulars: How many needles in a bunch? What type of bark? “It's a Douglas fir!” a 15-year-old concludes proudly.

At night the group gathers around a lantern, a campfire substitute in a high-risk fire zone. Some kids chant while playing an Indian stick game Pyeatt has taught them. It's one that Indians of different tribes could play together, she tells them, even if they didn't share a

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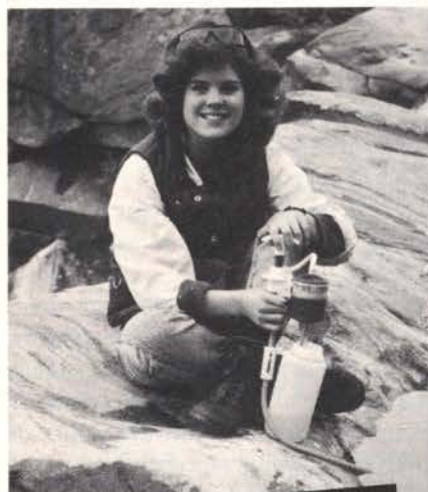
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common language. The kids listen intently as she reads from a poem she has written about the Cherokee god of creation: "Long Man's song tantalizes me./ Ancient god of Cherokee,/ Snowy mountains give glimpses of his white hair./ He wriggles wet toes in sea sands. . . ."

The contrast between her own nomadic upbringing and the lives of the kids in an urban high school prompted Pyeatt to begin leading trips soon after she started teaching at Oakland Tech in 1970. She found that many of her Native American students, recently transplanted from reservations, were feeling trapped in an urban environment. Her family owned five sets of backpacking gear, and by borrowing additional equipment from friends, she was able to outfit seven or eight kids. Later she met two other Tech teachers who were ICO leaders, and, already a Sierra Club member, she affiliated herself with the program.

Except for a few months in 1978, she's been on the move with ICO ever since. That lull followed a skateboarding accident that left the youngest of her three sons—"the best backpacker in the family"—blind and triplegic. For a time, she says, her grief kept her housebound. But then one weekend an ICO rafting trip faced cancellation because it needed a leader, and she decided to go. "The kids had a wonderful time," she says. "I saw that it was as important for other kids to be out there as it was for my own."

Pyeatt moves on to her favorite topic: the challenges facing ICO. "We try to be as inclusive as we can," she says, adding that substantial tensions between ethnic groups are rare. "It's just the nature of this type of outing, especially backpacking trips. People know they need to work together and deal with each other one on one, not as members of groups."

Cultural differences do sometimes lead to amusing consequences, Pyeatt admits. She recalls a time when she took four black and four Vietnamese students camping. When the spaghetti was brought out at dinnertime, the blacks said "no garlic, no onion"—but the Vietnamese wanted more of both. The black students, who loved the oil-doused salad, couldn't understand why

the Vietnamese didn't want to eat the uncooked greens.

More serious problems can arise. One time Pyeatt told a YMCA group at a pre-trip meeting that no alcohol or drugs would be permitted on an outing, a standard precaution. Only later did she learn that the group's community leader then told the kids that beer would probably be okay. Once at their campsite, the ICO leaders spent the entire first night trying to curtail the drinking. After an exhausting day on the river, the same thing happened the second night. Pyeatt ordered the group to pack up and go home.

Working with disabled kids can be a roller coaster too, she says. No matter how well the leaders prepare beforehand—practicing with blindfolds before leading visually impaired participants, or making extra logistical arrangements for mentally impaired groups—they can be taken by surprise. Once, she recalls, four mentally disabled kids disappeared just before dusk. Frantic, the ICO leaders arranged search parties, only to discover that the four had been hiding the entire time, watching them, terrified that they might have to wash the dinner dishes if they came out.

On the more positive side, she remembers taking a deaf-and-blind group on a Stanislaus River trip and leading them into Coral Cave, where it was customary to ask a volunteer to lead the group back out of the darkness. Although kids with sight invariably failed, this time the lack of light and sound was no hindrance. The deaf-and-blind volunteer easily found the way out.

In fact, on the hundreds of trips she has led, Pyeatt says, the frustrations have been few. And the pleasures have been long-term. Many of the kids talk about an outing with genuine excitement for months afterward. Some train to be leaders, a few write term papers about environmental topics such as ozone depletion or reforestation, and some go on to study natural sciences in college.

The ICO program also breeds conservation activists. When a proposed dam threatened to flood the Stanislaus River, a favorite for Bay Chapter ICO rafters in the 1970s, the city kids grew sad and angry. "The wilderness is not only a landform," wrote 15-year-old Kevin

Bolds at a campfire after visiting the river during the dispute. "It is also a state of mind . . . a place of rest, relaxation, recreation, and—challenge. When I went to the Stanislaus Canyon I thought it was not going to be beautiful—because why would anyone want to flood a beautiful piece of land?"

Some of the kids wrote letters to Congress protesting the dam, or attended hearings. Advocates of the project said the rafters were just "rich white people" who wanted their play space, Pyeatt says. "Weren't they surprised when we showed up at the hearings!" The floodgates eventually were opened, but for the kids it was an invaluable initiation into environmental politics.

One of her most memorable trips was at Pt. Reyes National Seashore with a group of new immigrants from Cambodia, Laos, and Indonesia. Without a common language, they played games usually reserved for hearing-impaired groups, communicating through sign language. "They had a wonderful time running around and playing in the waterfalls," Pyeatt says. "I know they'd want to preserve that place. And that's what ICO is all about."

It's also about the future, and Pyeatt has made a unique contribution in the kids she has trained to lead snowcamping, backpacking, and river-rafting trips. As a teacher, she can identify potential guides. "Lots of young leaders come from Tech because they go out frequently, year-round," she says. "I nurse them along and help them practice their skills. Then they can shine in leadership courses, and when the other trainees see them, their confidence grows." Pyeatt believes the young leaders are especially effective as role models. "They can work with the other kids on a peer level. If there's a problem with drugs or with getting people to do their share, a teen can often deal with it best."

When she looks for leaders, Pyeatt looks for kids with enthusiasm, an ability to learn, and a good heart. "You can't teach heart," she asserts. What she does teach is a basis for self-confidence. "It's especially important for teenagers to know what they're doing," she tells a group of river-guide trainees. "Know the river and the names of the rapids. Make your crew realize you know what you're

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talking about, and gain their trust."

Though she may deny it, Pyeatt is her teens' ultimate role model. "She takes care of everybody, and she can handle everything without blowing her stack," says Lorrie Nicoles, an Oakland Tech sophomore and a rafting and backpacking guide who trained with Pyeatt. "Like rowing. She'll show you, and you'll try it. If you mess up, she'll get you out of trouble, and she'll show you again without getting frustrated."

"She's phenomenal, like a second mother," says Ethan Alesi, a 15-year-old

from Oakland's Westlake Junior High School, an ICO backpacking leader and a river-guide trainee. "She really knows how to support you, but in an indirect way so you think you're doing things by yourself." Until last year Ethan had spent most of his school-age years at home caring for younger siblings; he had never camped in the wilderness. But Pyeatt realized the first weekend he went out with her, when rain caused most other participants to cancel, that he was enthusiastic and a quick learner. Now he receives scholarship money raised by

ICO leaders to pay for his share of gas and food on the trips.

On a hot day in early April, a group of ICO trainees sets out on the South Fork of the American River near Sacramento. Pyeatt sits toward the back of one boat, dressed snugly in a bright purple, full-body, waterproof dry suit. Although everyone in the group wears extra clothing as protection from the chilly water, Pyeatt is dressed more warmly than most, guarded against the hypothermia that has been a constant threat to her since she developed a variety of the chronic disease lupus five years ago. But Pyeatt says she is thankful to be here, doing what she loves most.

From the stern, Ira Rothenberg, a deaf trainee, makes vocal commands to his crew as interpreter Barbara Morris faces him from the bow. He is the most recent of several hearing-impaired guides to be trained by the Club, which pioneered rafting with entirely deaf crews. As Pyeatt explains, deaf guides sometimes have an edge over those who hear because they can use sign language when the water roars too loudly for verbal communication.

"Watch the water," Pyeatt tells Rothenberg, through Morris. "How do you want to angle the boat?" He steers over a rock, directly through a "hole," a pool of swirling water below the rock; water splashes up and crew members bounce toward the center before regaining their balance. But the raft remains upright as it spurts out downriver, and Pyeatt congratulates Rothenberg on a well-captained run.

