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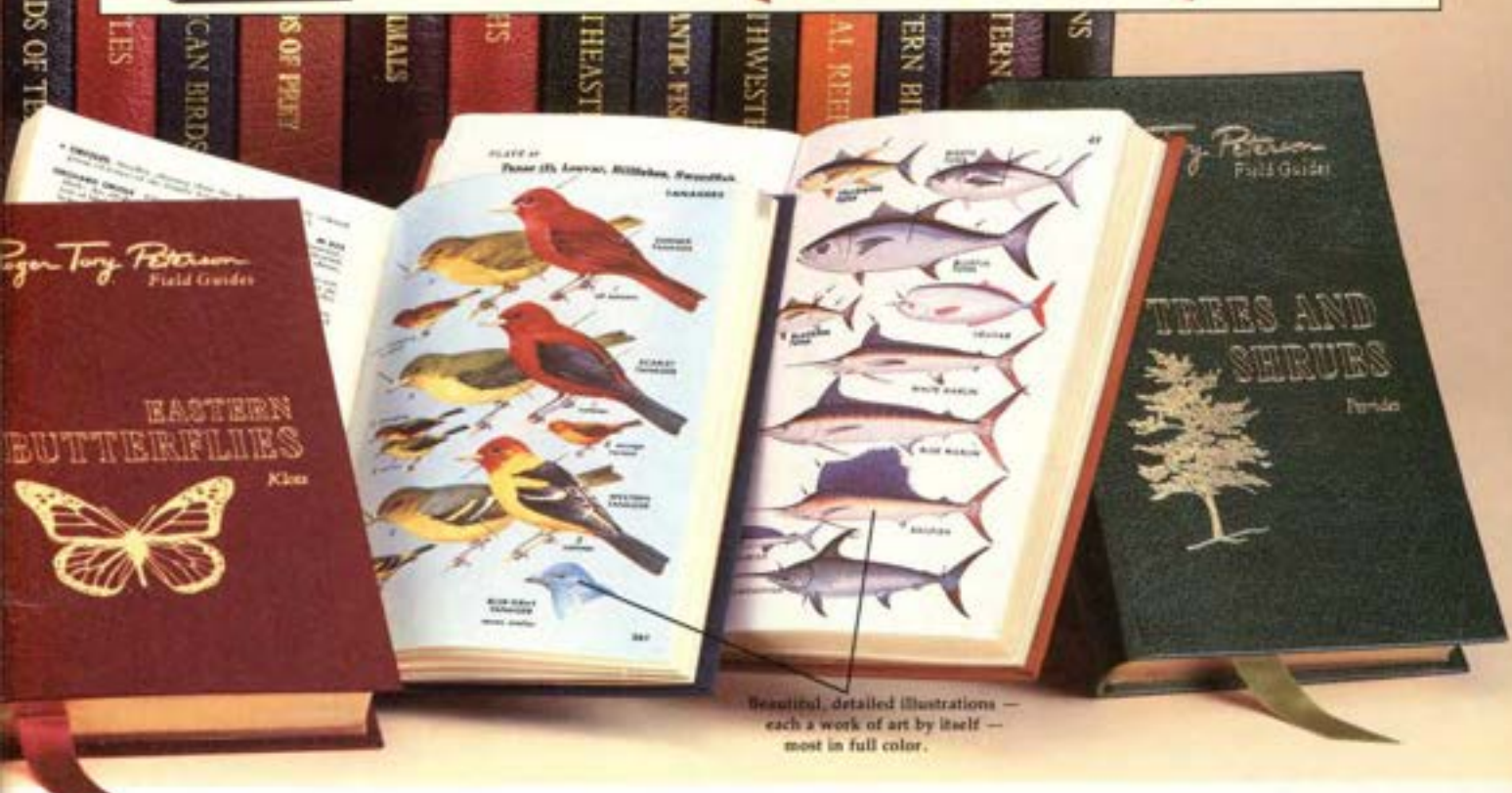
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Sierra

COVER: Cypress thrive in the Everglades' peat-rich sloughs, nurtured by shallow water flows that have made the troubled region a haven for diverse forms of plant and animal life. Can the Everglades' decline be halted in time? See page 38. Photo by David Molchos.

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Energy: In a society where nuclear power takes priority over human health, someone wants you to believe there's a safe threshold for radiation exposure.



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Stephen Graham

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David Galvin and Sally Toteff

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Gas prices keep falling, and many fear a return to America's spend-thrift ways. But the picture is more encouraging than you might think.



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LETTERS

NOT SURE IF IT'S MUIR

In Arthur W. Ewart's wonderful article about John Muir ("Spiritual Sauntering," July/August 1986), a photo on page 49 identifies as Muir an elderly man standing on a ledge at Yosemite's Glacier Point. However, the same picture is identified by historian Shirley



Sargent (in her book *Yosemite Guardian*) as being of Galen Clark, the park's great 19th-century administrator.

Would you please clarify who, exactly, is standing on that icy ledge?

*Thorpe R. Whiteman
Los Angeles, Calif.*

The Editor replies: According to Ronald H. Limbaugh, director of the Holt-Atherton Pacific Center for Western Studies (where we obtained the photo), the picture we ran was part of Muir's original photo collection, and was identified by his eldest daughter, Wanda, as "Muir on Overhanging Rock, 1908." Shirley Sargent, on the other hand, maintains that the photo is definitely of Clark, noting that two postcards in her possession (issued around 1908) feature the same photo and identify the figure as Clark.

We reprint the troublesome photo above, and join Limbaugh in wondering whether it is in fact 94-year-old Galen Clark—whom Muir himself called "the

best mountaineer I ever met"—standing on the snowy tip of Overhanging Rock. (In 1908, Muir would have been a relatively spry 70. We, at less than half Clark's age, won't even go out on a limb to answer the question once and for all.)

FREE ZONES AND FREE PEOPLE

The map in the July/August 1986 "Afield" indicates that Nevada has no nuclear-free zones. Actually, the First United Methodist Church of Reno declared itself a Nuclear Free Zone in 1983, and on January 14, 1985, the Reno City Council passed a resolution opposing transport of high-level nuclear waste through Reno or Washoe County.

*Joseph H. Robertson
Reno, Nev.*

Why in the article on the status of nuclear-free zones was there no corresponding map of the Soviet Union? It would have shown, of course, that no such private initiatives or other political and civil rights exist in that country.

I am glad we live in a system that permits and encourages such free expression. But you have a duty to point out that we do not operate in a vacuum, and that our reliance on nuclear weapons is in response to a clear Soviet threat and has in fact deterred global war for more than 40 years.

Surely neither you nor the nuclear-free campaigners can be pressing for unilateral disarmament, yet that is the clear import of these movements. As a long-term Sierra Club member who has been disturbed by the Club's gradual politicization, I urge you to show a little balance and recognize that good intentions and wishful thinking are no substitutes for expertise and experience in the very complicated and vital area of military strategy and national security.

*Richard Sybert
Washington, D.C.*

THE TRUTH ABOUT TRAILS

Tom Turner's promotion of public involvement in the forest planning process ("Rush Hour in the National Forests," May/June 1986) is gratifying. We believe



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very strongly that an involved citizenry will result in the best forest plans possible. There are several statements in the article, however, that could mislead someone unfamiliar with the history of the National Forests trail program.

The article implies an aggressive and continuing effort to shrink the trail system, and concludes that this is due to three causes: abandonment, burial under new roads and logging sites, and loss of trails to motorized trail bikes, the result of well-financed state off-road-vehicle (ORV) trail programs.

We do not believe this is an accurate picture. From 1946 to 1965 there was a substantial reduction in trail mileage (about 41,000 miles) as a result of the removal of substandard trails, the replacement of trails by roads for more efficient and effective administration and protection activities, and the removal of trails receiving little or no use. Program objectives then shifted from management to recreation uses, and during the last 20 years the system has remained at virtually the same trail mileage (currently 99,500 miles).

We'd also like to point out that state ORV programs do not change the amount of forest area allocated to ORV use in the forest ORV plans. These cooperative state funds actually complement our appropriated trail funds by freeing up dollars for use on trails where ORVs are restricted or banned.

We are quite proud of the recreation and wilderness trail opportunities provided in the national forests, and extend a sincere thank you to the individuals and volunteer organizations that help us maintain them.

R. Max Peterson, Chief
U.S. Forest Service
Washington, D.C.

OF PLANES AND POETRY

Thank you for the long overdue article addressing the issue of air traffic over the national parks ("Filling the Parks With Noise," July/August 1986). Having backpacked in Sequoia and Kings Canyon parks for the last 30 years, it is difficult to recall a trip in which Navy jets have not buzzed the Kern Canyon daily at treetop level.

Years of writing letters have been of no avail. The most recent response from



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the Navy was filled with the same old excuses about needing "more specific details." There is, however, one new justification: "In this era of violent and increasing worldwide terrorism, our military flight crews have a continuing operation requirement to conduct frequent specialized low altitude training." I am reminded of a line from e. e. cummings: "nothing stands in the way of military necessity."

*Jerome Lipetzky
Alpine, Calif.*

EDITOR, USE THY CALCULATOR!

"Food for Thought" ("Afield," July/August 1986) claims that 10 trillion pennies would pay off the federal deficit, which now stands at 2 trillion dollars. A little math tells me 200 trillion pennies would be needed; 10 trillion would pay off only 5 percent of the debt.

*Abbot A. Sackheim
Sepulveda, Calif.*

ACID RAIN ROUNDUP

I enjoyed "The International Acid Test" (May/June 1986). Unfortunately, some of West Virginia's delegation in Congress are part of the U.S. "analysis paralysis." I'm tired of hearing politicians talk continuously about cost-benefit comparisons—no dollar cost can be placed on a well-maintained environment. We should be trying instead to see how the cost of reducing acid rain can be distributed as fairly as possible.

*Samuel Bauserman
Huntington, W Va.*

I recently returned from a trip to Poland, where I was appalled by the air pollution in the major cities we visited (Warsaw, Krakow). We had great difficulty breathing, and the beautiful buildings are definitely affected.

I can't understand a system that does not care about its people, its own environment, and the environment of the rest of the world, where pollution travels. I feel very frustrated and helpless about what we can do to effect changes there.

*Janet Wilusz
Pittsburg, Calif.*

While I enjoyed your discussion of the international acid-rain problem and was

delighted to see such extensive use of the Earthscan book *Acid Earth: The Global Threat of Acid Pollution*, I must ask you to correct the description of Earthscan on two counts: We are neither "London-based" nor a "service of the United Nations." Earthscan is an independent news and information service with offices in London, Washington, and Paris. It is part of the International Institute for Environment and Development.

*Rosemarie Phillips
Director, Earthscan Washington
Washington, D.C.*

FIRST-AID UPDATE

I'd like to update and correct a few items listed in my "Do-It-Yourself First-Aid Kit" (July/August 1986). Hydrocortisone cream's over-the-counter concentration was printed as 5 percent; it should have read 0.5 percent. Lidocaine hydrochloride ointment at 5-percent concentration does indeed require a prescription, but the 2-percent concentration is available over the counter. And pseudophedrine (Sudafed), formerly available by prescription only, can now be bought over the counter, as can 25 mg tablets of diphenhydramine hydrochloride (Benadryl).

*Steve Donelan
Berkeley, Calif.*

PLUTONIUM SCARE

Sierra did a disservice in its May/June 1986 "Afield" by overdramatizing the dangers inherent in the launch of the Galileo spacecraft. It's true that Galileo carries 48 pounds of plutonium as a fuel source for its Jupiter mission. But the shuttle explosion in January was far below the level required to rupture the material's containers.

Moreover, *Sierra* vastly overstates the danger of an accident when it talks about giving "every person on Earth a lethal dose of lung cancer." The actual estimate is 42 additional cancer deaths in the central Florida area in the next 20 years.

*Paul R. Weissman
San Gabriel, Calif.*

The chief danger from a falling plutonium payload is being hit on the head!
*Waldo E. Cohn
Oak Ridge, Tenn.*

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APPARENTLY IT'S MORE THAN A WING AND A PRAYER

Bird migration is one of the world's great unsolved mysteries. Studies of the subject were stalled for years by the assumption that birds have few learning abilities. In fact, experiments have revealed that birds possess unparalleled navigational skills, and in some areas their capacity to learn is surpassed by only the highest mammals.

High-latitude birds migrate to find food and optimal living conditions. An internal clock tells them when to migrate, and an internal compass tells them where to go.

How birds keep time is still unclear, and current theories about how birds navigate vary; scientists claim some birds use low-frequency sound waves, polarized light, Earth's magnetic field, winds, smells, and/or external navigational aids such as the sun, stars, and landforms.

Migrational flights are often long and exhausting, so birds usually follow direct and unobstructed flyways. At right are some of the more frequently followed flyways used to get from breeding grounds to wintering areas: Flyways 1, 6, 7, 14, and 18 are used by birds that follow ocean pathways; birds that follow land contours or coastlines use routes 2, 3, 9, and 14; and routes 15, 16, and 17 are used by birds that trace seasonal food sources on continents. Birds from high latitudes travel to the equator along flyways 4, 5, 8, 10, 11, and 17, while those crossing the equator to the opposite hemisphere use 1, 3, 6, 7, 11, and 14. Birds migrating to temperate or subtropical zones follow routes 2, 9, 11, and 13; those traveling far to the east or west use 7, 9, 11, and 18; and those covering relatively short distances across mountains or seas use 12 and 15. The corresponding illustrations are of birds that commonly use these routes, although many birds use multiple paths. —*Rebecca Poole*



A DAM AFFRONT

A concrete dam in the heart of California's Ansel Adams Wilderness is hardly an appropriate tribute to the late photographer and conservationist. Nevertheless, the Federal Energy Regulatory Commission has once again given its preliminary okay to a large hydroelectric project on the San Joaquin River.

An earlier hydroelectric plan was shelved a few years ago because of a disagreement with a power purchaser and because the terms of the California Wilderness Act had not yet been made final. But when the act was signed by President Reagan on September 28, 1984, it featured a special provision

that did not preclude hydroelectric projects such as this one simply because they would be built in designated wilderness areas.



George W. Whitman

If the dam is built, the north fork of the San Joaquin River and several nearby streams will be diverted into tunnels and pipes to fill two reservoirs. The project would generate 200 to 300 megawatts of power and change the face of a popular Sierra wilderness area.

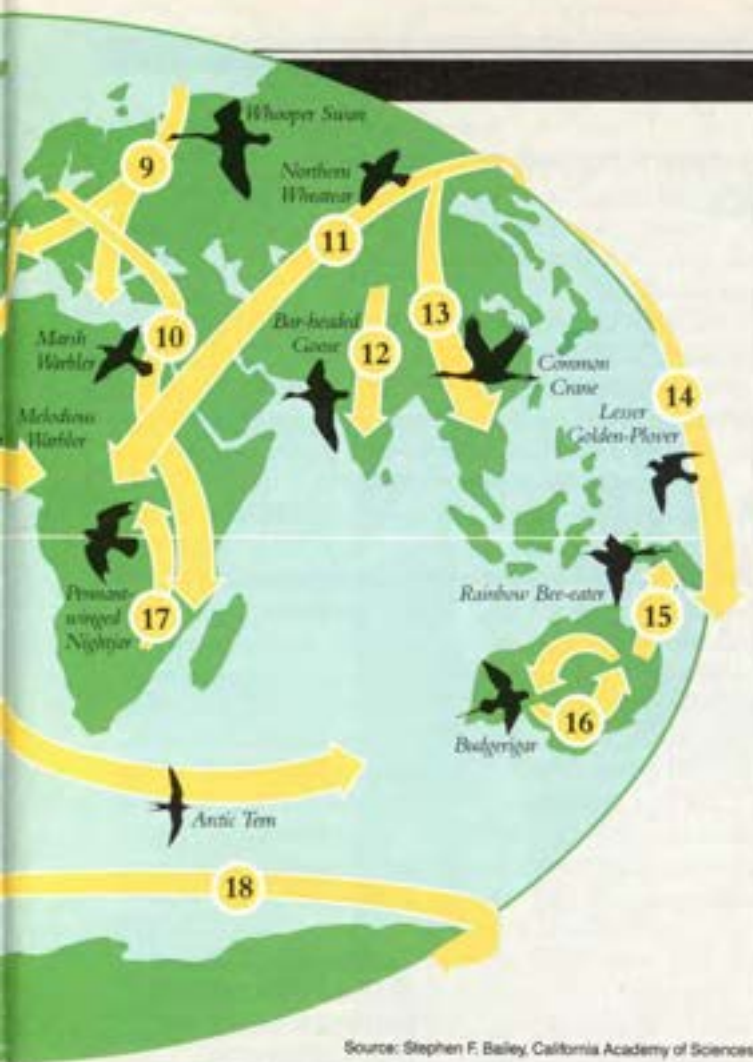
Ansel Adams, who worked for more than half a century to protect and expand wilderness, would never have approved.