"I didn't realize there was a hole there," he admits, as Morris interprets his signed words.

"You should have," Pyeatt says. "You need to learn to read the river. Even when you've been guiding as long as I have," she adds, "the river will keep teaching you things. Just look at it as a long-term learning process."

Rothenberg watches Morris as she signs Pyeatt's message. He nods, grins, dips his paddle, and angles the boat toward the next obstacle. "Forward," he calls out, and his crew follows the command. ■

BARBARA FULLER is an associate editor of Sierra.

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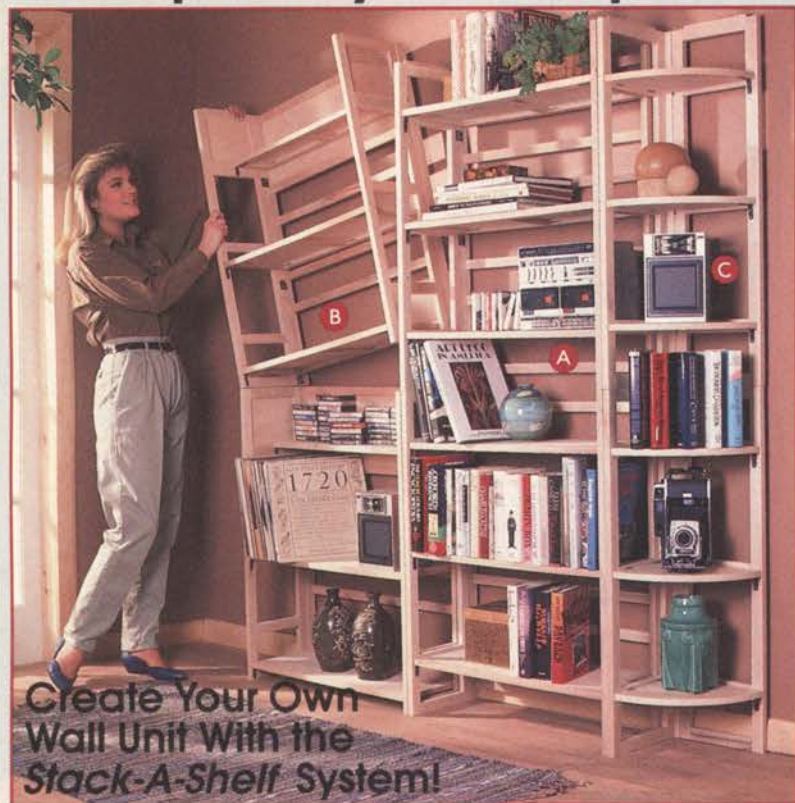
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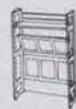
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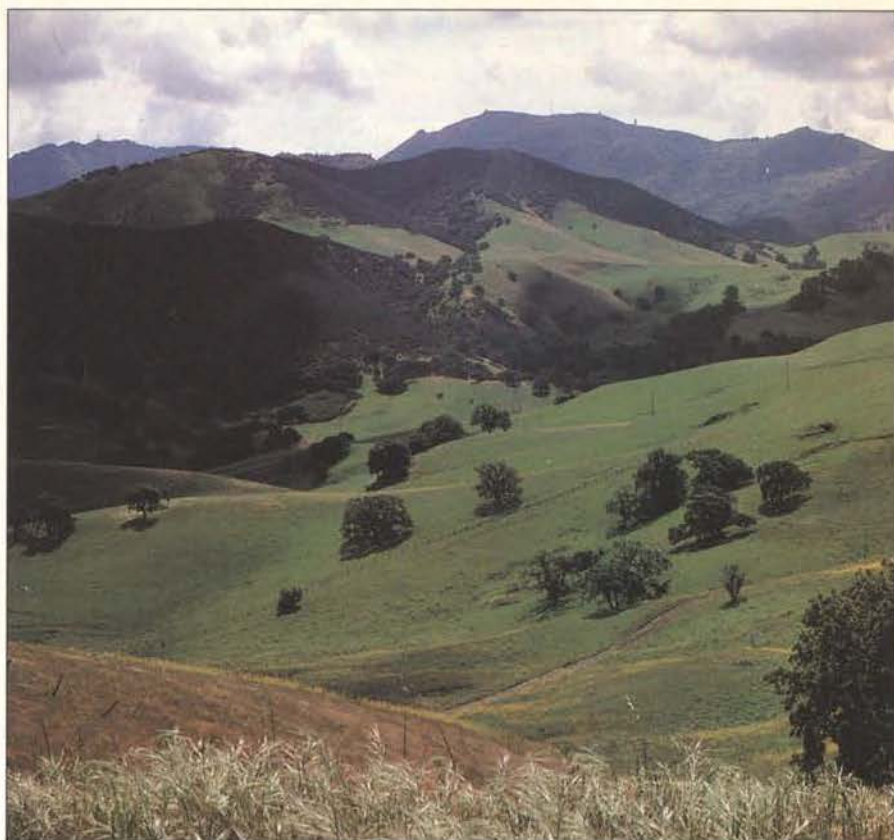
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MARK MARCON

Mount Diablo State Park—priceless open space in an increasingly urban area. If developers have their way, a large housing project will soon mar this view.

Outflanking Mt. Diablo's Foes

CONTRA COSTA COUNTY, CA

NOWHERE IN EUROPE can such a vast mountain line be seen as Diablo showed us on that clear day," Unitarian minister Thomas Starr King entered in his journal in 1862 after standing atop Northern California's Mt. Diablo. "Within the range of our vision lay an expanse of 46,000 square miles! An area as large as the state of New York!"

Today's visitors to that 3,849-foot summit, now within Mt. Diablo State Park some 30 miles east of San Francisco, still enjoy a dramatic vista surpassed in area only by that visible from Africa's Mt. Kilimanjaro. But for many the experience is marred by the encroaching subdivisions of Contra Costa County and by cattle grazing on the mountain's slopes.

"The development pressure in the county is intense," says Seth Adams, administrator of a land trust called Save Mount Diablo. "This mountain in the middle of suburbia is having its flanks attacked on all sides."

Founded in 1971 by members of local conservation groups, including the Sierra Club, Save Mount Diablo has negotiated the addition of nearly 9,000 acres to Mt. Diablo State Park, more than doubling the park's original size. But while open-space enthusiasts celebrate that success, they also struggle to fend off threats to the area.

Currently they are contesting a proposed housing project within the city of Concord, at the mountain's base. Crystyl Ranch, a development of 783 houses, would carve into Lime Ridge Recreation Area, a stretch of open space separated from the park by a mile-wide



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Fourteen organizations—among them Save Mount Diablo, the San Francisco Bay Chapter of the Sierra Club, and the California Native Plant Society—recently united under the banner of the Coalition for Concord's Future to oppose the Crystyl Ranch plans. "Houses and roads would be built high up steep, unstable slopes," the coalition contends, "destroying views of Mt. Diablo shared by much of Concord and central Contra Costa."

Coalition members are upset that the project's developers refuse to negotiate—or to even discuss their plans. Unlike other area developers who have voluntarily donated parcels of land for parks, the owners of Crystyl Ranch "plan no dedication of open space, referring instead to roads, parking lots, and golf courses as open space," according to the coalition.

Cattle grazing is an equally thorny issue on Mt. Diablo. A general plan for the state park, prepared over the past two years by the California Department of Parks and Recreation, calls for returning much of the area to its natural state, eliminating non-native plant species and removing the 400 cattle that now roam freely through much of the park.

Opponents of cattle grazing, including park rangers and the Sierra Club, note that the cows pollute springs and streams, erode hillsides, trample wildflowers, and impede the reintroduction of native grass into the park. Barbed-wire fencing, cow patties, and the cattle themselves also diminish people's ability to enjoy the area.

Tom Brumleve, who leases 7,000 acres of parkland for his ranch, says that he should be allowed to continue using the land for grazing. He points out that Spanish settlers introduced cattle to the mountain more than 200 years ago; his operation, Diablo Ranch, is one of the last vestiges of an industry all but eliminated from Contra Costa County by urbanization.