In an effort to preserve the river, conservationists are now responding to the Sierra National Forest draft land-management plan. This plan is expected to raise the issue of adding the San Joaquin to the National Wild and Scenic River System, which would safeguard it from dam and diversion projects. —*R. P.*

ROMANCING THE TOAD

Lightning flashed, thunder crashed, rain fell, and toads trilled a love call.

Well, not really. The lightning was from flashing strobe lights, the thunder came from banging on trashcan lids, the rain showered from a garden sprin-



Source: Stephen F. Bailey, California Academy of Sciences

kler, and the pre-recorded toad mating calls were broadcast over a stereo. The Houston Zoo was doing all it could to get its endangered Houston toads to mate.

About 30 years ago, Houston toads were identified as special because of their unusual love call, a high-pitched, 14-second trill. But by 1980 the toads had been placed on the list of the ten most endangered plants and animals in North America. The weak-digging toads prosper only in a special sandy soil, and they were rapidly falling victim to the sprawling urban growth that had ruined their favorite habitats.

After five years

and \$55,000, the zoo's efforts have paid off. While the "thunderstorms" didn't work, hormone shots did: Female toads finally produced eggs that hatched into tadpoles. Following the discovery of Houston toads elsewhere in Texas, the zoo is now releasing eggs, tadpoles, and baby toads into a wildlife refuge in hope that the species' "endangered" status can be changed to merely "threatened" in the near future. —*Jean Bray*



JERRY MURPHY

BLINDED BY THE BLIGHT

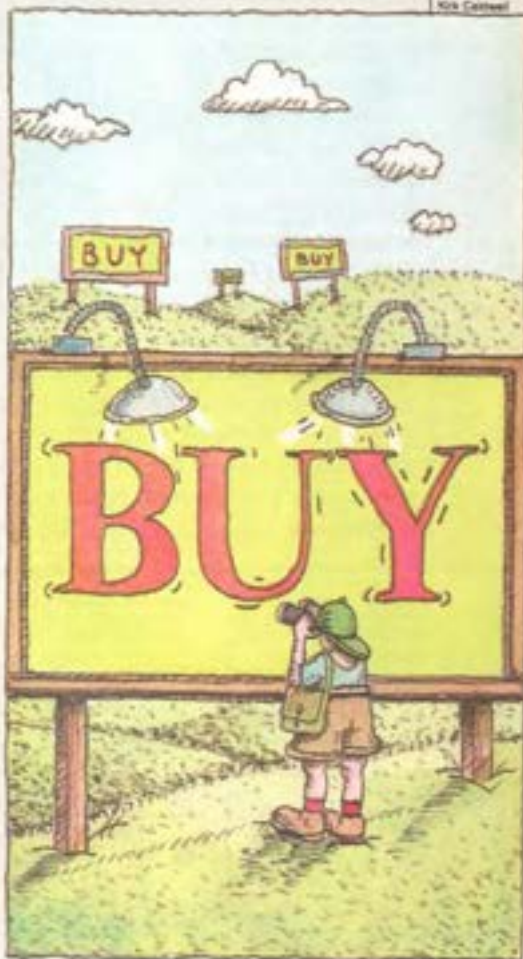
The Highway Beautification Act of 1965 was supposed to curb the proliferation of billboards; instead, more (and bigger) billboards line our highways than ever before.

Billboard opponents blame this increase on poor enforcement of a law filled with loopholes, coupled with the billboard industry's influential lobbying efforts.

When Congress passed the Highway Beautification Act, it stated that billboard controls are needed on federal highways to preserve scenic beauty. The act banned billboards outside commercial and industrial areas—but only those located within 660 feet of federal highways. This prompted the sign industry to blow billboards up to the size of houses and erect them just beyond the 660-foot limit. The act also imposed no effective restrictions on building new billboards in commercial and industrial areas, and several rural counties responded by rezoning their highway strips as industrial or commercial zones. In fact, a 1985 congressional study revealed that in 1983 alone the government allowed three times as many billboards to be put up as were taken down.

With one of the nation's most powerful business lobbies, the billion-dollar-a-year sign industry has succeeded in further weakening the act by pushing through several amendments. One of the industry's biggest victories was a provision requiring that the government pay sign companies to remove illegal billboards, regardless of state or local laws.

There are 500,000 billboards on our federal highways—an average of 14 every ten miles—and 34 percent are candidates for removal. But it would cost taxpayers \$2 billion to remove these billboards (\$203 million has already been spent), which would take a thousand years at the current rate of congressional appropri-



Mike Catlett

ation. Furthermore, when sign companies want to take down old, defunct billboards, they often ask for compensation, then turn around and invest the money in new billboards.

Hawaii, Vermont, Maine, and several small cities have eliminated and prohibited all billboards, while the cities of Little Rock, Ark., San Jose, Calif., Tucson, Ariz., and Houston, Dallas, Ft. Worth, and Austin, Texas, have banned new billboard construction. But the federal compensation policy has made it difficult for most jurisdictions to enforce billboard controls, because they often lack the funds to pay off the sign companies.

Senator Slade Gorton (R-Wash.) introduced an



amendment to the Highway Beautification Act last year (S.B. 1494) calling for an immediate ban on billboard construction along federal highways. If passed, the amendment would also close loopholes, prohibit the industry from cutting down thousands of trees to create better views of billboards

A FIGHT TO THE FINNISH

Proclaiming "Don't let our children turn into radioactive waste!" more than 4,000 Finnish women have pledged not to have children until Finland changes its pro-nuclear-power policy.

"After the Chernobyl accident we wanted our voices to be heard," says protestor Marjo Liukkonen. "We decided to declare a childbearing strike because we consider the effect of nuclear power on future generations. Men look at nuclear power only on the basis of short-term profit."

Who knows? Liukkonen might just be as influential as Aristophanes' Lysistrata, who ended a war by leading the women of Athens on a sex strike. —R. P.

BETTER LIVING THROUGH COW POWER?

Herford, Texas, will soon be the home of the nation's first dung-fueled electric power plant.

By burning six to nine tons of cattle waste per hour, the plant will generate about 40 megawatts of electricity, enough power to supply approximately 25,000 to 30,000 homes. It's also expected to emit half as much sulfur dioxide into the atmosphere as an oil-fueled plant.

Although many nations that lack sufficient forest resources rely on animal waste to produce heat, it is an often neglected but abundant source of energy in the United States.

The West German firm Lurgi, based in Frankfurt, will begin constructing the power plant this month. It is scheduled to be in operation by 1988. —R. P.

(sign companies are issued hundreds of "vegetation control" permits annually), and eliminate the government's obligation to pay for removal of illegal signs.

The Reagan administration has recently joined environmental groups in supporting Gorton's bill, and Reps. Morris Udall (D-Ariz.) and Claudine Schneider (R-R.I.) introduced a companion bill (H.R. 5043) in June. Both bills are currently tied up in committee.

Meanwhile, the Outdoor Advertising Association of America—the heavyweight lobby of the billboard industry—is continuing to push for amendments that would prevent the removal of some billboards, require states to pay for cutting down trees blocking billboards, and permit two billboards per mile on federal highways.

If history repeats itself, industry lobbyists will continue to weaken the Highway Beautification

Act while their opponents scramble to strengthen it. Some say the struggle will continue for years, and that with enough backing, billboard advertising will eventually be banned. But others claim it's just a sign of the times, and that the billboard is here to stay.

—R. P.

SHOOED FLIES DO BOTHER PARKS

Researchers fighting to eradicate sleeping sickness, one of Africa's most widespread and uncontrollable diseases, may unwittingly be paving the way for the further

destruction of African wilderness. Sleeping sickness

(trypanosomiasis) is a potentially fatal disease transmitted by the tsetse fly. Each year it affects thousands of



Illustration by Kim Caldwell

FIELD NOTES

“We stand guard over works of art, but species representing the work of aeons are stolen from under our noses.” —from *Game Management*, by Aldo Leopold.

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BRAVO! BRAVO! BRAVO!

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336578-396572. Bach: Rite Sonatas—Rampal, flute; Pinnock, harpsichord, etc. (Counts as 2—Digital)—CBS Masterworks)
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342329. Bartok: Miraculous Mandarin (complete ballet): Music For Strings, Percussion & Celesta—Dorati, Detroit Sym. (Digital)—London)

338004-398008. Beethoven: Piano Sonatas—Moonlight, Appassionata, Tempest, 3 more. A. Brendel (Counts as 2—Vox Cum Laude)

345199. Beethoven: Overtures (Egmont, Fidelio, Leonore 1, 3, etc.)—Cain Davis, Bavarian Radio Orch. (Digital)—CBS Masterworks)

341982-391987. Beethoven: Sonatas for Piano & Violin, Vol. 1—Eugene Istomin & Isaac Stern (Counts as 2—Digital)—CBS Masterworks)

343137. Beethoven: Symphonies Nos. 1 & 2—Hogwood, Acad. of Ancient Music (Digital)—Columbia-Lyric)

344109. Beethoven and Mozart: Quintets For Piano & Winds—Perchia, soloists English Chamber (Digital)—CBS Masterworks)

335547. Berlioz: Symphonie Fantastique—Barenboim, Berlin Phil. (Digital)—CBS Masterworks)

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344143. Chopin: Preludes, Op. 28—Vladimir Feltsman, (CBS Masterworks)

339374. Chopin: Piano Concerto No. 2, Schumann: Piano Concerto—Andreas Schiff, Dorati, Amsterdam Concertgebouw (Digital)—London)

335679. Debussy: La Mer; Nocturnes—Andre Previn, cond. London Symphony (Digital)—Angel)

343525. Dvorak: Sonata in G; Smetana: From My Homeland, etc.—Itzhak Perlman & Samuel Sanders (Digital)—Angel)

341214. Haydn: Symphony No. 100 (Military), No. 104 (London)—Hogwood, cond. (Digital)—Columbia-Lyric)

334508. Mahler: Symphony No. 1 (Titan)—Muti cond. Philadelphia Orch. (Digital)—Angel)

329094-399097. Mahler: Symphony No. 2 (Resurrection)—Lynn Maazel, Vienna Phil. (Counts as 2—Digital)—CBS Masterworks)

318824. Mendelssohn: Symphony No. 4 (Italian); Schumann: Symphony No. 4—Tennstedt, Berlin Phil. (Digital)—Angel)

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341297. Prokofiev: Symphony No. 1 (Classical); Love For Three Oranges Suite—Lynn Maazel, cond. (Digital)—CBS Masterworks)

324822. Ravel: Bolero; Rapsodie Espagnole; La Valse; etc.—Maazel cond. (Digital)—CBS Masterworks)

340190. Reich: The Desert Music—M. Tison Thomas, members Brooklyn Philharmonic (Digital)—Nonesuch)

341677. Schubert: Symphonies 2 & 8 (Unfinished)—Barenboim, Berlin Phil. (Digital)—CBS Masterworks)

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people and kills countless livestock. During the past decade epidemics have ravaged Cameroon, Uganda, and Zaire, among other countries, and more than 50 million people in 36 nations are now in danger of catching the disease.

But with the help of some cleverly designed weapons (cloth and mesh traps that are baited with irresistible ox odors), researchers are making strides in curbing

the tsetse-fly population, and health professionals are optimistic that sleeping sickness may soon be under control.

While potential eradication of this debilitating disease is cause for celebration, the solution has unexpectedly created a problem for the ecosystem: Farmers eager to find new grazing land for their livestock are jumping at the chance to take over tsetse-free areas.

"The tsetse fly's deadly effects on livestock and humans have long been the sole protection for many wildlife-rich areas," says Eleanor Sterling, program officer for the World Wildlife Fund's Africa Program. "If the tsetse disappears, there will be little to prevent farmers and ranchers from moving in. And the conversion of delicate ecosystems to ranchlands is detrimental to the native wildlife."

According to Sterling, the specter of grazing on tsetse-free African land is already threatening some of the continent's most spectacular natural areas, including many of its national parks. "Mikumi National Park in central Tanzania is just one of several parks that was set aside because tsetse made it useless for any other purpose," Sterling says. "The Tanzanian government and many others in similar positions may have great trouble justifying further protection for such areas once the fly is gone." —*Joseph Wallace*

CYANIDE CAFE

For more than a hundred years, Whitewood Creek has been virtually devoid of life. Located below the Homestake Gold Mine in the Black Hills area of

WINS

- Acid-rain control bills have gained substantial bipartisan support, building momentum for congressional approval.
- The House passed bills in June directing the U.S. Agency for International Development to avoid funding projects that would destroy tropical forests or impair biological diversity.
- President Reagan signed a bill in June that strengthens protection of the nation's drinking-water supplies.
- In June, a federal appeals court upheld a district court ruling that bars Sea World, a California marine amusement park, from capturing 100 killer whales from an estimated population of 300 in the Gulf of Alaska.

LOSSES

- The EPA announced in July that it would not include mining wastes in its regulation of hazardous waste.
- The House Interior Committee approved legislation in June that would ease restrictions that keep private corporations from speculating on federal coal reserves.

South Dakota, the creek has long been contaminated with a cyanide solution used to extract gold from ore. However, two mine workers have recently made a

Proposed Veloway



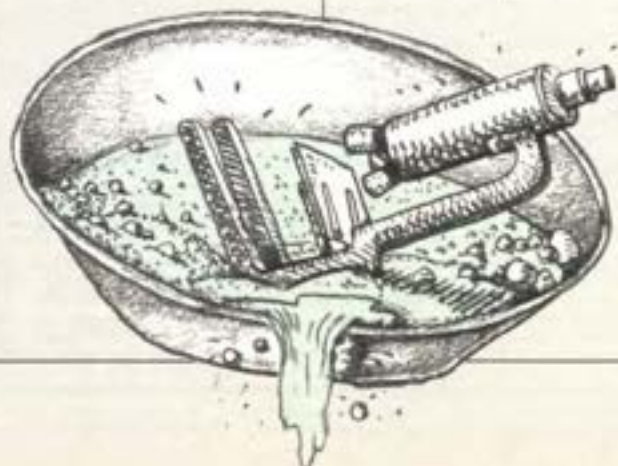
WHEELING WEST LOS ANGELES


The city known for its jam-packed highways wants to build yet another freeway—only this one's for bicycles. If built, the 2.5-mile, 17-foot-high concrete "veloway" would wind through Westwood Village and the UCLA campus, giving as many as 4,000 cyclists a day a chance to pedal where cars (and dogs) aren't allowed.

The California Department of Transportation, Los Angeles County, and UCLA have contributed a total of \$132,500 to study the project.

"I look at this as a demonstration project that will show that if you make bicycling safe and convenient, more people will do it," says Ryan Snyder, executive director of Citizens for the West Los Angeles Veloway.

After winning preliminary approval the bikeway must still attract financial backing—\$7 million to \$10 million worth. Snyder says that's not such a high price compared to the \$8 million it cost recently to build a 500-car Westwood parking lot. But he hasn't ruled out building a toll plaza to help defray the cost. —*R. P.*





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Since these miniature munchers (renamed *Pseudomonas paucimobilis mudlock* after their cultivators) have been on the job, Whitewood Creek has become clean enough to support fish and other life, and the natural color of the water is returning to what it must have been before gold was discovered in the region more than a century ago.

—David Wann

YOSEMITE'S ATTIC

The Yosemite Museum was given to the public in order that all visitors to this majestic valley might know the story of its creation and native life."

So reads the original dedication plaque on the arched doorway of the 60-year-old Yosemite Museum. Too bad the building hasn't always fulfilled its mission.

Park officials decided in 1966 that interest in the museum was waning, so they stashed 40,000 relics—from original Thomas Ayres drawings to rare hotel registers and Indian headdresses

—and converted the museum into Park Service offices, an audio-visual lab, a library, and a courtroom.

But plans are now in the making to revitalize the museum. "By 1987, if all goes well"—a big "if" considering funding limitations—"we intend to begin work

on a natural history and human history museum, and we will open a fine arts gallery," says Dave Forgang, the Yosemite curator instrumental in bringing back the museum. "They will become one of the park's best attractions."