Moreover, Brumleve says, without cattle, grass in the park would grow up to six feet tall, creating a fire hazard during the dry season. Park planners counter that their management scheme calls for strategic firebreaks and con-

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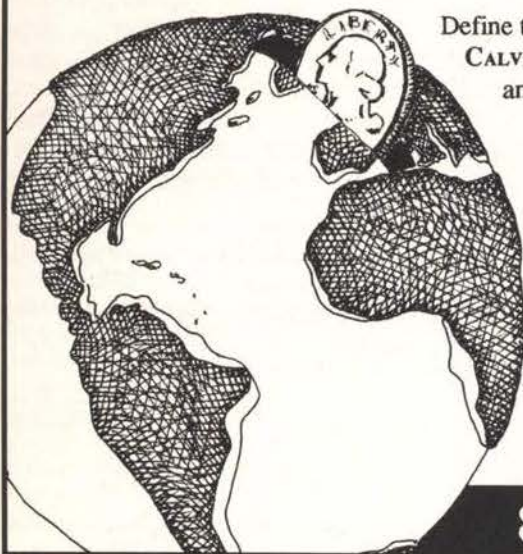
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trolled burning in tallgrass areas.

Parks should not be managed for commercial benefit, says Sierra Club member Genevieve Sattler, who serves on Save Mount Diablo's board of directors. In a park, "trees are not timber, wildlife is not game, and grassland is not forage for livestock production."

—Mark Mardon

A Peck of Trouble at Peck's Lake

VERDE VALLEY, ARIZONA

WATERBIRD HABITAT is scarce in the arid West these days. Largely because of the shortage, the duck population along the Pacific Flyway this winter dropped to just over half its average for the past three decades. In Arizona, where only 5 percent of the state's original wetlands remain, the situation is critical.



Now one of Arizona's last prime wintering grounds is in danger. Peck's Lake, adjacent to the Indian ruins of Tuzigoot National Monument in northern Arizona's Verde Valley, is home to more than a hundred species of waterfowl. The mile-long lake, encircled by marshes and wetlands, is also habitat for bald eagles, beavers, otters, and smallmouth bass. The lake was once sacred ground to the Sinagua Indians; today it is a mecca for anglers and naturalists.

But in February, the Yavapai County Board of Supervisors approved a zoning change to accommodate a proposed housing development at Peck's Lake. Phelps Dodge Development Corporation's plan calls for 1,755 residential units, 300,000 square feet of commercial services, a motel, and an 18-hole golf course, the latter to be constructed atop an abandoned mine-tailings dump at the southern end of the lake.

Scores of citizens attended the zoning hearing to voice their concerns. Although the lake is on Phelps Dodge land, it is fed by the Verde River—Arizona's last perennial, natural watercourse and a source of drinking water for thousands—and water is discharged

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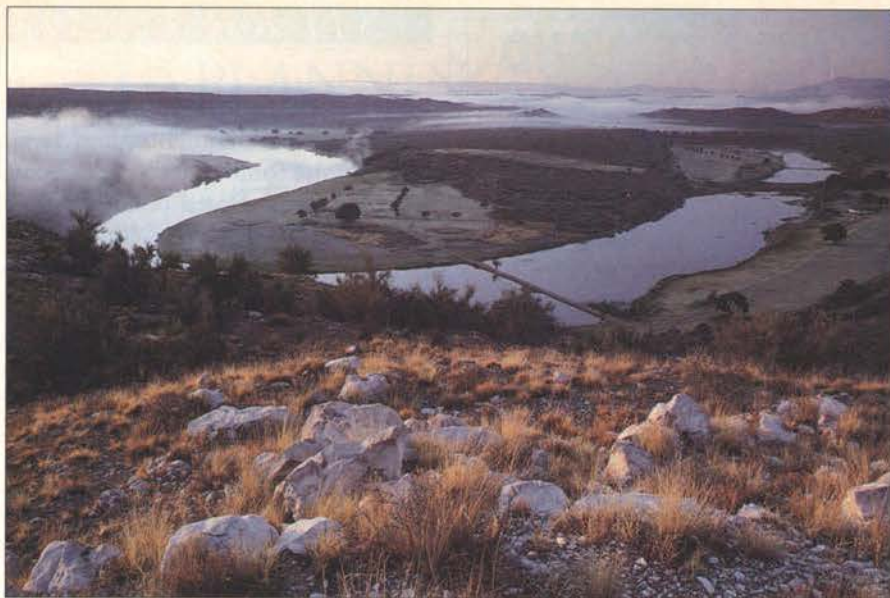
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from the lake back into the river. Citizens are also concerned that construction of the golf course would stir up pollutants, dormant for years, and contaminate the Verde River.

Many Verde Valley residents insist that Phelps Dodge should delay construction and apply for permits from the Environmental Protection Agency, the U.S. Army Corps of Engineers, and the Arizona Department of Environmental Quality. More definitive information should precede any judgment on the plan, the Northern Arizona Audubon Society's Anita MacFarlane argued at the hearing: "Phelps Dodge's information has been superficial, nebulous, inconsistent, and conflicting." Moreover, she says, questioning revealed that the developer's proposal was tentative and incomplete and that the company had not been forthright about its high-density plans.

Board of Supervisors Chair Carleton Camp dismissed the protests, saying the county is not equipped to perform an environmental assessment and is not responsible for calling in other levels of government. "We are not going to do



GREG WELDEN

Surrounded by bogs and wetlands, endangered Peck's Lake lies in the heart of Arizona's Verde Valley. Scrub oak, cactus, and bulrushes are among the plants that line its shores.

the state and federal government's job for them," he said.

But Verde Valley residents, who consider the lake a treasure, aren't about to surrender. In April they formed a group to alert federal and state regulatory agencies to the situation. At the very

least, says Bennie Blake, a Sedona-based organizer of Friends of Peck's Lake, the group wants to make certain that the area's fragile wetlands and marshes are preserved. "Ideally," she says, "the lake would make a jewel of a state park."

—James Bishop, Jr.

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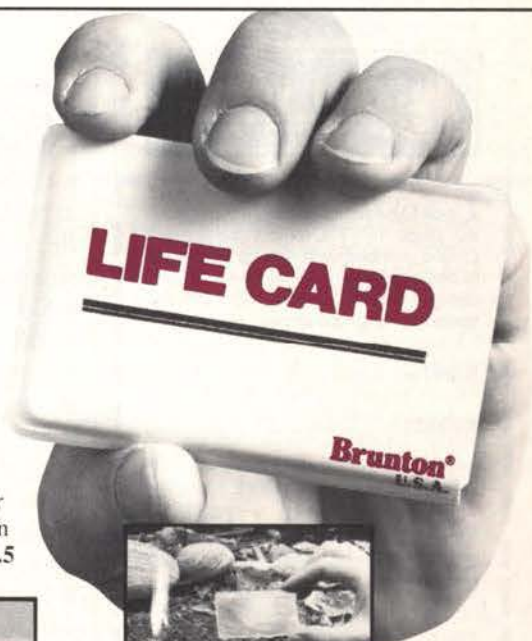
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SIERRA NOTES

Sierra Club members re-elected incumbents Vivien Li of Boston, Massachusetts, and Sanford Tepfer of Eugene, Oregon, to the Board of Directors in April. Jim Dougherty of Washington, D.C., Roy Hengerson of Jefferson City, Missouri, and Joni Bosh of Phoenix, Arizona, were also elected. Each will serve a three-year term.

At its May 7 meeting the Board re-elected Richard Cellarius of Olympia, Washington, to a second one-year term as Sierra Club president. The Board also elected Susan Merrow of Colchester, Connecticut, vice-president; Ruth Frear of Salt Lake City, Utah, secretary; Robert E. Howard of Stratford, Connecticut, treasurer; and C. Freeman Allen of Claremont, California, fifth officer.

The Sierra Club Annual Dinner, held May 6 at San Francisco's Hotel Nikko, featured David Brower, an honorary vice-president of the Club and its executive director from 1952 until 1969, speaking about the urgent need to heal the planet by means of environmental-restoration projects.

Sierra Club volunteers, chapters, and friends received the following awards for 1989:

- The John Muir Award (for leadership in national conservation causes) to Paul Brooks in appreciation for his lasting accomplishments in environmental protection. Brooks is the author of several books, including *The Pursuit of Wilderness*, *Speaking for Nature*, and *The House of Life: Rachel Carson at Work*.

- The William E. Colby Award (for leadership, dedication, and service to the Sierra Club) to Pat Frock for developing and implementing a leader-training program for the Club's Ohio Chapter.

- The Edgar Wayburn Award (for service to the environmental cause by a person in government) to Sen. Tim Wirth (D-Colo.) for his active support of environmental legislation.

- The Walter A. Starr Award (for continuing support of the Club by a former director) to Philip M. Hocker for chairing the Club's building committee.