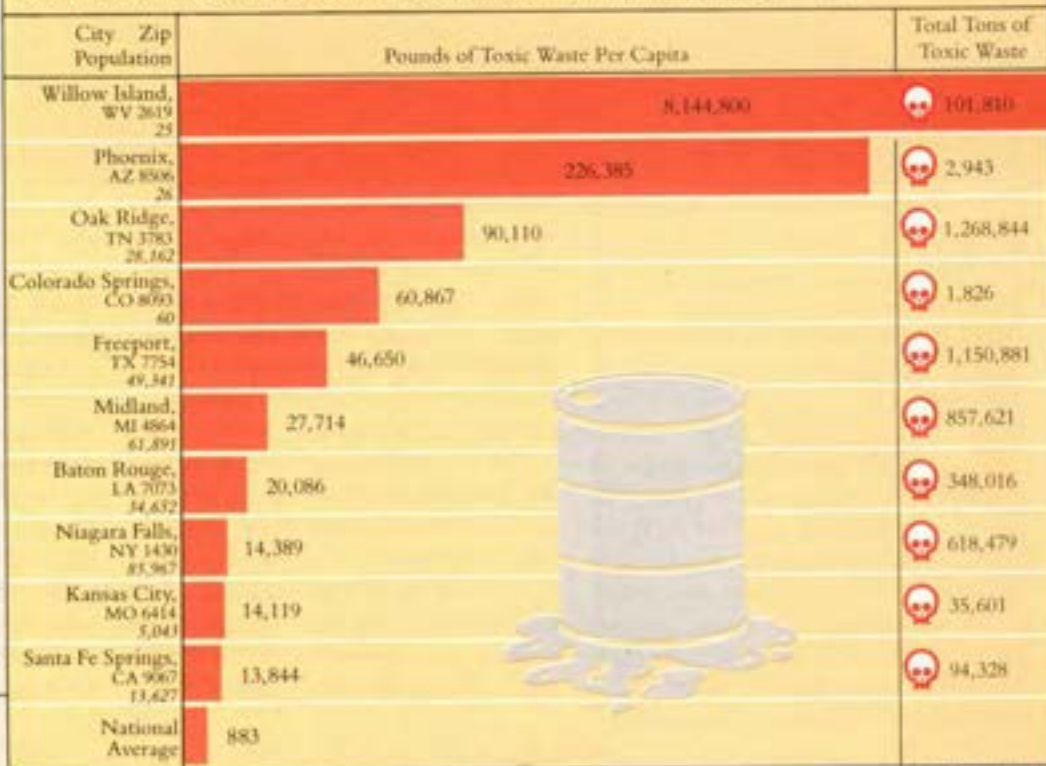
—Ardeth Huntington



National Park Service

A PER CAPITA GLIMPSE AT TOXIC WASTE IN AMERICA

Using data never before published, the Council on Economic Priorities released a study this year that reveals how much toxic waste is generated on a per capita basis in every part of the nation. In this study the country is divided into large areas based on the first four digits of their zip codes. Selected areas with large amounts of toxic waste per person appear below. Many of these locations are processing sites for nuclear weapons, and some are sparsely populated. But no location compares to Willow Island, W.Va. (zip code area 2619), where 25 residents live by plants that generate toxic waste at a per capita rate 9,244 times the national average. To illustrate the amount of toxic waste per person in this area accurately, the bar on the chart below would have to extend for an additional 17 pages. —R.P.



EarthSurface Graphics

Can Caribou and Oil Coexist?

A major conservation battle is taking shape over the question of oil and gas development in Alaska's pristine Arctic Wildlife Refuge.



Richard F. Smith/Anastasia Aronov

The porcupine caribou herd, shown here in the Yukon, travels west to a coastal plain in northeastern Alaska to calve. Congress will soon decide whether to open their refuge to oil and gas development.

Tom Kizzia

EACH SPRING the 150,000-head porcupine caribou herd—one of the two great caribou herds in the United States—ripples west across the tundra on its way to the coastal plain. The herd scatters near the shores of the Beaufort Sea in northeastern Alaska—the bulls and yearlings to graze, the cows to calve and nurture their young. In mid-summer, clouds of mosquitos rise from the soggy tundra and the caribou grow

restless, moving closer to the water in search of a breeze. Soon they will reassemble for the long march east to Canada, back to their wintering grounds in the southern Brooks Range.

The Arctic National Wildlife Refuge was established in 1960 in recognition of the area's outstanding wildlife and pristine ecosystems. The importance of the region was again acknowledged when the protected area was doubled to 18 million acres as part of the landmark Alaska National Interest Lands Conser-

vation Act (ANILCA) of 1980. Some 8 million acres of the original refuge were made wilderness—all but a critical 1.4 million acres of the coastal plain. This remains the only section of the North Slope that is still closed to oil and gas development, but it may not be closed for long.

Congress hesitated to extend wilderness protection to the sensitive caribou calving grounds, just 75 miles east of the oil fields at Prudhoe Bay, because the area is believed to contain one of the most promising onshore oil prospects in Alaska. The fight between wilderness advocates and oil interests over this piece of ground posed a serious last-minute obstacle to passage of ANILCA. The House of Representatives twice passed bills that extended wilderness designation to the coastal plain, thereby protecting the calving grounds, but the Senate rebuffed any ban on oil and gas exploration. (Oil development is permitted on Alaskan wildlife refuges if it is deemed compatible with use.) The compromise bill signed by President Carter called for a six-year study of the area's wilderness suit-

ability and oil and gas potential—thus postponing the day of reckoning.

That day is about to arrive.

The U.S. Department of Interior's Fish and Wildlife Service (FWS) must give the results of the study to Congress by September, along with the Interior Secretary's management recommendations. The September deadline may be pushed ahead to next spring because of a lawsuit brought by the Anchorage-based environmental law firm Trustees for Alaska, which is asking that the pub-

lic be allowed to review the study. But in any event, Congress will soon decide whether to allow oil and gas development on Alaska's Arctic coast—or whether to designate it wilderness.

Regional FWS director Robert Gilmore predicts "a battle of unprecedented size" over drilling on the coastal plain. Conservationists agree. "This is the only portion of the Arctic coastline that's protected," says Mike Matz, assistant Alaska representative for the Sierra Club. "It ought to be the last place we allow oil and gas development."

Since 1981, conservationists have fought a running battle with the Reagan administration over preparation of the 1002 report (named for the section of ANILCA that calls for a study of the coastal plain). Alarms were sounded when then-Secretary of the Interior James Watt assigned the U.S. Geological Survey—the agency responsible for assessing the nation's mineral and oil endowment—to head the study rather than the FWS, which oversees the wildlife refuge.

Environmentalists eventually won a court ruling saying that Congress had intended the FWS to head the study, and that Watt had no authority to transfer responsibility for the report to the USGS. Watt also angered conservationists when he announced that he was cancelling Carter's negotiations with Canada for a treaty to protect the caribou calving grounds. The negotiations have since been revived by local grassroots groups.

Interior Department officials claim that both the oil and environmental aspects of the study are now being handled fairly, but conservationists say the agency is predisposed to allow oil development. As evidence they point to secret Interior Department negotiations held last winter to trade federal mineral rights on the coastal plain for Native corporations' land holdings within other Alaskan wildlife refuges. Environmentalists charged the agency, which was simultaneously preparing the 1002 report, with a conflict of interest.

The Interior Department denied the charge, saying the trade was being handled by high-level administration officials, not the field personnel preparing the report to Congress. They pointed to

the fact that any trade would be subject to congressional approval. But conservationists said the agency had no right to spend \$300,000 on an appraisal of Native inholdings without informing congressional oversight committees. They hooted at the "James Bond language" of a leaked memorandum in which officials refer to the negotiations as "Megatrade" and "Project M." Opponents view the trade as an attempt to divide Natives—many of whom depend on caribou for subsistence—and claim that vested interests will use it as a way of pressuring Congress to allow development.

Already, a single exploratory well has been drilled as the result of a small trade of oil rights on the coastal plain's single Native inholding—a trade that was conducted without congressional oversight. The well is not far from the Inupiat Eskimo village of Kaktovik, which is within the wildlife refuge. Residents of the settlement, who rely heavily on caribou, are divided over the issue of oil development.

Official reports differ in their conclusions about the effects of oil and gas development on Alaskan caribou. Studies by the Alaska Department of Fish and Game have concluded that the oil complex around Prudhoe Bay has had an impact on the central Arctic caribou herd, but oil industry studies show that caribou numbers have actually increased. In this instance, the report may be a red herring: Randy Rogers, executive director of the Northern Alaska Environmental Center in Fairbanks, says the porcupine caribou can't be compared to the central Arctic caribou. Unlike the central herd, the porcupine caribou return to the same patch of coastal plain each year. "They don't have the option the central herd does of calving in another area," he says.

Although exploration on other parts of the North Slope has declined, due in part to the recent oil glut, the oil industry has shown no indication of backing off from its designs on the Arctic Wildlife Refuge. Congress will receive confidential ("proprietary") oil company data in the report from the FWS, some of which may be made public when Congress reaches its decision.

Conservationists staked out their

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position in May, when Rep. Morris Udall (D-Ariz.) introduced a bill to set aside the coastal plain as wilderness, preserving the unbroken Arctic vista from mountain to icy sea. Such a bill is not expected to pass—at least not before Congress receives the 1002 report—but

advocates see it as a symbol of support for the porcupine caribou, whose days of calving in peace may soon come to an end.

TOM KIZZIA covers rural Alaska for the Anchorage Daily News. He contributed "Feuding Groups Make an Oil Deal," page 76.

ENERGY

A Dose Is a Dose Is a Dose

Radiation is an unavoidable fact of life. Its safety ought to be a question of health, but more often it's a matter of politics.

Frank R. Schiavo

"AN INDUSTRY SPOKESMAN said the radiation released during the event—which is now under control—poses no serious threat to public health." This has become one of the more familiar statements of the atomic age, automatically accompanying almost every report of a nuclear accident. It reflects a basic tenet upheld by the nuclear industry and the federal government for more than 30 years: that there is a "safe" threshold of radiation exposure for human beings.

This assumption has been controversial from the early days of nuclear power to the Chernobyl accident last spring. In 1962 the Atomic Energy Commission (AEC) hired Dr. John Gofman to establish a biomedical division at Lawrence Livermore Laboratory in Northern California, one of two places where the nation's nuclear weapons research is conducted, to investigate the impact of radiation on humans.

In 1969, Gofman and Dr. Arthur Tamplin completed their studies. They made three generalizations about radiation and human health: (1) all forms of human cancers can be induced by radiation; (2) an increase of radiation produces a linear increase in cancer incidence; and (3) children are far more susceptible to radiation-induced cancers than older people. Gofman and Tamplin's research showed that the officially permissible annual dose of radiation from nuclear power plants—at that time an average of 170 millirems per person—would result in 16,000 to 32,000 additional deaths from cancer in the United States each year.

The AEC, which had held that no deaths would result from such an exposure, responded to the study by commissioning the National Academy of Sciences to investigate and report on Gofman and Tamplin's findings. Although 60 scientists worked on the project, neither Gofman nor Tamplin was asked to contribute; in fact, they were never even contacted. The committee released its report, "Biological Effects of Ionizing Radiation," in 1972. The report concluded that 6,000 additional cancer deaths would be caused by an average nationwide exposure of 170 millirems of radiation per year. The committee later acknowledged error in the number of deaths and revised its findings to bring them in line with those of Gofman and Tamplin. In 1979 the EPA issued standards allowing an average dose of 25 millirems of radiation per person per year from nuclear power plants under "normal, planned operations."

The AEC was replaced by the Department of Energy in 1975, and the campaign to minimize the dangers of nuclear power continued. That same year Dr. Rosalie Bertell released a study that linked X-rays to leukemia; she lost her DOE funding in 1977. The following year Dr. Thomas Najarian reported that workers at the Portsmouth, N.H., nuclear submarine shipyard who were exposed to low-level ionizing radiation showed incidences of cancer and leukemia that were respectively 4.5 and 5.5 times higher than the national average. Najarian lost his DOE funding that year. Dr. Thomas Mancuso was hired by the agency to investigate the conclusions of a 1977 report by Dr. Samuel Milham of

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the Washington State Department of Public Health that showed elevated cancer rates among workers at the Hanford, Wash., nuclear waste site. Mancuso's findings supported Milham's study and reported a 6-percent increase in cancer among the Hanford workers. He subsequently lost his DOE funding.

In a 1978 hearing on the issue before the House Subcommittee on Health and the Environment, subcommittee chair Rep. Paul Rogers (D-Fla.) drew the obvious conclusion: "Someone in the Department of Energy doesn't want the public to know about the effects of low-level ionizing radiation."

While Gofman and Tamplin were conducting their research, the International Commission on Radiological Protection proposed industry standards for "allowable" levels of exposure to radiation. Without baldly saying so, the committee implied that its first priority was promoting nuclear power, not public health: "This [radiation] limitation necessarily involves a compromise between deleterious effects and social benefits. . . . It is felt that this level provides reasonable latitude for the expansion of atomic energy programs in the foreseeable future. It should be emphasized that the limit may not in fact represent a proper balance between possible harm and probable benefit."

Although he lost his government funding, Gofman has continued his study of the effects of low-level radiation. "Since the 1960s I have searched the literature for any evidence to support the idea of a safe threshold of radiation regarding human cancer production," he says. "I know of none."

No one will deny the complexity of measuring releases of low-level ionizing radiation. From the mining and milling of uranium ore to the storage of nuclear wastes, there are planned and unplanned releases of radioactive elements that decay at varying rates and enter the food chain at different points. Nor will anyone deny the complexity of determining the actual doses of radioactivity absorbed by the human body. Few people wear radiation-monitoring badges or can tell how long a particular radionuclide remains in a particular tissue. Moreover, it can take as long as 40 years for latent cancers to develop,

and three or more generations for the genetic consequences to appear.

Despite these uncertainties, the nuclear industry claims it is capable of limiting radioactive releases to between 0.003 and 0.1 millirems per person per year, and that the consequences of such exposure are minimal. But the fact that the industry and the federal government fought to keep the permissible levels from dropping to 25 millirems per year despite these claims speaks to the enor-

mous latitude the industry requires for its normal operations.

Some exposure to radioactivity is unavoidable. Gofman estimates that natural, background levels of radiation (which vary according to site) cause 42,000 cancer deaths per year in the United States. But, he writes in *Radiation and Human Health*, this toll "can hardly be regarded as a benchmark of acceptability for other radiation doses. It would be foolish indeed for the popula-

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Source of radiation	Approximate annual dose in millirems
Cosmic rays from space: 40 mrem average at sea level; add 1 mrem for each 100 feet above sea level	43
Radioactive minerals in rocks and soil: ranges from 20 to 400 mrem; U.S. average = 55	55
Radioactivity from air, water, and food: ranges from about 20 to 400 mrem; U.S. average = 25	25
Medical and dental X-rays and tests: 22 mrem for chest X-ray, 500 for X-ray of lower gastrointestinal tract, 910 for whole-mouth dental X-ray film, 1,500 for breast mammogram, 5 million for radiation treatment of a cancer; U.S. average = 80	80
Living or working in a stone or brick structure: 40 mrem for living and an additional 40 for working in such a structure	0
Smoking one pack of cigarettes a day for one year: 40 mrem	0
Nuclear weapons fallout; U.S. average = 4	4
Air travel: 2 mrem per year for each 1,500 miles flown	0
TV or computer screens: 4 mrem per year for each 2 hours of viewing a day	4
Occupational exposure: 100,000 mrem per year for uranium ore miner, 600-800 for nuclear power plant worker, 300-350 for medical X-ray technician, 50-125 for dental X-ray technician, 140 for jet plane crews; U.S. average = 0.8	.8
Normal operation of nuclear power plants, nuclear fuel processing, and nuclear research facilities; U.S. average = 0.1	.1
Miscellaneous: luminous watch dials, smoke detectors, industrial wastes, etc.; U.S. average = 2	2
Your annual total	219
Average annual exposure per person in the United States	230

Chart adapted from *Living in the Environment* by G. Tyler Miller, Jr. (Wadsworth, 1984).



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tion to accept even a 'low' dose of 5 percent of the natural dose without an exceedingly good reason for doing so."

The nuclear fires in the Ukraine fade from memory as news coverage diminishes and public interest wanes. The American nuclear industry has reassured us that Chernobyl can't happen here,

while it continues to pressure Congress for weaker regulations. Meanwhile, radiation—some of it unavoidable, but much of it within our power to control—quietly enters our lives.

FRANK R. SCHIAVO is a lecturer in the Environmental Studies Department at San Jose State University in California.

ENDANGERED SPECIES

A Safe Harbor for the Sea Otter

Establishing a new colony of sea otters off the California coast may be this clever marine mammal's best hope for survival.

Rachel T. Saunders

THE CALIFORNIA SEA OTTER once ranged in the hundreds of thousands from Alaska to Baja California and across the Pacific to Russia and Japan. But in the 18th and 19th centuries the species (also known as the southern sea otter) was so ruthlessly hunted for its rich, dense fur that by 1911, when it was finally protected by international treaty, only tiny, isolated populations remained. Those otters inhabiting California's coastal waters, once estimated at 16,000 to 18,000 animals, were thought to be extinct.

But a small band of survivors managed to persevere off the rugged and remote Big Sur coast. In the nearly five decades since its rediscovery in 1938, the California sea otter has regained a tenuous foothold on survival. Today an estimated 1,400 adult animals inhabit the California Sea Otter Refuge, a 220-mile-long stretch of ocean off the central California coast. This remnant population is continually menaced—primarily by potentially disastrous pollution (particularly from oil spills), but also by accidental drownings in fishing nets and deliberate killings by shellfishermen with whom the otters compete.

In 1977 the Fish and Wildlife Service (FWS) designated the California sea otter a threatened species under the federal Endangered Species Act, largely because its small population size and restricted distribution make it extremely vulnerable to an oil tanker spill. Although the otter has so far been spared a major oil incident, there have been numerous close calls in the recent past, and

the threat of a gigantic spill in California's coastal waters remains ever present: At least 94 million barrels of oil and petroleum products are transported past the otter's range each year, conveyed by tankships 60 percent of which travel within just ten miles of shore.

In addition to the serious threat posed by tanker accidents, vigorous offshore oil-drilling activities are now encroaching upon the southern end of the otter's range, with tracts leased as far north as Morro Bay, well within the otter's habitat. The Interior Department's newly released five-year leasing plan would offer still more tracts at both ends of the otter's range, off San Luis Obispo and Santa Cruz counties.

For these reasons, conservationists and others concerned with the sea otter's survival are endorsing an FWS proposal to establish a colony of 70 otters on San Nicolas Island, outermost of California's offshore Channel Islands. The key assumption of the translocation plan (which the agency hopes to implement by the fall of 1987) is that no single incident—a massive oil spill off the Big Sur coast, for example, or a rig blowout in the Santa Barbara Channel—could devastate both of the widely separated populations. Furthermore, because of San Nicolas Island's superb habitat and the wide expanses of deep ocean water surrounding it, translocated otters are more likely to remain in the area than to disperse. This is considered one of the most important advantages of the site.

Unlike seals and whales, otters do not possess a layer of blubber; instead they rely on their thick fur for insulation.



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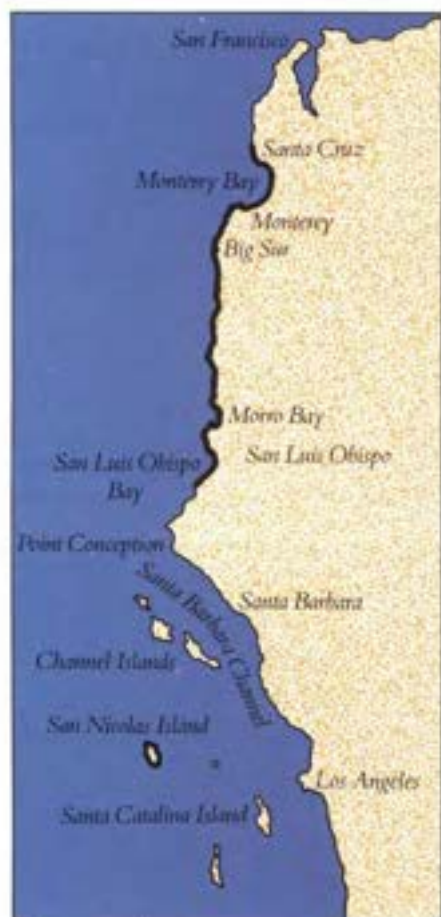
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Bedded down in a forest of floating kelp, an ever-curious sea otter takes its rest. In addition to helping the otter anchor itself in place, kelp supports a variety of shellfish, an otter staple.

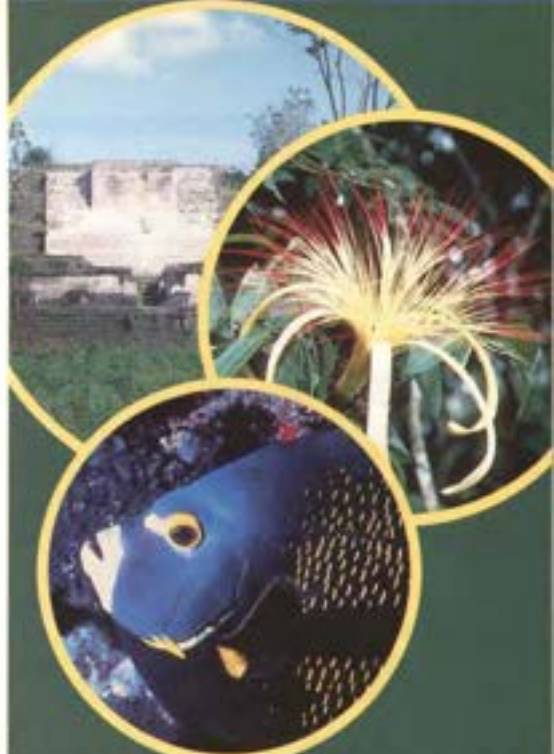


The sea otter's current range extends from above Santa Cruz to below San Luis Obispo. The proposed sea otter refuge, San Nicolas Island, is well below the southern limit of that range, and substantially farther out to sea. Both these factors would reduce the dangers to the threatened mammal from oil tanker spills and drilling platform blowouts along the California coast.

Direct contact with oil mats the fur, allowing chilling water to penetrate to the skin. If as little as 20 to 25 percent of the coat becomes oiled, the resultant heat loss can kill the animal. The ill effects of oil-matted fur may be compounded as toxic oil is swallowed with seawater, eaten with food, and ingested while grooming. Because floating oil tends to remain in kelp beds (which otters frequent in pursuit of sea urchins, kelp crabs, and other mainstays of its diet), the likelihood of contamination is greatly increased. Even animals that are spared oiling could suffer from oil-caused decimation of their shellfish prey. (Otters must consume up to 25 percent of their weight per day to maintain their 100-degree body temperature.)

Its dietary preferences and impressive metabolic requirements have earned the otter the enmity of those who make their living harvesting shellfish from California's waters. Thus, some commercial and recreational shellfish interests oppose the translocation plan, because in their view otters threaten the remaining shellfisheries in Southern California, which are already plagued by pollution and overfishing.

Responding to this argument, supporters of the translocation point out that fishery conflicts are significantly lower at San Nicolas than at other potential sites; furthermore, the island's natural isolation should discourage emigration to adjoining areas. The FWS, the California Department of Fish and



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Game, and conservationists have agreed that any otters found south of Point Conception (except in the nearshore habitat surrounding San Nicolas) would be assumed to be strays from the translocated population, and would be captured and returned to the island or mainland population. As otters historically abounded in waters off the Southern California coast, this is a major concession to the shellfish industry.

Yet shellfishing interests continue their efforts to block translocation, seeking instead to restrict the otter's movements and numbers severely. The oil industry, which fears curbs on development if a legally protected species is introduced to Southern California, may

also try to stop translocation, or use it to justify further drilling in the otter's range.

Clearly, the California sea otter will remain threatened with depletion or even extinction as long as its entire population is located within its current limited range along the central California coast. While protection of the otter's existing habitat remains of paramount concern, the establishment of an additional colony at San Nicolas Island offers the recovering species its best prospect for surviving a large-scale environmental disaster.

RACHEL T. SAUNDERS is staff biologist for Friends of the Sea Otter (P.O. Box 221220, Cannel, CA 93922).

MINING REFORM

The Miners' Watchdog Doesn't Bite

Though obliged to enforce a tough law, the Office of Surface Mining has let confusion reign in the nation's coal fields.

Fred Brown

ON THE OUTSKIRTS of Norton, Va., shantytown trailers sit perched like starlings below the ridge of a mutilated mountain. The land above totters on the brink of avalanche. Children of the shanties splash in a stinking mountainside rivulet laced with acid from an abandoned strip

mine. Festering sores dot the children's arms and legs, a result of romping in an acidic playground.

Scenes like this were not supposed to exist after passage of the Surface Mining and Control Reclamation Act of 1977. The hotly contested legislation was designed to repair old wounds from strip-mining and prevent future ones. But



A coal mine in West Virginia: Despite the passage of a strong strip-mine law in 1977, many operators are still leaving behind leveled mountains and polluted streams in Appalachia.



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nine years later such scenes are still common. The agency that was created to enforce the law, the Interior Department's Office of Surface Mining (OSM), has failed to do so.

David Short, professor of mineral law at the University of Kentucky, says the OSM began to languish with the appointment of James Watt to head the Interior Department in 1981. "The regulations were deliberately rewritten to make the law more complicated, to make it unworkable," Short says. "I don't object to tightening regulations or getting rid of stupid ones—and there was some of that—but most of the regulatory reform was aimed at crippling the law."

Representative Morris Udall (D-Ariz.), chair of the House Interior Committee, says, "Watt deliberately set out to destroy the OSM. He fired everybody who believed in the law, and he put in some people who didn't believe in it at all."

A 1985 report prepared by the National Wildlife Federation, "Failed Oversight," states that the OSM rewrote 95 percent of its regulations during the Watt era—only to have 79 percent of the changes revised after successful court challenges by conservation groups, including the Sierra Club, the National Wildlife Federation, and the Environmental Policy Institute. Meanwhile, according to the report, the OSM allowed 6,000 mines to operate without any reclamation efforts, and failed to collect fines of more than \$200 million. The agency has also failed to enforce vigorously what conservationists see as the keystone of the law—a provision requiring that mined lands be restored to approximately their original contours.

After twice investigating the agency, the House Subcommittee on Energy and Environment bitterly criticized the OSM for its inability to assess and collect fines. From a set of 90 mining violations investigated by the subcommittee, 23 case files were missing. Of the 67 files that were located, 53 indicated that in each case the agency had not been able to correct the problem. The subcommittee pointed out many additional signs of mismanagement, including a 4,000-case backlog of collections in 1983.

The states of Tennessee, Kentucky, West Virginia, and Virginia—the heart of Central Appalachia's coal country—all bear witness to the inability of the Office of Surface Mining to use its enforcement tools. In Tennessee alone, more than 11,000 acres of abandoned mines still show the ravages of stripmining, even though the strip-mine bill was designed to reclaim them. The government-owned Tennessee Valley Authority, one of the biggest coal buyers in the region, admits that some of its coal suppliers are not in compliance with the

law, but it continues to buy from them.

Senator Wendell Ford (D-Ky.) is equally nonchalant about enforcement. "In eastern Kentucky we've had mountaintop removal and head-of-the-hollow fill," he says. He defends this rearrangement of the landscape by pointing out that level land is valuable to the region. "Surface mining has provided major areas of improvement, such as industrial sites and hunting preserves," he says.

But even Ford is upset by one form of lax enforcement. "We've got one prob-

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lem in Kentucky, and that's the two-acre permit," he says. The strip-mine act allows 250 tons of coal to be removed from any two-acre mining operation without a permit, a provision intended to give property owners the right to dig coal from their backyards for winter fuel, and to allow mom-and-pop operations to continue. But the provision has been widely abused by miners who pay little attention to either the 250-ton restriction or the two-acre boundaries. Two-acre abuse is largely responsible for the "string of pearls"—a series of unclaimed mountains in Kentucky and other Appalachian states that have been razed by bulldozers.

The OSM has also had difficulty with its job of overseeing state governments' efforts to regulate stripmining. A provision of the strip-mine act permits each state to run its own program if its laws are at least as strong as the federal statute. Unfortunately, many states' performances in the regulatory arena have been even spottier than the OSM's. In March, after a two-year fight between the agency and the state of Tennessee, the state lost its control of surface mining. Many within the agency currently fear that other states may also lose their authority to regulate stripmining, leaving the federal agency with much more work than it can handle.

"The performance of the OSM since January 1981 has been a national disgrace," says Tennessee Senator Albert Gore, Jr. (D). "Those mine operators who are committed to working within the law are put at a serious competitive disadvantage by the OSM's policy of ignoring violations."

Representative Mike Synar (D-Okla.), chair of the Energy and Environment subcommittee, says that if the agency fails to get its house in order and enforce the law, there will be a move to take it out of the Interior Department and put it elsewhere, perhaps under the EPA. "I would like to get rid of this issue, but [the situation] is getting worse," he says. "The OSM has yet to accept the fact that the surface mining act is law." ■

FRED BROWN is a feature writer for the Knoxville News-Sentinel. He recently studied environmental law as a journalist-in-residence at the University of Michigan.

The environment of South America's largest nation is reeling under the effects of rapid development. Will Brazil take time to learn from the mistakes the industrialized world has made?

Down But Not Out in Brazil

Stephen Graham

BRAZIL: immersed in a struggle for modernization, saddled with a notorious \$103-billion foreign debt, and blessed with a wondrously varied natural environment. These seemingly disparate descriptions have become intertwined—sometimes painfully so—in today's Brazil.

The economic implications of Brazil's debt are staggering. The nation must produce a trade surplus of at least \$10 billion per year just to meet its interest obligations. These debt pressures "are environmentally harmful in that they encourage rapid development of extractive industries," says Peter Oyens of the World Wildlife Fund.

But while the debt crisis has forced many projects to be launched before their environmental impacts can be assessed, in many cases it is not possible to differentiate between development caused by debt pressures and development that would have occurred anyway. "I suspect the situation might be worse—not better—if there were no debt crisis," says Emilio Moran, an ecological anthropologist at Indiana University. "The problem has to do with a rapid development model and with geopolitical expansionism rather than with debt or payments to debtors."

Whether or not it is rooted in the debt crisis, the drive for export development is resulting in the rapid transformation of Brazil's natural environment. In the Amazon Basin, home to the largest remaining tropical forest on Earth, land is being cleared for cattle ranching, timber, and mining. In addition to being highly destructive, grazing cattle on the nutrient-poor soils of the Amazon "is

not economic," according to the World Wildlife Fund's Oyens. So much land is necessary to support a cow here that large areas must be cleared each year. This land is grazed for a few years and quickly exhausted, so ranchers move on to virgin land, leaving barren and degraded soils that cannot support new forest growth. Researcher Susanna Hecht of UCLA reports that cattle ranching takes place on 90 to 95 percent of the land cleared in the region.

The Brazilian government has publicly acknowledged that this type of ranching is destructive and inefficient, and has cancelled its program of generous fiscal incentives for new projects in the region. Hecht points out, however, that this means only that the government is not authorizing any new incentives. "Existing contracts are still going. There are still fairly substantial amounts of credit available, about \$200 million annually, for investment in Amazonian livestock."

Perhaps the most tragic transformation has occurred in the northwestern state of Rondonia, where the World Bank has sponsored a project to develop agriculturally what was once pristine tropical forest. The result has been the migration of hundreds of thousands of people, the disruption of local Indian tribes, and the highest rate of deforestation in the Brazilian Amazon.

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But it is mining that is the Brazilian Amazon's most profitable growth industry, and that poses a serious threat to the region's waterways. "Because it is placer mining, there is enormous sediment generation," says Hecht, "so its effect on fisheries is much worse than that of forest clearing."

The pride of Brazil's state-sponsored industries is the world's largest iron-ore and metals mining complex at Carajas, in the rainforest of the northern state of Para. Although Oyens says the Companhia do Vale do Rio Doce, which developed the project, "has an impressive program of environmental control and protection of local species," a development of this size will inevitably have a major environmental impact. The complex itself is situated in a giant clearing, and railway engineers have cut a 900-kilometer swath through the forest to the coast to ship the mine's potentially enormous production around the world. Farmers and prospectors have moved into the area by the thousands, using mining access routes and clearing forest as they go.

While the Amazon Basin is well known as the nation's most threatened ecosystem, the landscape of western Brazil is changing at an even faster pace. During the last decade immense soybean plantations have been introduced west of Brasilia, and these mechanized farms have catapulted Brazil into the ranks of major world exporters of the crop. Huge stretches of fertile land in Goias, Mato Grasso, and western Minas Gerias are being cleared for agricultural production, and agrochemical pollution of waterways has already become a problem in the region.

Despite the growth of agriculture and extractive industries, the thrust of the nation's export drive is on manufacturing. Manufactured exports—which now include steel, cars, airplanes, chemicals, weapons, industrial equipment, shoes, clothing, and hundreds of other



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kinds of consumer goods—are setting new records. The problems of pollution and industrial accidents have closely accompanied this growth. At Cubatao, in a once-beautiful valley on the São Paulo coast, the mostly state-owned petrochemical industry has poisoned the air and water, killing plant life in the valley and discoloring the area's freshwater streams. Abnormal rates of cancer and other diseases plague local residents. In 1984 gasoline gushed from a Cubatao pipeline into a swamp where the poorest inhabitants lived in a village they had built on stilts. The gasoline ignited, creating a tremendous fireball that incinerated hundreds of people (how many is still unknown) in Brazil's worst industrial accident.

Creating trade surpluses to cover the nation's debt means not only promoting exports but cutting import levels as well, substituting as many Brazilian products for them as possible. The single largest share of the import bill goes for petroleum; consequently, the energy sector is the centerpiece of the government's self-sufficiency program.

Part of this effort is a nuclear energy program that has produced little or no financial return on capital borrowed abroad. The program made headlines in Brazil last April when at least two workers were contaminated by radiation at the Angra I nuclear plant in the state of Rio de Janeiro.

Brazil is also increasing its previously marginal production of petroleum by deep-water drilling off the coast of Rio. Production is already at more than 600,000 barrels per day, and the risk of a major oil spill increases with each new well.