- The Ansel Adams Award (for super-

lative use of still photography to further the conservation cause) to Robert Glenn Ketchum for his photographs in *The Tongass: Alaska's Vanishing Rain Forest* (Aperture), which he coauthored with Carey D. Ketchum.

- The William O. Douglas Award (for contributions in the field of environmental law) to H. Donald Harris and R. Frederick Fisher for their roles in founding the Sierra Club Legal Defense Fund.

- The Oliver Kehrlein Award (for outstanding service to the Club's outings program) to Walter Wells for 15 years of dedication to the Sierra Club Metropolitan Washington Regional Outings Program.

- The Susan E. Miller Awards (for exceptional contributions to chapters by individual Sierra Club members) to Christine DeChristopher, West Virginia Chapter; Linda Winecoff, South Carolina Chapter; and Clarence Gregory, Atlantic Chapter.

- The Denny and Ida Wilcher Award (for outstanding work in membership development or fundraising) to the Ozark Chapter for innovative fundraising efforts.

- Special Achievement Awards (for strong and consistent commitment to conservation over an extended period of time) to Robert Jack Neff for his work on energy policy within the Tennessee Chapter, and to the Georgia Chapter for organizing a reception for environmentalists at the 1988 Democratic National Convention.

- Special Service Awards (for efforts of singular importance to conservation or the Club) to James Watters for working to preserve the resources of the national forests; Barry Beasley for leadership in the South Carolina Chapter; John Sproul, Jr., for conservation work in western Texas and southern New Mexico; Ann Lage for supervising the Club's oral history project; and Abigail Avery for her work with the Club's program on the environmental impacts of warfare.

The 1989 annual dinner was also occasion for presentation of the first David R. Brower Environmental Journalism Award. The recipient was Charles

Kuralt, commentator of CBS's *Sunday Morning* program.

Nominations for Sierra Club honors and awards to be presented at the next annual dinner should be received by January 15, 1990. For a list of award categories, nominating forms, and selection criteria, write to J.J. Werner, Honors and Awards Committee Chair, 2020 Chamberlain Ave., Madison, WI 53705.

As part of its 1992 centennial celebration, the Sierra Club will offer an award for the best published article on any aspect of the Club's history. The Sierra Club History Committee will select the winning manuscript on the basis of its contribution to an understanding of the Club's background as well as the quality of the author's research and writing.

To be eligible for this award, an article must be published after April 1989 and submitted for consideration by January 1, 1992. Address all inquiries and submissions to the Sierra Club History Committee, 730 Polk St., San Francisco, CA 94109.

Policy statements on major conservation issues addressed by the Sierra Club are now available. Each circular outlines the Club's position on a single topic. Among the issues covered are wildlife, rainforests, wetlands, public rangelands, water, acid rain, pest management, solid-waste management, off-road-vehicle use, urban environment, transportation, nuclear weapons, high-level radioactive waste, and hazardous-waste management. Statements are 25 cents each, available from Sierra Club Public Affairs, 730 Polk St., San Francisco, CA 94109. Include 50 cents with each order to cover postage and handling. A complete list of titles is available upon request.

Dark Circle, a film criticizing the United States' reliance on atomic power and the production of nuclear weapons, premieres August 8 on PBS television. The independently produced film documents the relationship between plutonium as a by-product of nuclear power and its use in making bombs, a "dark circle" connecting atoms for peace with atoms for war. ■



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June Fleming

IN THE 25 YEARS that I've been backpacking, the food choices available to hikers have expanded like popcorn. Years ago, packaged trail foods tried (and usually failed) to mimic home-cooked meals. Most were frustratingly difficult to prepare and as appetizing as boiled boots. (Simmer with 3 cups water and voilà—turkey tetrazzini. Or is it shrimp creole?) And the selection of foods in supermarkets that were useful for backpacking was far more limited than it is today.

While there's no reason to subsist on C rations just because you're slogging through the backcountry (a truth clear to anyone who's feasted on fresh trout high in the mountains), meal-planning for the trail is a challenge. You've got to decide which meals you'll be happy eating as well as buying, packaging, carrying, preparing, and cleaning up after. Whether you rely on dehydrated and freeze-dried foods from camping stores, scour supermarket shelves, or combine the two, it's more likely that you'll eat well on the trail if you do your legwork before setting out.

First and foremost, backpacking food must be nutritious. A hiker needs constant refueling to keep stamina high and to avoid susceptibility to injury, illness, and hypothermia. On average, one day's backpacking burns 1,000 more calories than you use normally. Cold weather, a heavy pack, demanding terrain, and prolonged exertion double or triple your energy needs. Under these conditions, three meals a day are not enough. Ready-to-eat, high-energy

snacks are as important as main meals.

About half the calories you take in should be from carbohydrates, and one quarter each from proteins and fats. Carbohydrates, such as grains, fruit, and candy, are easy to digest and provide quick, short-term energy. Proteins and fats are harder to digest, so it's best to distribute your intake throughout the day. They release their energy more slowly than carbohydrates, but it lasts longer. Good protein sources are meat, dairy products, eggs, seeds, and nuts. Margarine, oil, cheese, chocolate, and seeds are good sources of fats.

On a vigorous week-long expedition that calls for moving camp often and perhaps scaling a ridge or two, you'll need a lot of nutritional punch (especially carbohydrates) from foods that weigh the least. Good choices include

granola prepacked with dry milk, hard cheese, summer sausage, fig bars, dried fruit, instant soup, and bagels spread with a blend of peanut butter, wheat germ, dry milk, and molasses. In cold weather you need more fats to stoke your body's furnace.

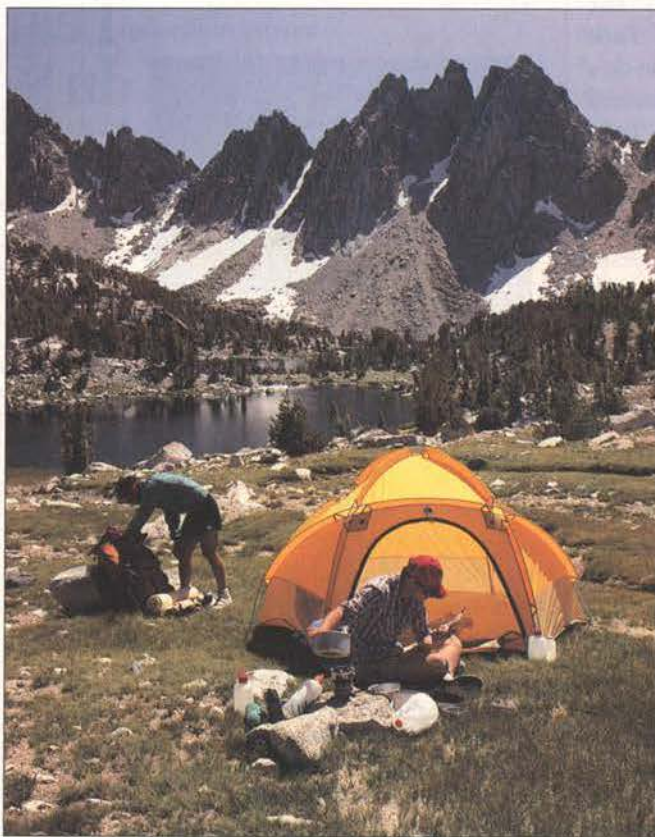
Food for a day, even if freeze-dried, is heavy. For long trips keep food weight to no more than two pounds per person per day. Use dehydrated fruit instead of fresh, dried soups instead of canned, and mixes packed in bulk instead of in individual servings. Freeze-dried foods are the lightest way to go, but grocery stores offer worthwhile lightweights such as instant potatoes, ramen noodles, and texturized vegetable protein (a meat substitute). On a weekend hike you can pack such weighty luxuries as fresh fruit, meat, and vegetables; canned

foods; even a bottle or two of wine—as long as you don't mind packing out your garbage.

A dish calling for three separately mixed parts is best left at home. Aim for single-pot meals so you'll have fewer pots to carry and clean. (Ziplock bags make good mixing "bowls.") Two pots, an aluminum skillet, a single-burner stove, and some basic utensils will stock a well-equipped, lightweight kitchen for up to four hikers.

Keep fuel weight to a minimum by cooking foods that require no more than 15 minutes' stove time, such as instant soup, sauce, and gravy mixes. Thin noodles, cubed meats, and thinly sliced veggies also cook quickly.