While they have been successful at reducing imported sources of energy, Brazil's hydroelectric and alcohol-for-fuel programs both involve serious environmental risks. One of the country's most stunning natural phenomena, an immense set of cataracts in Sete Quedas National Park, was destroyed several years ago when the valley formed by the waterfalls was flooded by the construction of a giant hydroelectric plant down-

stream. Dam-building on the rivers of the country's southern, northeastern, and Amazon regions has damaged the rivers, flood basins, and surrounding forest areas. In many cases the dams themselves are threatened by silting from upstream development.

Projects to replace gasoline with alcohol from sugar cane have also run into problems. Agricultural chemicals used

on the enormous cane fields have created residues in local water supplies. Highly toxic waste from the alcohol factories has also been implicated in water contamination.

The ecological and economic issues in Brazil are more complex than is often perceived outside the country. Much criticism has been leveled at foreign banks and investors, who are seen as the

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key agents of environmental destruction. But this reasoning belies the complex motivations behind the country's rapid development, and the important role played by domestic planners and domestic capital.

Essential to understanding environmental issues in Brazil is seeing that, to a much greater extent than their Latin American neighbors, the nation's leaders have an eye toward breaking into the ranks of the fully industrialized world by early in the next century.

The trend of Brazilian economic policy over the past few decades is neatly summarized by the slogan of Juscelino Kubitschek, the president who built Brasilia and promised "fifty years of development in five years of government." Succeeding governments also saw rapid economic growth as the key to the future, while environmental protection was considered a luxury affordable only by wealthier nations. Although the current government has turned some attention to both social and environmental problems, accelerated growth is still seen as essential to overcoming poverty and becoming a great nation. Brazilian leaders will not accept the fact that growth must slow down for the sake of the environment.

In addition, critics in industrial countries often lump together developing tropical nations and see them as being under the same domination by foreigners. For example, people may look at forest clearing and beef exports by U.S. investors in Central America and assume that the same processes are at work in Brazil. However, Hecht reports that 95 percent of Brazilian beef is consumed domestically. And almost all this beef is produced in the nontropical southern areas, while the Amazon region is a net beef importer.

Thus, criticism of Brazil's policies tends to be rejected out of hand if it is perceived as purely anti-growth or makes incorrect assumptions about the nation's economic realities. As Hecht bluntly notes, "If the whole environmental discourse isn't going to take a realistic view of what's going on, why



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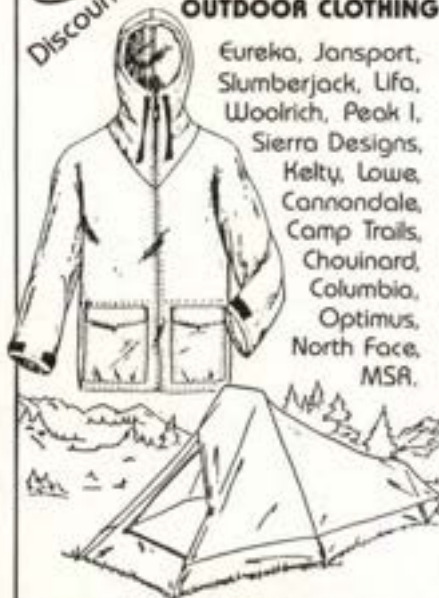
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should the Brazilians even listen to it?"

Among the growing number of Brazilian environmentalists, the debate revolves not so much around the debt or a slowdown of growth as around the relative merits of different methods and types of development. For example, environmentalists support the development of hydroelectric and alcohol-fuel programs; both have been so successful at producing cheap renewable energy that their hazards are beginning to be overlooked.

Within the nation's overall pro-growth framework, environmental movements on the North American and European models are growing. Federal, state, and local environmental-protection agencies have become standard and, although they still have a long way to go, are beginning to flex some muscle: The São Paulo state agency has approved a plan to restrict development sharply in the beautiful subtropical rainforest on the mountain slopes between São Paulo and the coast.

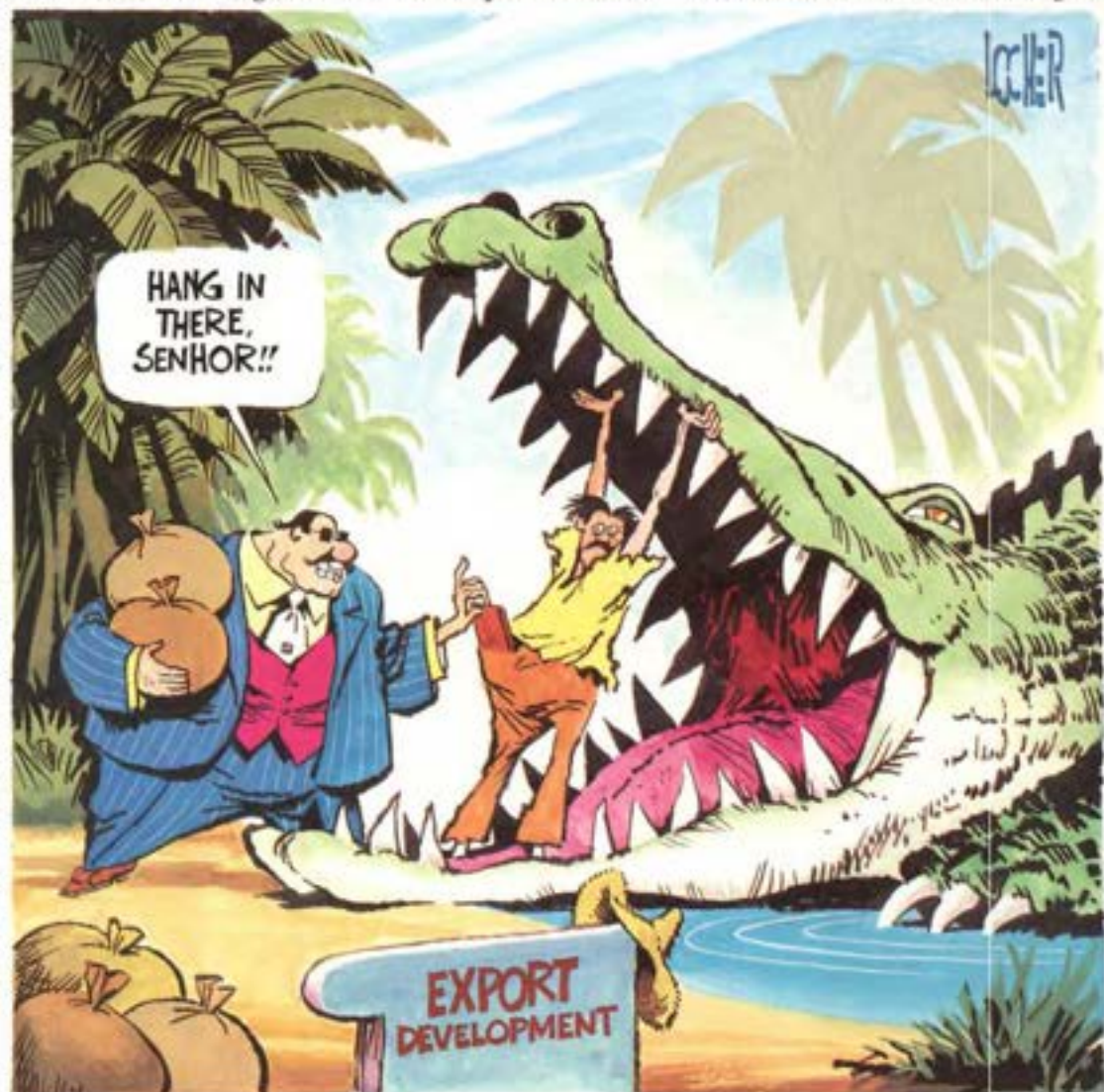
Urban environmentalism is also gaining momentum. In Rio de Janeiro, a large saltwater lagoon behind famed Ipanema beach dominates views of the city. For years the lagoon had been polluted by raw sewage, which killed the fish and created a stench that wafted over nearby residences. During the past two years the city government has closed off dozens of sewage outlets and restocked the lagoon with fish. Today

the odor is gone, fishing and water sports are back in vogue, and the gulls and herons have returned.

Last year the federal government banned the use of several toxic agricultural chemicals already banned in Europe and the United States, and it has invited environmentalists and farmers to help put together the first major reform of

years, accompanied by a sharp decline in deaths from chemical poisoning.

Despite these gains, the Brazilian ecological struggle is just beginning. Environmentalists in other nations will have to be more sensitive to Brazilian conditions if they want their voices heard. Proposals of viable development methods and serious offers of funding for



agrochemical legislation since the original laws were passed in 1934. Meanwhile, nonchemical pest control and fertilization techniques, mostly developed by Brazilian scientists, have been so successful in the farm state of Parana that the state government now promotes them wholeheartedly. Reports have shown a constant decline in the use of agrochemicals in the state in the last five

research and preservation strike a more responsive chord than pressure to slow down growth. Moreover, industrialized nations can show from their own experience that development itself is ultimately threatened by continued destruction of the ecosystem. ■

STEPHEN GRAHAM works in New York as a researcher on Latin American issues. He has lived and studied in Brazil.

Restoring the

COVER

Jeffery Kahn



THE PLANTS and animals of Florida's vast "river of grass" evolved in harmony with the flow of water during alternating wet and dry seasons. A century of water management and development has disrupted that natural flow. In fact, after decades of declining health, the Everglades very nearly died.

Finally, at the 11th hour, Florida reacted. Imperceptibly at first, but with a sense of gathering momentum, the state has begun to reverse the policies that brought the Everglades so close to ruin.

In 1983 Gov. Bob Graham launched his "Save Our Everglades" program, which aims to restore natural waterflow patterns to an area that has suffered greatly from the "improvements" of the past hundred years. In what is being called the most ambitious environmental restoration project ever, the state is spending millions to acquire land, alter levees and canals, and reflood drained marshes—all in an attempt to resurrect the Everglades. There have already been some positive changes. But how fully this will revive the park's life forms—the plants and animals that have suffered most—won't be apparent for several years.

Florida's ambitious land-acquisition



The cormorant-like anhinga thrives in the placid Everglades, where acres of smooth, shallow water allow it to stalk and then spear its prey.

PHOTOS COURTESY OF DAVID MATHIAS

Everglades



John J. Leggett



Patrick Cavanah

Highway modifications may help the Florida panther—a frequent hit-and-run victim—in its battle to survive.

Florida's complex waterworks have contributed to the near-ruination of the Everglades.



The conversion of much of south Florida to agriculture (at left, tomato crops near Everglades National Park) could spell disaster for many wild-life species, such as the roseate spoonbills above.

- Canals
- Kissimmee River
- Everglades Agricultural Area
- Holey Land and Rotenberger Tracts
- Water Conservation Areas
- Big Cypress National Preserve
- Fakahatchee Strand
- East Everglades
- Everglades National Park

The natural complexity of the Kissimmee-Okeechobee-Everglades ecosystem has been so manipulated that a massive restoration effort is now required.



© Getty Images

The wood stork (left) adapted to alternating wet and dry seasons by learning to fish by touch rather than sight. As water levels fall during the dry season, fish concentrate in small pools scoured out by alligators (like the one below, seen keeping company with a blue heron). The stork dips its open beak in the water and moves it about, snapping it closed when it brushes against a fish. Altered waterflows into the Everglades have left the wood stork endangered.

© David McPherson



program helps illustrate the extent of the state's resolve. Through an innovative tax on growth—a statewide assessment on real estate transactions—and an additional tax on oil and mineral mining, more than \$7 billion will be spent over the next 40 years to buy land for parks, beaches, and wildlife habitat, much of it vital to the Everglades' restoration. This commitment is unrivaled by any other state; only the federal government now spends more to buy natural areas.

Despite Florida's formidable commitment (and equally demonstrable needs), progress has been hard-won. Even though the state has been willing to take on much of the cost of restoration, the federal government has repeatedly cast up obstructions. Not only has the Interior Department refused to aid the state financially, the Army Corps of Engineers has regularly denied Florida the federal permits it requires to undertake elements of the restoration effort. Meanwhile, agricultural and real estate interests have pursued delaying tactics of their own, hoping to outlast Graham, the restoration effort's prime mover, who leaves office in January.

WATER is the lifeblood of the Everglades, and the disruption of the region's natural wet and dry seasons is the cause of the area's problems. Everglades National Park is downstream of a massive waterworks—mile after mile of canals and levees designed to contain water, and numerous gates to regulate its flow. Under this artificial system the natural flow of water into the park has been interrupted, and this has severely damaged the park's wildlife.

The plants and animals of the Everglades have evolved to depend on alternate wet and dry seasons. But restoring these natural flows is a plumber's nightmare. The waterworks must be jury-rigged to simulate natural water conditions—the very conditions the canals and dikes have so drastically disrupted. At the same time they must continue to supply water and provide flood control for residents and farms. Even if the project succeeds, there's no guarantee park life will recover.

Land moguls began their relentless campaign to convert Florida's swamps

to real estate in 1882. Drained by a \$500-million maze of canals, the watery wilderness has been transformed from a wildlife mecca shared by 11,200 resolute settlers to a thriving suburbia of 4 million residents. Where it once encompassed 9,000 square miles, the Kissimmee River-Lake Okeechobee-Everglades ecosystem has been reduced to a remnant 6,000 square miles of wetlands. Nevertheless, it remains the largest wilderness in the eastern United States.

"Canals were dug with missionary zeal," Gov. Graham told a recent gathering of conservationists. "Settlements became cities. The Everglades were

peat soil in the world, subsidence has been occurring at the rate of a foot per decade. In some places only a few inches of soil remain above bedrock.

The vast flocks of wading birds, the creatures most directly dependent on the Everglades' seasonal rhythms of rising and falling water, have all but vanished. The flamingo-hued roseate spoonbill, the snow-white egret, the ebony-and-blond anhinga, and their long-legged kin numbered an estimated 2.5 million in the 1800s. Some biologists say that fewer than 250,000 remain in south Florida today.

For decades the growing, prospering

John J. Lapina



When the drought of 1980-'81 set much of the Everglades region ablaze, Floridians began to come to grips with how much the ecosystem had declined. This crew at work building a fireline in the Big Cypress preserve contributed early labor to the current restoration.

treated as a commodity. . . . However, in the process of draining the Everglades, the developers reduced a natural work of art to a thing pedestrian and mundane."

The changes wrought by Florida's pioneers have had severe consequences. Drainage created dry, buildable land, but water tables dropped, estuaries turned saline, and marine life suffered. Fishing, the nucleus of the outdoor life that attracted early settlers, gradually evolved into an exercise in near futility.

The newly drained land was remarkably fertile, but as the peat soils dried out, the muck turned to dust and blew away. In the Everglades Agricultural Area immediately south of Lake Okeechobee, where 700,000 acres of drained wetlands comprise the largest pocket of

state ignored the decline of its fisheries, rich muck soils, and avian life. Then, in 1980 and '81, Floridians were roused by a year-long drought. The muck caught fire, sending clouds of noxious smoke billowing over Miami, Fort Lauderdale, and the Palm Beaches. Lush suburban lawns turned to straw. Ominously, an underground wedge of saltwater moved inland, tainting the more vulnerable freshwater supplies and threatening others. Water was rationed; waterborne diseases began to increase. In this crisis atmosphere, a feeling of helplessness prevailed.

"We faced an awesome truth," Graham tells sympathetic audiences. "Our presence here is as tenuous as that of the fragile Everglades. The compli-

cated ecosystems that support delicate swamp lilies and great blue herons are the source of our water."

LIFE IN Everglades National Park depends upon water flowing in from three natural drainage systems, all of which have been altered so that water can be routed away for human consumption or flood control. Ruinous to the Everglades, the artificial systems have proved less adept at providing water than the original Everglades, a vast natural recharge area for replenishing south Florida's wellfields.

When the polar ice caps receded to their present dimensions, retreating waters exposed the old sea bed, land that sloped south from Orlando to Florida's southern tip. This slight flatland slope and the all but imperceptible southward creep of water it generates forms the Kissimmee River-Lake Okechobee-Everglades ecosystem.

In June come the rains, sometimes torrential and relentless; in October comes the dry season. Historically, rain that fell below Orlando moved slowly south through wetlands along the ox-bowed Kissimmee River, which emptied into Lake Okechobee, the largest freshwater lake in the United States south of the Great Lakes. Toward the end of the rainy season, Okechobee overflowed its banks, spilling a shallow sheet of water that crept ever southward. This "sheetflow" nourished a shallow depression called Shark River Slough, the heart of Everglades National Park, then drained through mangrove forests and salt marshes into Florida Bay. The mix of salt and fresh waters nurtured the bay's once abundant shellfish beds and schools of game fish.