Prepackaged meals simplify planning greatly, but you can cut your food bill in half by making up your own



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meals from such foods as noodles, quick rice, oatmeal, pudding, spices, and dried jerky or fruit. Pack them in plastic bags, add other ingredients (such as dry milk and spices), and include cooking instructions.

Don't forget essential secondary ingredients. Pastas, soups, and sauces often call for milk, margarine, or tomato paste (now available in tubes). Overlook them and you'll go to bed without much of a dinner. A good selection of spices and condiments can resuscitate the most monotonous meal.

Experiment with offbeat combinations in main dishes; backcountry meals must be nourishing but they need not be boring. Keep your interest alive by using a different carbohydrate base for each dinner (rice, noodles, buckwheat kernels, etc.), planning desserts with different textures, and experimenting with different food combinations. Try rice with chopped apricots, dates with curry sauce and peanuts, or ramen with pineapple. Snacks can be just as uncommon: Along with the gorp, pack halvah bars, smoked salmon, or cream cheese to spread on sesame crackers.

Even after you've mastered the basics of meal planning, it's easy to fall prey to some common errors. Almost every backpacker packs more food than necessary. Keep in mind that most trail foods will expand when cooked. Many are rich and dense, so small servings usually suffice for the average eater.

The best remedy is experience: Test recipes and quantities on a few weekend trips, and dutifully store your notes in a trail-foods folder. Your records will help you duplicate successes and avoid repeating mistakes—a main dish with too little sauce, another with too little pasta, brownies that crumble, too many or too few pots, or too much fuel. Keep tabs on your appetite after exerting yourself; you may find that you eat more or even less than you do normally.

Whether you concoct freeze-dried gourmet meals for four or raid the supermarket for instant mixes, you don't need to ignore your stomach just because you've got a load on your back. ■

JUNE FLEMING is author of *The Well-Fed Backpacker* (Vintage Books, 1986). She lives in Portland, Oregon.

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BOOKS

Writers, Fish, and Buffalo Jumps

Montana Spaces: Essays and Photographs in Celebration of Montana

Edited by William Kittredge

Photographs by John Smart

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Donald Snow

MONTANA IS A fine place for writers—"the last best place," according to William Kittredge, who directs the creative-writing program at the University of Montana. Along with movie stars and gun nuts, you find writers all over the state now, no longer clustered so tightly around the fires of Culture and espresso in the college towns. Lots of them actually fish and hunt, and most seem to demand at least proximity to wild nature even if they have little time to be out in it. Come to think of it, there are probably more working writers than grizzly bears in Montana these days. In that particular race to extinction, it's pretty clear who will win.

In *Montana Spaces*, which gathers together twenty writers and one photographer to celebrate that last best place, Kittredge provides an introduction explaining part of Montana's allure to artists. It's in their ears, he says, attuned so sensitively to those "boyish and heart-broken storytelling voices" of authentic westerners.

One of those voices belonged to Charlie Russell, himself both an artist and a Montana raconteur in the cowboy tradition. Listening to a group of Great Falls boosters extol their own courage at a celebration sometime in the 1920s, Russell got his chance to speak:

"In my book a pioneer is a man who turned all the grass upside down, strung bob-wire over the dust that was left, poisoned the water and cut down the trees, killed the Indian who owned the land, and called it progress. If I had my

way, the land here would be like God made it, and none of you sons of bitches would be here at all."

Little nuggets like that one lie throughout *Montana Spaces*, and thankfully it doesn't take too much panning to get to them. Yet this book of celebratory writing lacks a consistent purpose, which is odd given the circumstances.

Assigned to "express their connection to and conception of Montana," according to the preface, some of the writers chose tired, old devices, the worst here being several sloppy recitations of hunting and fishing treks, which of course are so often about self-discovery (*boom!*).

The anthology also contains some pointless examinations of scenic views, such as one from William Hjortsberg's cabin window. I'd rather have gotten a decent look inside *him*. Apparently the connection to Montana is awfully faint for some, who really had nothing at all to say about it.

But the book is saved by the ones who did. Wallace Stegner, who seems to have endless gifts to give the West, tells an original tale of his "Great Falls year." In the autumn of 1920, when Stegner was 11, his family migrated south from Saskatchewan and took up residence in a *real* city. Try to imagine Great Falls 70 years ago as a center of domesticity and sophistication and you begin to feel the childlike wonder that Stegner captures in this delightful reflection.

Young Wallace got to mow Charlie Russell's lawn a few times, but the great experience for this boy was not being near an artist—it was feeling the simple pleasure of a lawn. "When we arrived, I had never seen a lawn or imagined one. . . . On the farm the yard had been an alkali flat. . . . Here, the miracle of turf impressed me for the first time with the sheer *comfort* of the earth." While many writers in this book, and elsewhere for that matter, wax on about Montana experiences as their own "coming into the country," Stegner reverses that equa-

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tion. The result is refreshing: A boy comes from a Canadian prairie wilderness to a very civilized Montana. He becomes socialized in a Great Falls public school and learns something about loyalty and friendship besides.

There is a disproportionate amount of fishing in this book, but then there is a disproportionate amount of fishing in Montana. People just aren't serious here. Thomas McGuane's "Runoff" transcends the breezy drudgery of the ordinary angling essay while preserving many of its time-worn features. He does the usual stuff: plucks mayflies from rocks and tries to match them with Quill Gordons, Light Cahills, and whatnot; fumbles with his thermometer in the streams he plies in spring ahead of runoff; struggles to get a drag-free drift in difficult water. But then he tosses in a few of the strange, sweet moods that go with fishing in all places worth fishing. He finds himself wading through the stench of a bloated, winter-killed cow only to catch and release three brown trout; speculating aloud about whether the angler's passion for solitude might not be a form of misanthropy; meandering home after a spring snowstorm hits the river so that he can look up a certain dun—*Ephemerella compar*—in his book of aquatic insects: "Even as I write this, I visualize a trout scholar in pince-nez rising up out of the Henry's Fork to correct my findings." McGuane's narrative oddly captures what it is to live and fish in Montana, a place where not a few fly-casters, those most effete sportspersons, call large trout "hogs."

Mary Clearman Blew drills into the village psyche of Havre, a little city with a little college up on the East-West "highline," along which railroads run. She visits a buffalo jump (a cliff over which Indians would herd buffalo in order to kill them) named Wahkpa Chu'gn, where a group of amateur archaeologists struggles to maintain an impressive excavation and indoor display while vandals rip through the fences and fire rifles into the buildings on a whim. Her essay is a small treasure of information about Indian life, buffalo death, and local lore, but its point is to use the precarious protection of an archaeological site as a vantage point from which to observe the terrors, demons,

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and obsessions of a small western town.

"Something lives on the highline that cannot examine itself," she writes. "Judging from the closed and sullen faces in the old photographs in the museum, the hysterical invective rising from the pages of the earliest newspapers, it has existed here since the first white penetration of the highline. Perhaps it is the quality that perpetrated genocide, or perhaps it is the inevitable outcome of genocide, a kind of mark of Cain. . . . The record of its past is a threat, and Wahkpa Chu'gn is just such a record—of the roots it cannot claim, of the fate it cannot accept."

You see, Montana is not just all trout-fishing.

I also admired Beth Ferris' honest essay "The Gatekeepers," about two novice filmmakers photographing mountain goats; David Quammen's weirdly cerebral "Strawberries Under Ice"; and Annick Smith's painful description of her husband's death in "Homestead."

John Smart's 28 black-and-white photographs capture both the brawniest and the most delicate features of Montana's skies and horizons, along with a few shots of grand old saloons in towns that have somehow avoided the assault of the gentry. His picture of the Jersey Lilly in Ingomar kept me up half of one night. The placement of the photos in the book, however, is mystifying. I've never seen a skein of featured graphics that was so difficult to reach, clumped together as they are in the final one-eighth of the book. Whoever came up with that idea has terribly thin thumbs.

The book also neglects biographical sketches of the writers, a serious omission for those who would like to read more of their works.

Having waded through about five recent years of Montana writers making congratulatory lists of other Montana writers (and/or artists, and/or legendary drunks), I have little use for the two quasi-bibliographic essays in the book (Kittredge's introduction was quite enough), but readers interested in western arts and letters might appreciate the authors' care and good taste.