All that changed. The Kissimmee River was converted to a drainage ditch. (However, the state has since begun painstaking work to dechannelize part of it. See "Restoring a River," September/October 1985.) Lake Okechobee was ringed by a dike, its natural flows restricted and controlled to suit the pragmatic ends of water managers. The Everglades wetlands south of the lake were surrounded by levees, subdivided by canals, and turned into vast reservoirs for the more than 3 million residents of Florida's southeast coast. Seven



Today, more than two decades after ground was broken for southwest Florida's Golden Gate Estates subdivision, only a fraction of the original site has been fully developed. The canals that were dug to drain this swampy land caused local water tables to drop dramatically.

hundred thousand acres of glades on the south edge of the lake were converted to agriculture, mostly sugar cane. The levees and two trans-Everglades highways further impeded the southward flow of water. The shallow sheet of water that once flowed into the park through a 30-mile-wide channel was funneled in through a nine-mile-wide bottleneck of floodgates on U.S. 41. The gates opened and closed, sometimes withholding needed water from the park, at other times dumping unwanted storm water.

Upstream of the park, bordering on its western reaches, the Big Cypress Swamp (now the 2,400-square-mile Big Cypress National Preserve) provided additional sheetflow. It spilled into the park and emptied into the Ten Thousand Islands region, an archipelago of small mangrove keys along the western Gulf Coast. In the 1960s, 183 miles of canals were dug outside the preserve for the 173-square-mile Golden Gate Estates subdivision, which to this day remains largely uninhabited. These canals lowered the water table by more than two feet, discharging 1.6 billion gallons of freshwater annually into the Ten Thousand Islands' estuaries. Marine life was severely affected, while acreage lost to wildfires in Collier County increased nearly eightfold. Flood-control and irrigation projects have produced similar

effects on the Everglades' eastern rim.

In February 1983, Everglades National Park research director Gary Hendrix told the board of the South Florida Water Management District (SFWMD) that the park's wildlife populations had sunk to levels so low that only swift, emergency action to restore the park's historic wet and dry seasons would give them a fighting chance to recover.

Prodded by the governor, the region's water managers grappled with the problem. The SFWMD commands a remote-controlled, computer-driven network of gates, canals, and pumps that is unquestionably among the most extensive and sophisticated waterworks in the world. Even so, the agency had trouble seeing how it could accommodate the park's need for natural water conditions and continue to avert floods and prevent water shortages. Fortunately, the water managers embraced what to them must have seemed a revolutionary concept: Why not use existing technology to mimic natural flow patterns? When it's raining upstream of the park and water is plentiful, let water flow into the park. When it's dry and people need the water, let the park be dry.

Revised flows began coursing into Shark River Slough in June 1985, the second phase of a congressionally authorized five-year experiment. Water

managers term the flows a rainfall-driven model, meaning water is released in proportion to the amount of rain that falls in the water-conservation areas upstream of the park. But park managers say that when surplus water accumulates upstream, it is still being dumped into the heart of the park, while natural flows into the park's eastern realm are restricted. Nonetheless, they say, the revised flows are a step forward, an experiment water managers might modify after two years.

The late Art Marshall would have said the test was a good first step. The former state administrator of the U.S. Fish and Wildlife Service designed a blueprint for repairing the Everglades that had restored sheetflow as its central element. Water must be allowed to flow freely through the entire ecosystem, Marshall urged; gates and canals must be removed.

Transported gradually southward by the slight slope of the land, upstream wet-season rainfall will arrive downstream in the Everglades months later, during the dry season. Keeping the Everglades from drying out until late into the dry season, the shallow sheetflow will recharge underground water supplies at a time of year when the rains have ceased. The current experiment stops short of Marshall's free-flowing natural system, but in using the gates that allow water to flow into the heart of the park from shallow upstream reservoirs, it mimics the "Marshall Plan."

Despite this promising beginning, however, the obstacles to saving the park and its surrounding region remain monumental. Flows into the park's eastern and western breadths remain impeded. To the east the way is blocked by a scattering of settlers and agricultural interests in western Dade County. During the current experiment, waterflows to the east are shut off when flooding threatens the adjacent Rocky Glades, where 200 settlers have homesteaded flood-prone land. They have sued to stop the restored flows, but say they will not pursue their case if provided flood protection. Whether federal monies will help fund flood control around that segment of the park remains uncertain.

So far, land purchases have been made with an eye toward reinventing the

vast troubled fishery of the northeast section of Florida Bay, which comprises about a tenth of the park. Fish and shellfish populations within the bay had declined to the point where the Park Service banned commercial fishing as of December 31, 1985. But the nearly sterile northeast bay cannot recover until sheetflow is restored to its freshwater-starved estuaries.

With the assistance of the Trust for Public Land, the state has spent \$22.1 million to purchase 55,332 acres in the East Everglades. This wet prairie land is a world-class wildlife sanctuary, but sheetflow across it cannot resume until existing canals are altered and another 8,700 acres purchased, at an estimated total cost of \$14 million. That canal work has not yet been authorized.

The western section of Everglades National Park is healthier than the eastern, but it also remains threatened. The state has targeted 110,000 acres for purchase in this region to return healthy flows to the area—which includes Big Cypress National Preserve and the heavily drained Golden Gates Estates subdivision—and to protect the habitat of the endangered Florida panther. A 128,000-acre addition to the Big Cypress preserve is also planned.

THE FATE OF the Everglades may well depend on who succeeds Bob Graham when he leaves the governor's office in January. Graham conceived the Save Our Everglades program and has been its driving force. He has dispatched staff around the state to resolve political logjams, pushed through critical legislation, and reformed key agencies. Graham appointed new board members to the SFWMD, welcomed a new executive director, and made sure the agency could not misread the seriousness of his intentions. Today the water district is probably the park's closest ally.

While Graham placed the Everglades at the top of his political agenda, not all of those seeking to succeed him have done the same. Political observers say Democrat Steve Pajcic would embrace the restoration program; the positions of Democrats Jim Smith and Harry Johnston and Republicans Lou Frey and Bob Martinez are less clear.

"If a program depends on the force of an individual personality for its attainment, it probably will wither," says Graham. "For a program to be sustained, it has to capture the imagination of the people. I believe that the Save Our Everglades program has that essential quality."

Graham, a Democrat, is running for the U.S. Senate; he will face incumbent Senator Paula Hawkins (R) at the polls in November. Graham says the Save Our Everglades program needs help at the federal level, and that a unified and supportive approach is critical. While the U.S. Fish and Wildlife Service has



Bob Graham asking a congressional subcommittee to expand Florida's Big Cypress National Preserve.

been cooperative, other federal agencies, such as the Army Corps of Engineers and the Federal Highway Administration, have impeded progress.

Regardless of the outcome of the gubernatorial and senate elections, the most critical step to bringing back the Everglades has already been taken. Some generations-old attitudes have changed. The exploitative mentality, which considered the Everglades a worthless, mosquito-infested wasteland fit only for ditching and draining, is being replaced by an attitude of stewardship—one that will help restore this complex and fascinating ecosystem to its historic vitality. ■

JEFFERY KAHN, a third-generation Floridian, now lives in San Francisco. He wrote July/August's "In Depth" piece on Big Sur.

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TOXICS on the HOME FRONT

Household drains, toilets, and garbage cans aren't usually considered conduits for hazardous waste. But in most homes across the United States, chemical products as toxic as cyanide and as persistent as DDT are poured down the kitchen sink, flushed down the toilet, emptied into the backyard, and thrown out with the trash every day. This mismanagement of hazardous chemicals has turned into one of the environmental nightmares of the decade. Although factories are consistently blamed for producing and inadequately disposing of hazardous wastes, households have been adding steadily to the problem. And in many ways the toxic wastes they generate are the most difficult to control.

Household hazardous waste is any material discarded from the home that may, because of its chemical nature, pose a threat to human health or the environment when handled improperly. These wastes can be solids, liquids, or gases. They differ from other household wastes in that they are toxic, corrosive, caustic, flammable, reactive, or explosive. Hazardous substances are often found in such common products as pest strips, mothballs, insect and roach sprays, motor oils, antifreeze, wood preservatives, rust removers, metal polishes, batteries, deodorizers, degreasers, weed killers, drain cleaners, paint thinners and strippers, disinfectants, battery and pool acids, hobby products, bleaches, gasoline, kerosene, oven cleaners, nail polish remover—even car waxes.

Congress exempted the disposal of household products from its reg-

ulation of hazardous waste, although consumers have been contributing to toxic pollution for years by haphazardly disposing of tons of dangerous products. For many people waste disposal is an "out of sight, out of mind" process, and that can mean pouring hazardous products into septic tanks, spreading them on the ground, or washing them into storm drains. But septic tanks are not designed to treat toxics, and city sewer lines transport wastes to municipal treatment plants designed to process natural wastes only. The hazardous wastes flushed into these systems eventually enter the ecosystem. Throwing waste out with the trash can be just as risky, because garbage is usually crushed and dumped in landfills, where materials can leak into the soil. (Municipal landfills also make up half of all Superfund cleanup sites.)

A typical community of 200,000

people (about the size of Richmond, Va., or Colorado Springs, Colo.) generates approximately 10 million pounds of hazardous materials a year—an average of 50 pounds per person. Improper disposal of these household chemicals has led to some alarming immediate and long-term impacts: contaminated groundwater, poisoned wildlife, damaged municipal sewer systems, blinded refuse collectors, and burned landfill tractor operators. In fact, a soon-to-be-released study by Dr. Kirk Brown and K. C. Donnelly of Texas A&M University reveals that the toxic chemicals found in a variety of municipal landfills were similar to those found in industrial hazardous-waste landfills, and posed many of the same health hazards.

According to Gina Purin, assistant director of environmental health at the Golden Empire Health Planning Center in Sacramento, Calif., one of the nation's leading household-waste information agencies, this polluting has not been intentional. "Common practice has long been to treat these hazardous products as normal waste," she says. "Conscientious citizens have not been given safe methods for disposal. As a result, the fact that we now call it 'improper' disposal is due only to our recent, enlightened perspective."

Consumers sometimes assume that a product wouldn't be on the supermarket shelf if it weren't safe and nonpolluting. That's not always true. A report by the National Clearinghouse for Poison Control Centers revealed that in 1981 more than 17,000 cases of poisoning were attributed solely to cleaning and

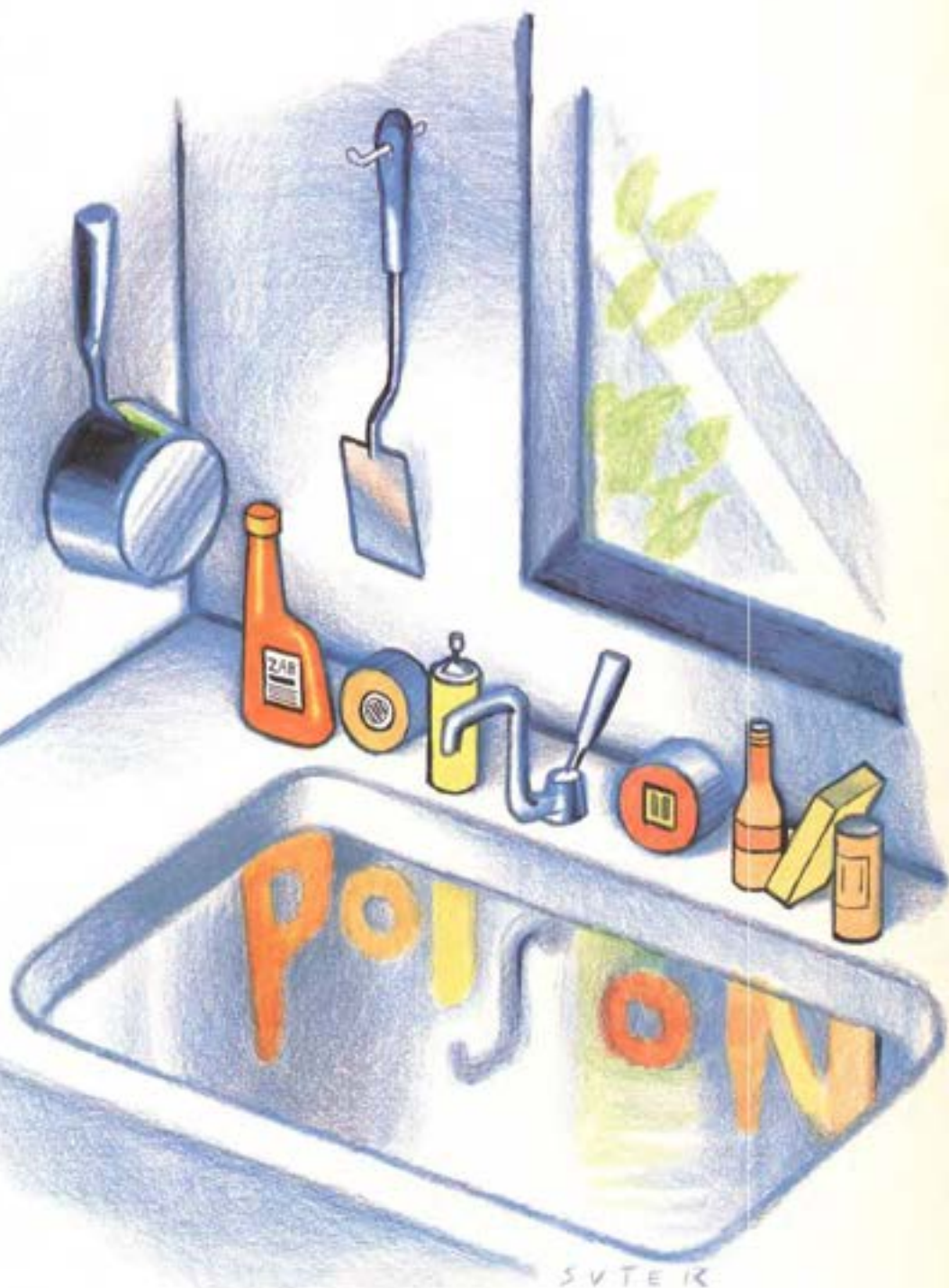
A HAZARDOUS WASTE DUMP MAY BE AS NEAR AS YOUR KITCHEN SINK, YOUR GARBAGE, OR YOUR GUTTER.

polishing agents. In fact, many household products in current use, such as pesticides, have not been analyzed for their health effects because they were put on the market before testing was required. A 1982 EPA staff report states that many pesticides sold in the United States have not been adequately tested: 90 to 93 percent for their effects on genes; 79 to 84 percent for cancer-causing agents; 60 to 70 percent for their capacity to cause birth defects; and 29 to 47 percent for their effects on reproduction, such as sterility.

Furthermore, many homes are stocked with old paints, pesticides, and solvents that couldn't even be bought today. Some of these products have been tested since they were first marketed and banned from commercial sale because they are carcinogenic or environmentally persistent, or, according to federal regulations, "possess such a degree or nature of hazard that adequate cautionary labeling cannot be written and the public health and safety can be served only by keeping such articles out of interstate commerce."

"There usually isn't a way for people to handle these wastes safely," says Susan Ridgley, a former Municipality of Metropolitan Seattle (Seattle Metro) assistant planner who is now developing a household hazardous-waste program in Minnesota. "And we can't say 'Don't do this' without having a reasonable alternative available."

In classic grassroots style, reasonable alternatives have been springing up at the local level all across the country. In 1979 a simple public information brochure, "Toxic Substances in Your Home," was cred-



Illustrations by David Suter

ited with prompting citizens to start a toxic-cleanup movement in Seattle, where a local company agreed to dispose of small amounts of household hazardous waste as a public service. A couple of years later, household-poison disposal events began in Marion County, Ky., and the following year in Seattle, Sacramento, and Lexington, Mass. Since then, collection projects have been organized in cities and counties in at least 28 states. (For the first time, a belatedly interested EPA has scheduled a national conference on household hazardous wastes in Washington, D.C., for November.)

"These programs get past people's basic anxieties to show that proper management of hazardous waste does not present a problem to the community—it's the mismanagement of these wastes that presents the problem," says Jan Kleman, director of Florida's Amnesty Days collection program. Usually these cleanup events are one-time-only attempts to sweep old or unwanted items from people's homes, but some have now become annual cleanup programs. Continuous collection services are offered only in San Bernardino, Calif., Duluth, Minn., and King, Thurston, and Whatcom counties in Washington;

yet several state bills that would encourage counties to establish regular collection projects are pending in the legislatures. Florida has the largest and one of the only statewide programs, a "collection site on wheels" that moves from county to county, and San Diego has sponsored a unique and effective door-to-door disposal project.

Most local waste-disposal efforts involve a collection day when hazardous home products can be brought to a temporary site. The wastes are grouped into categories, packaged in 55-gallon containers, labeled, and sorted according to state and federal regulations. Then they are usually transported to EPA-permitted, Class I hazardous-waste landfills. However, because landfills are not the best disposal solution (studies have revealed that Class I landfills eventually leak), some program coordinators are focusing on the preferred methods of reducing, recycling, treating, and incinerating wastes.

Dana Duxbury, a national household-waste activist from Massachusetts, says consumers can also help control the waste-disposal problem by monitoring what they buy at the store. "If people

don't purchase products with toxic chemicals in them, manufacturers won't produce them, workers won't be exposed to them, and volumes of industrial hazardous waste will be lessened," says Duxbury. "Consumers can influence the whole chain of events." Safer and sometimes cheaper alternatives to many toxic products are available (see "Household Hazardous Waste Reference Chart," opposite). Industries are being encouraged to use safer chemicals and to recycle them more often.

Some local and national businesses have even been donating funds and special services to help dispose of household hazardous wastes, usually in an effort to establish good community relations. Dow Chemical sponsored a local collection project in Midland, Mich., in which wastes were burned in the company's rotary-kiln incinerator. In Cape Cod, Mass., Dow, Chevron, Coca-Cola, and McDonald's donated funds to towns participating in a collection program, while Honeywell, Browning-Ferris Industries, and 3M have funded a number of local collection projects around Minnesota.

These national cleanup programs have collected staggering amounts of hazardous wastes. Last year Sacramento



HOUSEHOLD HAZARDOUS WASTE REFERENCE CHART

	SUBSTANCE	PROBLEM	PROPER DISPOSAL	ALTERNATIVES
PESTICIDES & HERBICIDES	Rodent bait	Lethal to humans and pets in minute quantities, such as one taste.	Use up according to directions or take to hazardous-waste collection site.	Cats; traps; chopped bay leaves and cucumber skins
	Insect repellent	Poisonous. One teaspoonful may be lethal to an adult.	Use up according to directions or take to hazardous-waste collection site.	Screens; protective clothing; creams or lotions are occasionally effective
	Garden herbicides, insecticides, fungicides, etc.	Poisonous. Can persist in the environment. Especially hazardous around food plants.	Use up according to directions or take to hazardous-waste collection site.	Strong hosing or hand picking; keep garden clean; use "natural" insecticides such as pyrethrins, or predators such as ladybugs
HOME & PERSONAL PRODUCTS	Drain cleaners	Poisonous. Can cause serious burns. May contain carcinogens.	Wash down drain with lots of water or take to hazardous-waste collection site.	Boiling water; plunger; metal snake
	Oven cleaners	Poisonous. Can cause serious burns. May contain carcinogens. Spray cans the most dangerous.	Use up according to directions or take to hazardous-waste collection site.	Salt; quarter cup of ammonia overnight
	Toilet cleaners	Poisonous. Can cause serious burns. One teaspoonful may be lethal to an adult.	Wash down drain with lots of water.	Mild detergent or small amounts of bleach
	Spot removers	Poisonous. Most are solvent-based. May be carcinogenic.	Use up according to directions or take to hazardous-waste collection site.	Immediate cold water and detergent; rubbing alcohol; or a little acetone
	Silver polishes	Poisonous. May contain carcinogens. One ounce may be lethal to an adult.	Use up according to directions or take to hazardous-waste collection site.	Soak silver in water with baking soda, salt, and small piece of aluminum foil
	Furniture polishes	Include various poisonous solvents. One ounce may be lethal to an adult.	Use up according to directions or take to hazardous-waste collection site.	Mineral oil with lemon oil (but this may strip finish) or Carnauba wax
	Cleasers and powder cleaners	Strong oxidizers. Poisonous. Can cause burns.	Wrap tightly in plastic, place in a box, tape shut, and put in garbage.	Baking soda and mild detergent; elbow grease
	Window cleaners	Contain harmful chemical compounds and sometimes carcinogens. May cause birth defects.	Wrap tightly in plastic, place in a box, tape shut, and put in garbage.	Vinegar and water
	Mothballs	Contain poisonous chemical compounds.	Use up according to directions or take to hazardous-waste collection site.	Cedar chips; newspapers; wrap wool clothing in plastic bags during warm seasons
	Bleach & liquid cleaners	Contain strong oxidizers. Can cause burns.	Wash down drain with lots of water.	Use powder, not liquid bleach
	Dyes	Poisonous, especially to kids; don't use cooking utensils when dyeing. May be carcinogenic.	Wrap tightly in plastic, place in a box, tape shut, and put in garbage.	Use vegetable dyes such as onion skins, teas, marigolds
AUTOMOTIVE & PAINT PRODUCTS	Motor oil, brake & transmission fluid	Contain poisonous chemical compounds. Oil also has lead, other metals. Fluid may be lethal.	Take to service station or local waste-oil recycling center.	None
	Antifreeze	Sweet-tasting, poisonous, may be lethal; don't leave puddles where kids, pets can get to them.	Wash down drain with lots of water.	None
	Car batteries	Contain lead and are highly acidic (can produce serious burns).	Trade in or take to special recycling center (see phone book).	None
	Paints*	Contain solvents and other poisonous chemical compounds.	Tightly wrap residue and place in garbage or donate to someone who needs paint.	None; use water-based (latex) paint if possible; avoid aerosol sprays
	Lacquer, varnish, thinner, & stripper	Poisonous. Solvent-based. Some are flammable and carcinogenic.	Use up according to directions or take to hazardous-waste collection site.	None; except for stripper, sand off old finish in well-ventilated area

*Old, lead-based paints are toxic and should not be used. Take them to a hazardous-waste collection site (or store them until one is available).

Sources: Citizens for a Better Environment; Selma Berish, Berish Environmental Research, Inc.

DOCTOR

HOSPITAL

POLICE

POISON CENTER

RECYCLING CENTER

IMPORTANT TELEPHONE NUMBERS

filled 393 55-gallon drums in just eight hours. Florida's program, which collects small quantities of commercial wastes in addition to household wastes, has collected more than 1.5 million pounds in a few years. But sometimes the types of wastes brought in are more surprising than the quantities. In addition to tons of old paint, cleaners, and automotive oil, the programs have collected DDT, PCBs, cyanides, arsenates, illegal drugs (including cocaine and LSD), strychnine, ammunition, shock-sensitive explosives such as diethyl ether and picric acid, and even methyl isocyanate, the chemical that killed thousands of people in the Union Carbide accident at Bhopal, India.

There is a great need for communities to set up convenient, permanent systems to dispose of toxic products, and to develop appropriate treatment facilities. Although hazardous-waste collection is



a dangerous business that should be conducted only by trained professionals, individuals can develop task forces to kick off cleanup programs. (A good way to start is by reading the handbook *Household Hazardous Waste: Solving the Disposal Dilemma*, available from the Golden Empire Health Planning Center, 2100 21st St., Sacramento, CA 95818.)

The several tons of toxic waste collected by grassroots programs demonstrate that hazardous chemicals are everywhere—in old and new products precariously shelved in almost every household in America. But there are no rules and regulations controlling what happens to these wastes. The responsibility for disposing of them safely lies in the hands of every consumer. ■

DAVE GALVIN is a water-quality planner with Seattle Metro. SALLY TOTEFF is working on the development of a hazardous-substance information office for the state of Washington.

DESPERATELY SEEKING SAFETY: IDENTIFYING HAZARDOUS HOUSEHOLD PRODUCTS

DETERMINING WHETHER a household product is hazardous is often a difficult if not impossible task. Manufacturers are not required to list the ingredients of most products (with the exception of some foods and cosmetics), and even if they were, the health effects of many ingredients are not known because they haven't been adequately tested. Labels are usually the only available source of content information, but they are often incomplete.

In accordance with federal regulations, a product's degree of acute toxicity must be marked with the following signal words, in increasing order of damage potential: *caution*, *warning*, or *danger*. Other key words that usually indicate hazardous substances are *poison*, *flammable*, *volatile*, *caustic*, and *corrosive*. But rules defining how manufacturers should label a product are vague, and it's estimated that 85 percent of all labels are misleading. In general, it's best to avoid products that are labeled with any of these cautionary words when alternatives exist; be wary of unlabeled products, because they aren't necessarily safe; and, regardless of what is or is not on a label, follow these safety guidelines:

- Heed label warnings (as limited as they may be), but be aware that first-aid information on labels can be misleading or incorrect. Call the poison center for up-to-date advice.
- Keep products in their original containers and store them in a safe place, out of reach of children.
- Do not overuse a product. Twice as much does not necessarily work twice as well. Follow dilution instructions carefully.

- Never mix products or different brands of the same product. Poisonous or explosive chemical reactions may occur.
- Do not use hazardous products that are old. Many contain dangerous chemicals that have been banned from the marketplace.
- Wear protective equipment such as glasses, goggles, gloves, or respirators with interchangeable cartridges when using a product that is harmful to

eyes, skin, or lungs. Consult the *Yellow Pages* under "Safety Equipment" for stores that carry safety products.

- Avoid wearing soft contact lenses while using products that emit harmful vapors.
- Avoid breathing mists or vapors, especially from aerosol products. Use proper ventilation if you must use hazardous products indoors.
- If pregnant, try to avoid exposure to all toxic chemicals. Many household products have not been tested for their effect on unborn children. Even "safe" chemicals can be unsafe when exposed to other chemicals.
- Post the number of the nearest poison center and other emergency numbers by the telephone.
- Keep readily available a one-ounce bottle of syrup of ipecac, used to induce vomiting. Never use it without the recommendation of a physician or poison center personnel.

—D. G. and S. T.

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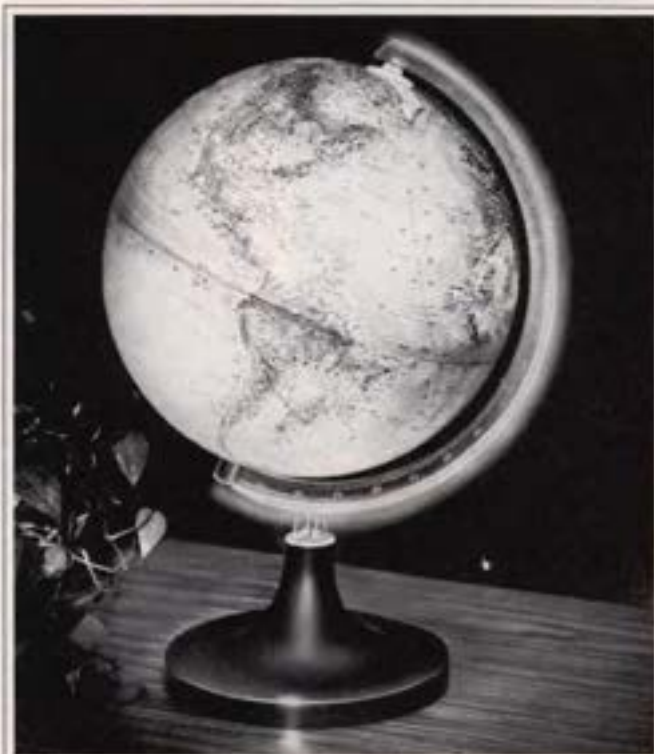
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SIERRA'S ANNUAL PHOTO

IN THE EYE
OF
THE BEHOLDER

FIRST PRIZE
BLACK & WHITE
WILDLIFE

FISH HEAD,
PUERTO VALLARTA,
MEXICO
MARTOS HOFFMAN
FLAGSTAFF, ARIZONA

FIRST PRIZE
BLACK & WHITE
CHILLY SCENES OF
WINTER

SHADOWS,
GRAND MESA,
COLORADO
MARTOS HOFFMAN
FLAGSTAFF, ARIZONA



•
SECOND PRIZE
BLACK & WHITE
CHILLY SCENES OF
WINTER
•

ICE FORM ON ROCK IN
MERCED RIVER,
YOSEMITE,
CALIFORNIA
KAY McCAMMOND
YUBA CITY,
CALIFORNIA



To appreciate beauty, especially the beauty to be found in nature, all we need do is look closely enough at what the world puts before us—a simple habit that too often gets lost in the hurly-burly of modern life.

Such is not the case for the photographers whose work appears on these pages. They have looked for beauty and found it, skillfully capturing its image for all of us to enjoy. *Sierra* congratulates the winners of this year's contest and thanks the hundreds of readers who entered.

The grand-prize winner will receive a new Nikon N2000 35mm SLR camera with a 50mm f/1.8 Nikkor lens. First-prize winners receive a pair of 9×25CF Nikon binoculars; second prize is a Silva Type 15 Ranger compass from Johnson Camping. Our thanks to both companies for their continuing sponsorship. (Not all prizes were awarded in each category.)

•
FIRST PRIZE
BLACK & WHITE
GOING WILD

•
SUMMIT RIDGE OF
MT. ATHABASCA,
CANADIAN ROCKIES
JEFFREY M. REYNOLDS
YAKIMA,
WASHINGTON



•
SECOND PRIZE
BLACK & WHITE
GOING WILD

•
CROSS-COUNTRY
SKIING,
KLOSTERS,
SWITZERLAND
KEHN W. BERRY, JR.
BIRMINGHAM,
ALABAMA



•
FIRST PRIZE
COLOR
IN PRAISE OF PLANTS
•

PITCHER PLANT,
WEBB'S MILL BOG,
PINE BARRENS, NEW
JERSEY
IJI GUNNARSSON
PARSIPPANY-TROY
HILLS, NEW JERSEY

•
SECOND PRIZE
COLOR
IN PRAISE OF PLANTS
•

HELICONIA CARIBAEA
PURPUREA,
HANA, HAWAII
JACOB R. MAU
KULA, MAUI, HAWAII





•
FIRST PRIZE
COLOR
**CHILLY SCENES OF
WINTER**

•
ICE PATTERNS,
CHEWACK RIVER,
WASHINGTON
PETER MORRISON
WINTHROP,
WASHINGTON

•
SECOND PRIZE
COLOR
**CHILLY SCENES OF
WINTER**

•
WINTER MEADOW,
EAST SIDE OF SIERRA
NEVADA
INES E. ROBERTS
SANTA BARBARA,
CALIFORNIA



•
SECOND PRIZE
COLOR
GOING WILD

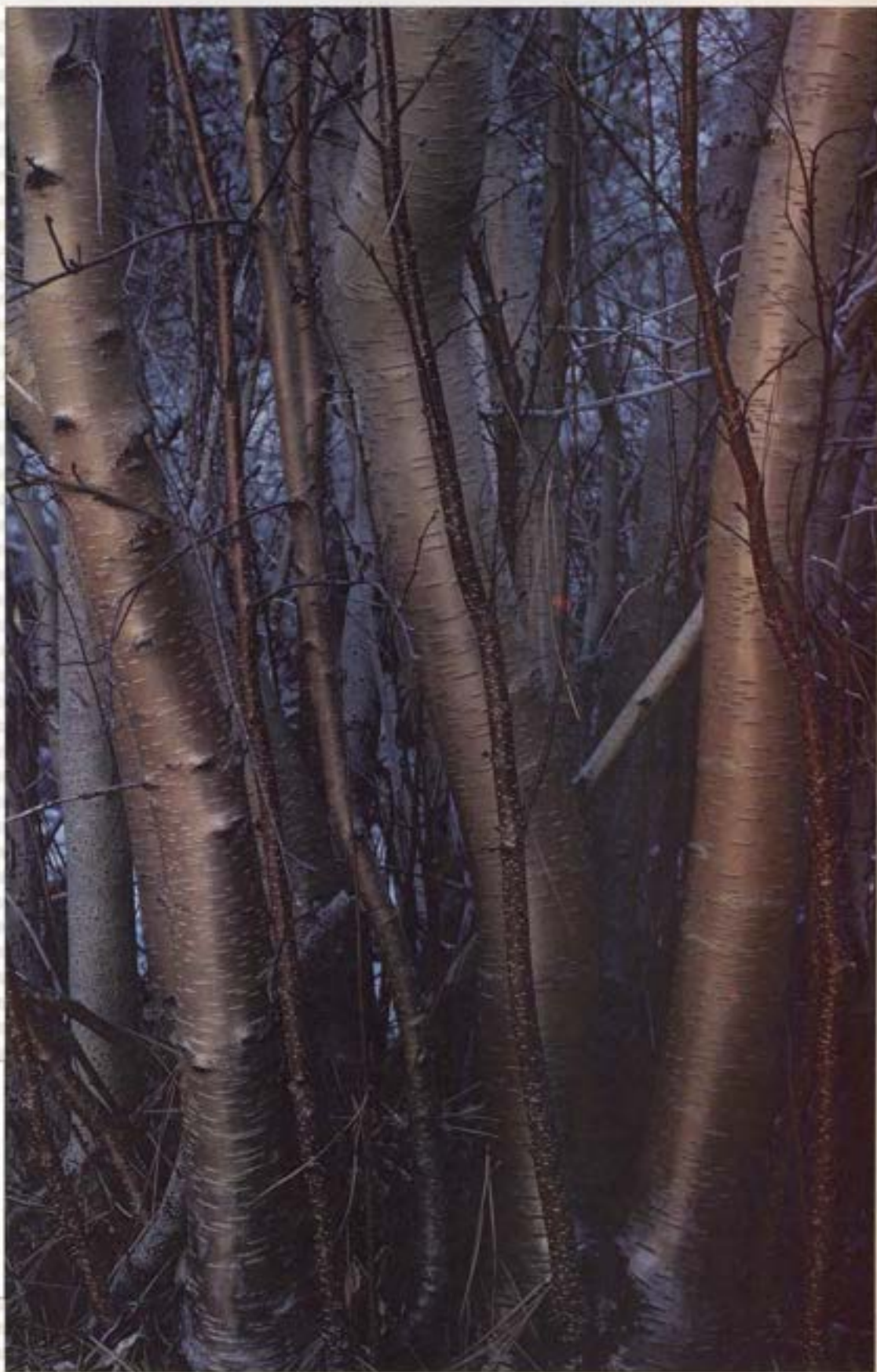
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BACKPACKER ON
SAHALE PEAK
MORaine,
NORTH CASCADES
NATIONAL PARK
TIM BOYER
BELLINGHAM,
WASHINGTON