Montana cannot be pressed into a book, and this book does not try. Where the essays are good they are very good,

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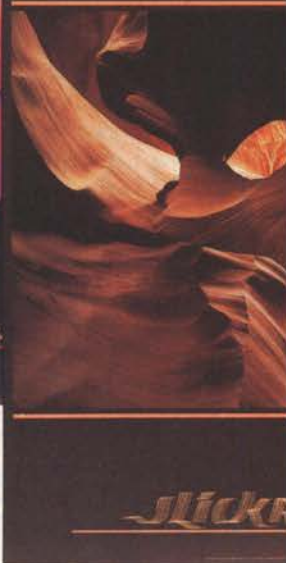
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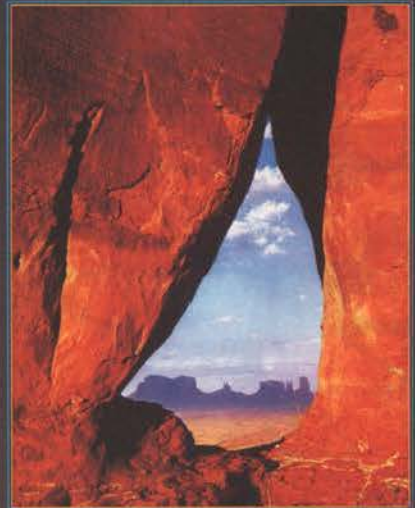
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and where they are weak . . . well, they are not so weak that they would fail to warm the spirits of those who want to read about Montana before they visit next time.

DONALD SNOW is founder and co-editor of *Northern Lights* magazine. He lives in *Stevensville, Montana.*

BRIEFLY NOTED

The Adirondack Mountain Club (ADK) began publishing trail guides to the Adirondack Forest Preserve in 1935. Last year it completed the seventh book in the series, *Guide to Adirondack Trails: Southern Region* (ADK, 174 Glen St., Glens Falls, NY 12801; \$12.95 plus \$2 shipping and handling). . . . Cartographer Tom Harrison has produced several topos of interest to hikers and campers in California. His detailed, relief-shaded maps cover such areas as the San Diego backcountry (\$5.95), Topanga State Park in the Santa Monica Mountains National Recreation Area (\$4.95), Sequoia and Kings Canyon national parks (\$5.95), Yosemite National Park (\$5.95), and Yosemite Valley (\$4.95). The latter map features legends in English, Spanish, French, German, and Japanese. The maps are available from Tom Harrison Cartography, 333 Bellam Blvd., San Rafael, CA 94901. Add \$1 per order for shipping. California residents should add 6-percent sales tax. . . . Four photographers and one reporter from a Montana newspaper convey the dramatic events of last summer's Yellowstone blazes in *Yellowstone on Fire!* (available from *The Billings Gazette*, P.O. Box 36300, Billings, MT 59107-6300; \$12.95, paper). . . . Photographer and biologist George Wuerthner, who wrote about the fires for *Sierra* ("Burning Issues," January/February), explores the ecological impacts of the conflagration in *Yellowstone and the Fires of Change* (Haggis House, available from Dream Garden Press, P.O. Box 27076, Salt Lake City, UT 84127; \$8.95, paper). . . . *Denver Post* columnist Jim Carrier, a seasoned Yellowstone observer, and photographers Jeff Henry and Ted Wood offer yet a third examination of Yellowstone's searing in *Summer of Fire* (Peregrine Smith Books; \$12.95, paper). ■

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[90523] **Another Mexico: Jungle, Beaches, and Lagoons—December 9–16, 1989.** Leader, Jenny Holliday, 1170 Cloud Ave., Menlo Park, CA 94025. Price: \$1,310; Dep: \$100. Spend a week sea-kayaking, body surfing, snorkeling, or jungle-walking in a Mexico few tourists ever see. Camping on the beach in the quiet village of La Manzanilla (three hours south of Puerto Vallarta), you can pick the activity you enjoy doing most—or you can simply relax and enjoy Mexican life in the slow lane. We'll have one overnight paddle trip to the village of Barra de Navidad, where we'll camp at a remote beach, and

we'll take time to do some Christmas shopping. No prior kayaking experience is necessary.

[90526] **Sea of Cortez Kayaking, Baja California, Mexico—December 18–24, 1989.** Leader, Gary Larsen, 13777 Lava Dome Way, Nevada City, CA 95959. Price: \$1,050; Dep: \$100. Espiritu Santo and Partida islands lie in the Gulf of California north of La Paz. Explore sandy coves and inlets where you will find excellent fishing and snorkeling, hidden canyons, fascinating geology, and spectacular desert vegetation. You'll even spend a day snorkeling at a sea-lion rookery. Camping on island beaches, you'll have time for both hiking and relaxing. This trip is designed for inexperienced to expert paddlers and will include instruction and a support boat to carry duffel, food, and fresh water. Airline schedules require coming to La Paz a day ahead of the trip and leaving a day after.

[90528] **Holidays in Belize: Reef and Ruins, Central America—December**

SIERRA CLUB OUTINGS

23, 1989–January 1, 1990. *Leader, Sallee Lotz, 997 Lakeshire Ct., San Jose, CA 95126. Price: \$1,490; Dep: \$100.* See description for trip #90532.

[90529] Belize, Central America: Coral, Blue Water, and Kayaks—February 11–17, 1990. *Leader, Margie Tomenko, 3261 Via Grande, Sacramento, CA 95825. Price: \$1,665; Dep: \$100.* Kayak into a Caribbean paradise of warm, crystal-clear water, white sand beaches fringed with palms, and small coral islands as we explore one of the world's longest barrier reefs off the coast of Belize. Taking a break from our paddling as we island-hop at a relaxed pace, we can lounge in hammocks, swim, or snorkel to see colorful fish. One of our guides is a local fisherman, ensuring a daily feast of fresh seafood. No previous kayaking experience is necessary.

[90531] Tropical Wildlife—Sea-Kayaking in Costa Rica—February 11–19, 1990. *Leader, Carol Dienger, 3145 Bandera Dr., Palo Alto, CA 94304. Price: TBA; Dep: \$100.* The small, peaceful nation of Costa Rica is unsurpassed in its rich diversity of wildlife and plant species; it is also a world center of tropical research. Sea kayaks will allow us to explore otherwise inaccessible rivers, estuaries, and palm-lined ocean beaches for close-up views of birds, iguanas, crocodiles, howler monkeys, and more. Although we will be accompanied by a support boat, some basic paddling experience is required. A bus will transport us from San José to the Pacific coast and will take us on side trips to wildlife-observation centers in contrasting habitats. Airline schedules require coming to San José a day ahead of the trip and leaving a day after. Accommodations for these nights are included in the trip price.

[90532] Belize: Reef and Ruins, Central America—February 17–26, 1990. *Leader, Lola Nelson-Mills, 3020 N.W. 60th St., Seattle, WA 98107. Price: \$1,490; Dep: \$100.* One of the longest barrier reefs in the world, jungle flora and fauna, mysterious Mayan ruins—we'll explore these and more in Belize. Nestled between Guatemala to the west and Mexico to the north, Belize is politically stable, safe, and "off the beaten path." English is the official language. We'll explore the lush interior using a rustic ranch as our base. A highlight will be an overnight visit to the magnificent Mayan ruins of Tikal in neighboring Guatemala. We then move on to the

Caribbean coast and a palm-studded island adjacent to the reef. We'll stay in a guest house on the beach, snorkel in crystal-clear water, and feast on fresh seafood.

[90533] Magdalena Bay Sea-Kayaking, Baja California, Mexico—February 18–24, 1990. *Leader, John Garcia, 124 Romero Circle, Alamo, CA 94507. Price: \$1,075; Dep: \$100.* Wake up to the sounds of whales blowing, paddle over the waters of Magdalena Bay, and explore the uninhabited shoreline and dunes of the bay's barrier island. Suited for both novice and expert paddlers, this trip will give us a close-up look at California gray whales in their winter home. Every year the whales come to Magdalena Bay by the hundreds to mate and return the following year to bear their young. We'll also see a wide variety of migratory shore- and seabirds as we paddle through channels lined with mangrove. Basic paddling instruction is provided; a support boat will carry duffel, food, and fresh water. Airline schedules require coming to La Paz a day ahead of the trip and leaving a day after.

[90534] Bio Bio River Run, Chile—February 23–March 7, 1990. *Leader, Blaine LeCheminant, 5824 Mathilde Dr., Windsor, CA 95492. Price: \$2,620; Dep: \$100.* The Bio Bio! It's all that a river could and should be. With some of the most exhilarating rapids in the Western Hemisphere, the Bio Bio cascades down the western slope of the Andes, through the "Switzerland of South America." Surpassing all American rivers in raw beauty and lively rapids, the Bio Bio is a dream river come true, with its clear, clean water, hot springs, tributary waterfalls, and unbelievable panoramas. Enjoying South America's summer weather along the way, we'll see glaciers and alpine lakes and hike to an active volcano. This is the optimum time of year to run the Bio Bio.

ASIA

[90505] Trekking in the Dragon Kingdom, Central and Eastern Bhutan—September 23–October 21, 1989. *Leaders, Jane and John Edginton, 2733 Buena Vista Way, Berkeley, CA 94708. Price: \$4,415; 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 se-

cluded, remote kingdom was just opened to visitors in 1988. Imposing temple forts, picturesque carved and painted rural 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. Photographers will delight in Bhutan's green alpine valleys, towering white Himalayan peaks, and forested canyons in fall colors.

[90515] Makalu Trek, Nepal—October 2–28, 1989. *Leaders, Emily and Gus Benner, 155 Tamalpais Rd., Berkeley, CA 94708. Price: \$2,850; 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 to camp 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 flight from Tumlingtar to Kathmandu will shorten our return trek to seven days. This moderately difficult outing is great for veterans as well as strong hikers new to Nepal and to the trekking experience.

[90521] Kangchenjunga Himal, Nepal—October 30–December 2, 1989. *Leader, Wayne R. Woodruff, P.O. Box 614, Livermore, CA 94551-0614. Price: \$2,295; Dep: \$100.* Kangchenjunga, the world's third-highest peak at 28,208 feet, is in eastern Nepal on the Sikkim border. Our trek will take us on an up-and-down route from thick rhododendron and bamboo forests through terraced fields, along mountain ridges, and across glaciers to the crowning finale: towering Kangchenjunga as seen from Pangpema. We'll also have vistas of the "mystery peak," Jannu, and the mountains surrounding Yalung Glacier. This will be a moderate to strenuous trip.

[90524] Lamjung Christmas Trek, Nepal—December 18, 1989–January 6, 1990. *Leaders, Cheryl Parkins and David Horsley, 4285 Gilbert St., Oakland, CA 94611. Price: \$1,560; Dep: \$100.* Leave the shopping mall behind this holiday season to hike beneath some of the highest and most beautiful mountains in the world. On this little-known trekking route along

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the eastern slopes of the Annapurna range, we will enjoy the solitude of true Himalayan wilderness. The ascent to this seldom-visited region will take us through delightful Gurung villages, where terraced fields are planted with winter wheat. Direct contact with the local people, the warmth and friendliness of our Sherpa and Tamang staff, and the watchful presence of Machhapuchhare, Annapurna IV, Annapurna II, and Lamjung Himal make this pilgrimage to the "roof of the world" very rewarding. Maximum elevation reached will be about 13,000 feet.

EUROPE

[90510] Autumn Colors in Idyllic East Bavaria, West Germany—September 24–October 7, 1989. Leaders, Sigrid and Ken Miles, 1056 First Ave., N., Napa, CA 94558. Price: \$2,200; Dep: \$100. Experience autumn on this leisurely to moderate hiking trip through friendly Bavaria. From the Roman-founded town of Regensburg ("Castrum Regina"), we will hike through the Bavarian forest (central Europe's largest mixed mountain-forest) to Passau on the Danube River. We will encounter not only great natural beauty but also historic castles and villages. We will stay in *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.

1990 DOMESTIC WINTER TRIPS

[90352] Adirondack Wilderness Grand Ski Tour, New York—January 28–February 2, 1990. Leader, Tom Kligerman, RD3, P.O. Box 1070A, Selkirk, NY 12158. Price: \$585; Dep: \$100. In the heart of the High Peaks we will ski from Keene Valley over Klondike Notch to Heart Lake, and



Chisos Mountains and the Rio Grande, Big Bend National Park, Texas

through Avalanche Pass. Then it's on to the Siamese Ponds Wilderness for some of the best backcountry skiing anywhere. Travel is through sometimes challenging, mostly rolling terrain, eight to ten miles per day. Round-trip transportation to the trailhead is provided from Albany, New York. This trip is for intermediate skiers and qualified novices. Leader approval required.

[90353] Zealand Valley Cross-Country Ski Tour, White Mountains Forest, New Hampshire—February 5–9, 1990. Leader, Craig Caldwell, 5691 Green Oak Ct., Fairfield, OH 45014. Price: \$480; Dep: \$50. Zealand Valley, north of Franconia and Crawford Notches, provides outstanding backcountry skiing. We can visit the iced-over Thoreau Falls and Pemigewasset River, climb Zeacliffs for the distant winter views, and ski across beaver ponds and through groves of birch and hemlock. We'll stay in snug Zealand Hut, and each evening we'll plan the next day's activities. The day trips are moderate with strenuous options. Skiers should be intermediate

level with experience off groomed tracks. Leader approval required.

[90355] Desert Winter Backpack, Big Bend Park, Texas—February 11–22, 1990. Leaders, John Lemon Sellers and Sid Hirsh, 112 N. University Ave., Enid, OK 73701. Price: \$590; Dep: \$100. If your idea of winter backpacking doesn't include snowshoes, cross-country skis, or frostbite, then this outing is for you. Big Bend National Park is a land of contrast and diversity. Our route will begin high in the Chisos Mountains, the only mountain range in the United States contained entirely in a national park, and wind through fantastic volcanic monoliths down to the rugged canyon of the Rio Grande. We will see most of the landforms and ecosystems this unique area has to offer. There are no layover days, but we will have many opportunities to climb major peaks, explore Indian ruins and ghost towns, and photograph wildlife. Water and food caches will help lighten the load for this strenuous cross-country trek. Leader approval required.

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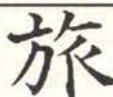
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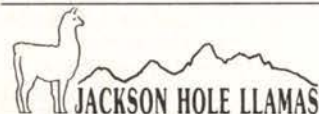


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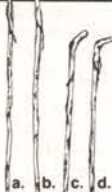
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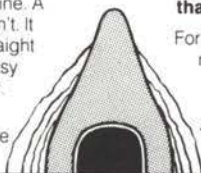
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QUESTIONS & ANSWERS

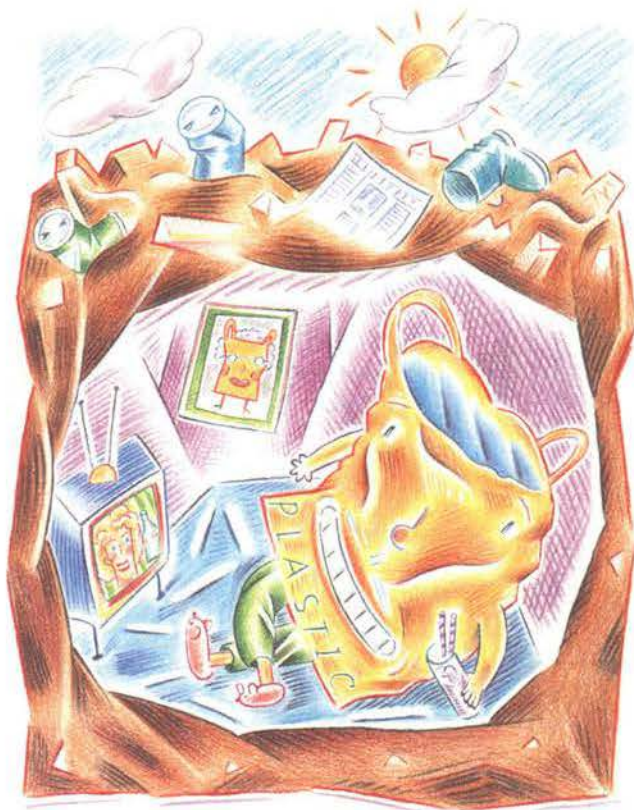
Are the new "biodegradable" plastic bags used by some supermarkets as good as they're cracked up to be? (Donn J. Colby, New Hyde Park, New York)

While laboratory tests suggest that these bags do in fact degrade, it's not yet clear how that finding translates in practice, or whether the by-products are any more desirable than the plastic itself.

The plastic shopping bags offered by most grocery stores are already photo-degradable in varying degrees. They're made of polyethylene (a petroleum product) and light-sensitive chemicals that decompose when exposed to the sun's ultraviolet rays. Although photo-degradability helps reduce litter, it's of limited benefit for shopping bags, because most are buried with household refuse in sanitary landfills.

The bio-degradable bags are a blend of plastic and cornstarch or cellulose. Once a bag is disposed of in a landfill, the starch can be consumed by micro-organisms, separating the tough polyethylene compounds into smaller, theoretically weaker, particles. But questions remain about whether the plastic ever completely breaks down (or just breaks into littler pieces), and whether degrading plastics could release toxic chemicals into the soil.

Using paper bags is not without its own ramifications: Paper makes up 50 percent of the waste in landfills; and papermaking destroys trees, pollutes water, and contributes to acid rain.



In addition, according to the National Audubon Society, nonrenewable fossil-fuel fertilizers are used to grow the trees used for making paper.

The most environmentally benign way to carry your groceries is to use your own bags. If that's not practical, the next best thing is to choose whatever kind of bag you're likely to reuse at home.

How effective has the reduction of lead in gasoline been in alleviating air pollution? (Bruce Odom, Seattle, Washington)

Lead is a nondegradable metal that has been added to gasoline since the 1920s to eliminate engine knock. Virtually all of it is emitted into the atmosphere, contaminating dust and soil. Prolonged exposure can cause neurological disorders and

damage to kidney, liver, and reproductive systems.

Although its health hazards were long known, lead was first restricted in the United States in the 1970s as an incidental consequence of the Clean Air Act. To meet the act's auto-emissions standards, car manufacturers began installing catalytic converters in engines to control three harmful pollutants—nitrogen oxides, carbon monoxide, and hydrocarbons—and discovered that lead destroyed the catalysts. Unleaded gasoline was required for new models beginning in 1975; in 1979 the first restriction on leaded gasoline was enacted.

Since then, lead content in gasoline has been reduced 99 percent and, according to a 1988 report published by Worldwatch Institute, the average lead content

in Americans' blood has dropped by more than a third.

The successful reduction of lead in the last 20 years can be improved upon. If you're still pumping leaded gas into an old car, you can make the switch to unleaded without damaging your engine. According to the Environmental Protection Agency, most old vehicles can safely burn unleaded gas as long as it's the proper octane.

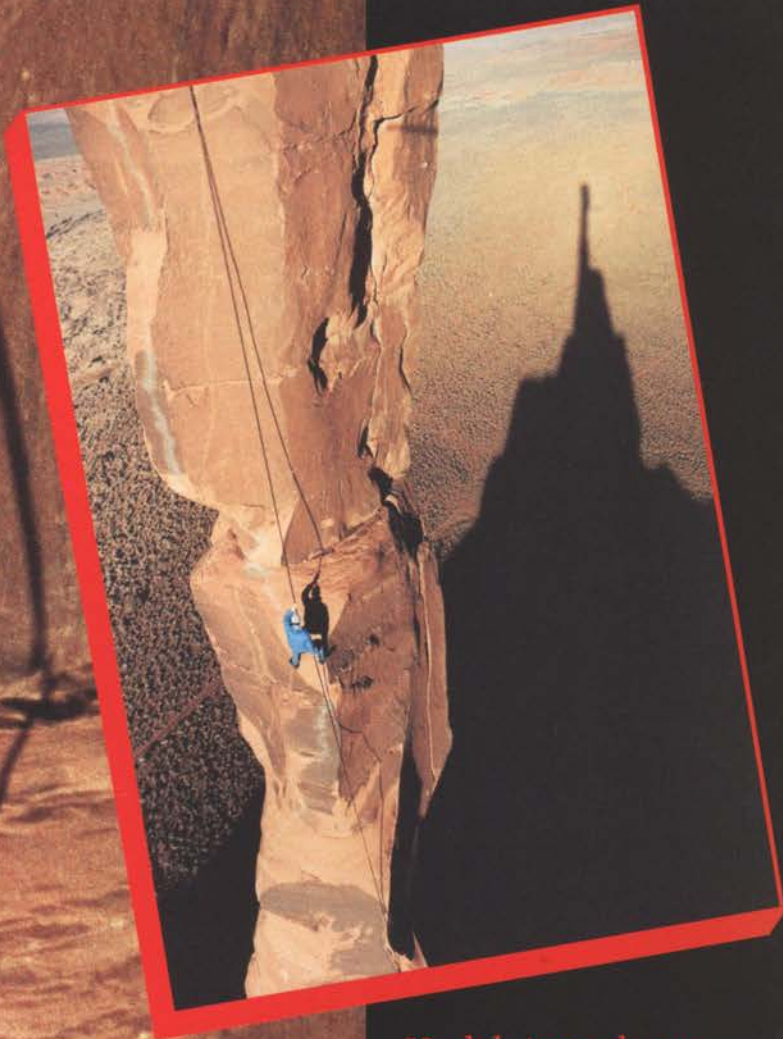
Can public-land managers be criminally prosecuted for not abiding by federal environmental laws? (Dennis Kaleta, Trego, Wisconsin)

According to several environmental attorneys, the answer is generally no.

The Bureau of Land Management and the U.S. Forest Service, for example, are governed primarily by the Federal Land Policy and Management Act and the National Forest Management Act, respectively. Both are civil statutes containing no provisions for criminal prosecution. Civil statutes serve to define policy rather than to set legal standards for officials' conduct. An agency challenged for not enforcing an environmental law might have to correct its actions, but no fines would be levied or jail terms imposed.

If a land manager were to participate in a scheme to steal timber from federal lands, on the other hand, that official might be prosecuted—for theft and conversion of property, not for violating environmental laws. The land-management agency would not be held responsible. ■

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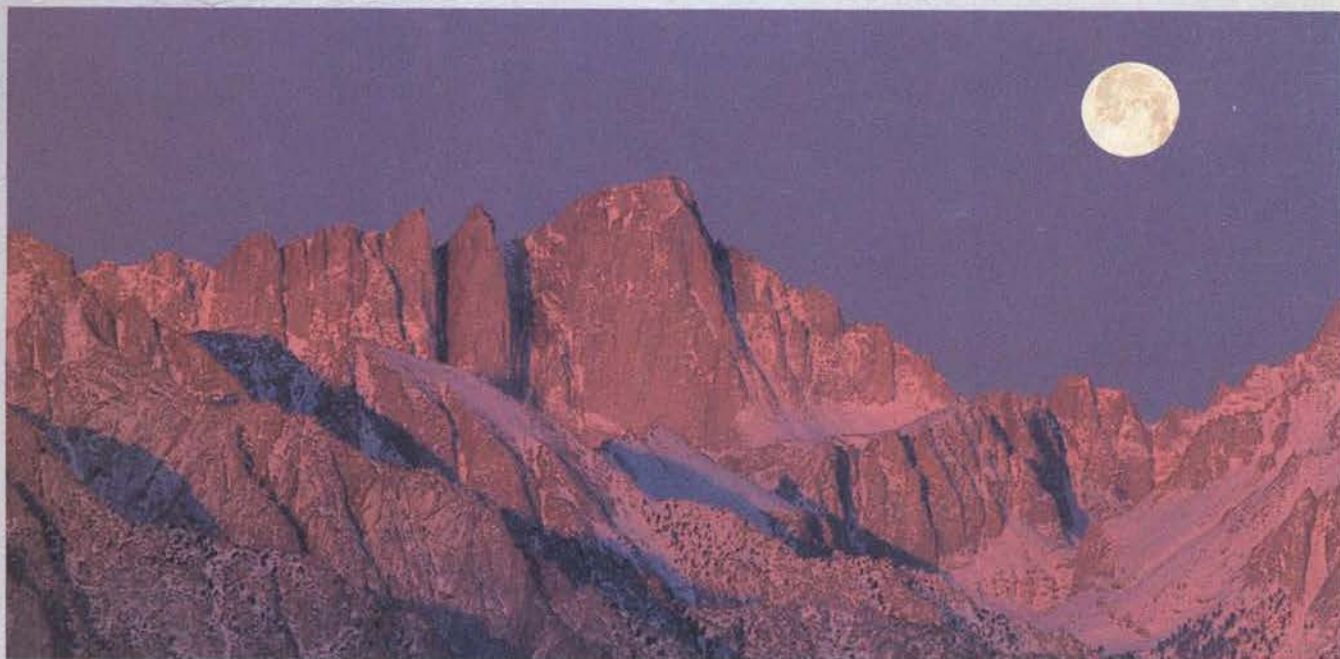
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