•
FIRST PRIZE
COLOR
GOING WILD

•
KAYAKERS,
SOUTHEAST ALASKA
DENNIS GAITHER
PALMER, ALASKA



•
GRAND PRIZE

•
BIRCH TREES,
EASTERN SIERRA
TOM RICKMAN
CROWLEY LAKE,
CALIFORNIA



•
SECOND PRIZE

COLOR

WILDLIFE

•
SANDHILL CRANES
ON A CLOUDY
MORNING,
BOSQUE DEL APACHE
WILDLIFE REFUGE,
NEW MEXICO
KATHEE S. JOHNSON
LAKEWOOD,
COLORADO

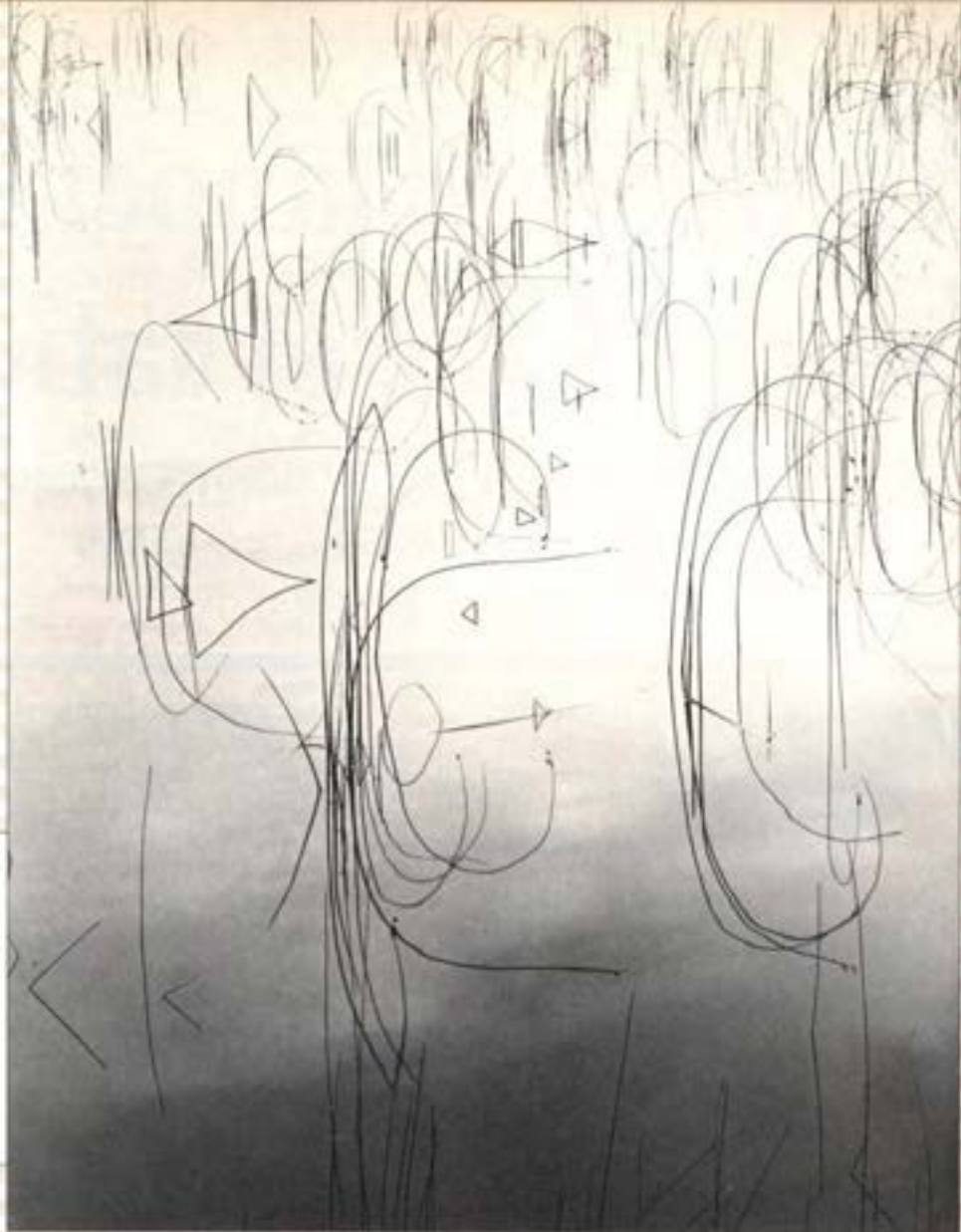


FIRST PRIZE
COLOR
WILDLIFE

LAYSAN ALBATROSS
COURTSHIP DANCE,
LAYSAN ISLAND,
HAWAIIAN ISLANDS
NATIONAL WILDLIFE
REFUGE
MARK J. RAUZON
BERKELEY,
CALIFORNIA

FIRST PRIZE
BLACK & WHITE
IN PRAISE OF PLANTS

REEDS IN WATER,
HILES, WISCONSIN
THOMAS LEMKE
MEQUON, WISCONSIN



SECOND PRIZE
BLACK & WHITE
IN PRAISE OF PLANTS

FALLEN TREE,
SIESTA LAKE,
YOSEMITE
NATIONAL PARK
MARK W. ATWOOD
HERNDON, VIRGINIA

What Ever Happened to Energy Conservation?

*Nobody talks about it in these energy-rich days,
but using less has become a way of life.*

Seth Zuckerman

WHEN THE END CAME, it came with the suddenness of an oil gusher. Last December, OPEC oil ministers once again failed to agree on keeping oil flows down and prices high. But this time the Saudis let the bottom fall out of the market. Crude oil, which had slid from \$35 a barrel in 1981 to \$26 by the end of 1985, plunged to \$10 on the world market in April. Gasoline prices started a parallel drop, diving to levels unknown since the Iranian oil shock of 1979.

Will this price crash—an obvious boon to consumers—spell an end to conservation and efficiency improvements? The picture is not as gloomy as it might appear. Analysts predict that the drop in oil prices will slow the transition to more efficient use of energy, but they also agree that the collapse of OPEC does not augur a return to the wasteful days of the 1960s, when Americans were running through natural resources at blinding speed. "Energy efficiency is to a large extent entrenched," says Howard Geller, associate director of the American Council for an Energy-Efficient Economy. "Things will continue to improve, but the rate at which they get better may decrease."

Analysts say advances in automobile fuel economy will be delayed the most, while the move toward more efficient use of electricity is likely to remain relatively unaffected, despite the surplus of generating capacity that has appeared over the last three years. From energy codes to fuel economy standards, energy efficiency now has institutional momentum behind it. That momentum will be crucial in averting the risks of renewed dependency on oil—which would lead to another energy crunch in the 1990s.

The recent collapse of oil prices follows a decade of increasingly efficient use of energy.

The United States' dependence on energy, measured by the amount required to produce a real dollar of GNP, has dropped by more than 25 percent since 1973. Researchers at Lawrence Berkeley Laboratory in California attribute about half the drop to "technical fixes"—changes that enable people to perform the same services using less energy. Some examples: The average car goes 29 percent farther on a gallon of gas now than it did in 1973; millions of homes have been insulated; factory heat that was once wasted is being recovered; and new refrigerators and air conditioners are more efficient than the models they replaced. The rest of the drop has resulted from consumer belt-tightening, the transition from a manufacturing to a service economy, and changes in consumer preferences.

Both government regulation and economic forces have spurred these changes. Congress set the Corporate Average Fuel Economy (CAFE) standards in 1975, mandating that each manufacturer's new fleet average 27.5 miles per gallon by 1985. Although the standard was rolled back to 26 mpg in 1985 as a special favor to Ford and General Motors, it played a major role in boosting the typical car's 1974 average of 13 mpg.

Some states and many cities have passed codes that

**"Anyone
who tries to sell you an oil
price-and-demand forecast
is dealing more with hot air
than anything else."**

*Christopher Flavin
Worldwatch Institute*



set limits on the energy consumption of new buildings. Several large states have led the way with appliance efficiency standards. For example, California plans to cut the maximum permissible electricity use of an average-size refrigerator from 1,400 to 700 kilowatt hours per year by 1992. Because California represents about a tenth of the U.S. appliance market, this change will have an effect on manufacturers' product lines nationwide.

Even if the oil crash keeps standards from being stiffened further, analysts agree that they will probably not be weakened, and will continue to pull up overall energy efficiency.

GOVERNMENT REGULATION isn't the whole story, however: Price hikes have also led people to use energy more efficiently. Between 1978 and 1981, oil prices doubled and gasoline prices leaped 60 percent above the rate of inflation. Electricity prices rose by a fifth between 1978 and 1982. Energy analyst Amory Lovins estimates that about a third of the country continues to experience electric "rate shock"—sudden, sizeable increases in rates, usually caused by new facilities.

People have responded by buying devices that provide the services they want while using less energy. Manufacturers now produce refrigerators and air conditioners that are more efficient than required by the strictest standards. Numerous energy-saving products are succeeding in the marketplace even though their installation is not mandated by state or local codes. Some auto manufacturers exceed the CAFE standards handsomely.

Many of these changes, especially fuel-frugal cars (along with the plentiful supply of natural gas as a substitute for oil), contributed to the oil glut. Between 1979 and 1984, oil consumption fell by one sixth in the industrialized Western world. If the United States still used the same amount of oil per unit of real GNP that it did in 1978, it would be importing nearly three times as much oil as it is today.

While demand dropped, non-OPEC oil exporters such as Mexico, Great Britain, and Norway increased oil production. As a result, OPEC's share of the world market dropped from 42 percent in 1979 to 30 percent in 1984, and its revenues from \$275 billion in 1981 to \$150 billion in 1984, with a drop to \$100 billion likely in 1986 if current trends continue.

Analysts agree that oil prices are likely to start climbing in the late 1980s or '90s, but are uncertain exactly when. "Anyone who tries to sell you a price-and-demand forecast is dealing more with hot air than anything else," says

Worldwatch Institute senior researcher Christopher Flavin.

But analysts do agree on certain trends. The Mideast members of OPEC hold 56 percent of the world's oil reserves. "At some point, dependence will shift back to the Middle East," says Daniel Yergin, co-author of the Harvard Business School's *Energy Future*. Flavin points out that OPEC members such as Algeria, Ecuador, Indonesia, and Nigeria are likely to exhaust their exportable reserves by the mid-1990s, making the cartel "smaller, more geographically concentrated, more cohesive, and more powerful." American oil consumers face the danger of being fooled by the cycle of crisis and glut into letting energy efficiency decline.

WHATEVER EFFECT the price crash has on oil use, it will have much less of an impact on the consumption of other fuels. A 1986 report by the American Council for an Energy-Efficient Economy shows that oil represents less than 3 percent of the cost of generating electricity nationwide. Observers suggest that the oil price drop will therefore have little or no effect on the retail price of electricity. On the other hand, it is theoretically possible to substitute oil for natural gas, driving down the price of gas. But Lovins plays down this possibility, saying that such substitutions are no longer as feasible technically as they used to be.

Transportation still depends on petroleum; here the effects of the OPEC collapse are as plain as the price signs at the corner gas station. Yet, even in transportation, analysts believe progress in energy efficiency will be slowed but not stalled. "Detroit has re-tooled," says Yergin. "It's awfully hard to buy a gas-guzzler—unless you can afford a Rolls-Royce."

Indeed, the average new domestic car gets more than 26 miles to the gallon, a substantial improvement over the 17 mpg of the average car on the road, and an even greater leap from the mileage of the cars being retired from the road. The new American cars being made by foreign

"The drop in oil prices may shift attention from saving heat to saving electricity. If so, that's long overdue—electricity is the most costly form of energy."

*Amory Lovins
Rocky Mountain Institute*



manufacturers (35 percent of the total) are even more impressive: They average more than 30 mpg.

One possible blow to fuel economy would be growth in the size of cars that people buy. Sierra Club Washington lobbyist Brooks Yeager sees a move toward larger and less efficient cars. The oil crash, he says, "allows consumers to believe they will be able to afford the gas." But there's a limit to that trend. "It's not as though we're going back to 1965 cars," says Lovins, and even today's large cars are about as efficient as some ten-year-old subcompacts.

The drop in oil prices has made a rollback of the CAFE standards a near certainty, however, as demonstrated by the National Highway Traffic and Safety Administration's lowering last year of automakers' required average mileage for their fleets from 27.5 to 26 mpg. No one in Congress could muster the votes necessary to stop the rollback, much less raise the standards to 45 mpg by 1995, as Reps. Barbara Boxer (D-Calif.) and Claudine Schneider (R-R.I.) proposed.

It's now clear that both the administration and Congress are willing to keep the standard at 26 mpg through 1988, Yeager says. "There's a lost sense of urgency about forcing the U.S. auto industry to conserve energy."

**"People
are not going to rip
the insulation out of
their walls."**

Howard Geller
American Council for an
Energy-Efficient Economy



Although U.S. auto manufacturers may lag behind, more efficient cars continue to appear on showroom floors. One is the imported Chevrolet Sprint, which boasts an EPA rating of 55 mpg in the city and 60 on the highway. "The top-rated cars still improve from year to year," says Geller.

Deborah Bleviss of the Federation of American Scientists cites prototypes by Volvo (63 mpg city, 81 highway) and Toyota (89 mpg city, 110 highway) as indications of how far automakers could go. To achieve mileage increases, these cars use plastics and ceramics in auto engines and plastics in auto bodies, as well as even newer technologies such as direct-injection diesel engines.

OUTSIDE the transportation sector, the prospect for increased energy efficiency continues to look positive despite the dive in oil prices. Homeowners are likely to continue to seek efficiency improvements, says Lovins, "because practically all home energy fixes are cost-effective down to \$5 a barrel." A 1985 survey by the National Association of Home Builders found that homebuyers mentioned energy efficiency as a priority in a new home more often than any other factor—somewhat less often than in a 1980 survey, but far ahead of the next-most-important factors, less exterior maintenance and a newer house.

The most energy-efficient strategy, superinsulation (which reduces a house's energy needs for heating and cooling below a tenth of their usual levels), is still standard only in severe climates, but energy efficiency in general is making progress. Efficiency is taken for granted in new homes, "especially by the better builders," says Larry Sherwood, executive director of the New England Solar Energy Association.

In existing homes, the situation will continue to improve, but more slowly than it has. While "people are not going to rip the insulation out of their walls," as efficiency lobbyist Geller says, they may well loosen their energy belts a notch or two.

According to a study by Battelle Memorial Institute, curtailment of energy services (turning down the thermostat, for example) and lifestyle changes (tak-

**"Detroit
has re-tooled. It's awfully
hard to buy a gas-guzzler
—unless you can afford
a Rolls-Royce."**

Daniel Yergin
Harvard Business School



ing a bicycle instead of a car) have played a greater role in home savings than in any other sector. If home energy bills were to drop dramatically, these energy-saving strategies could easily be abandoned. But the effect of the oil price drop on most energy bills is likely to be minimal, because oil accounts for only about a tenth of home and office energy consumption.

In other areas, progress seems to be more permanent. "Where industry has actually invested money or adopted housekeeping procedures that promote energy conservation, I doubt they will be dropped," says the Sierra Club's Yeager. He suggests that the more expensive strategies will no longer seem as attractive, however, and that the rate at which new energy-saving strategies are adopted will decline. Geller is more optimistic: "There's a lot of savings with two-year paybacks that haven't been made yet," he says, but he concurs that the rate of improvement will drop.

ELECTRICITY is in a very different economic position from other forms of energy. Electricity prices, three quarters of which are based on fixed costs such as capital, labor, and profit margin, have kept slightly ahead of inflation in the past four years. As

new capital-intensive plants come on line, those fixed costs will continue to increase, raising rates and creating further incentives for customers to use electricity more wisely. "The drop in oil prices may shift attention from saving heat to saving electricity," says Lovins. "If so, that's long overdue—electricity is the most costly form of energy."

Such savings would be somewhat ironic for utilities, most of which have a large surplus of generating capacity. During the past ten years, while they were bogged down with huge, over-budget construction projects, many utilities encouraged their customers to use less electricity, or to use it at times when generating capacity was not over-

taxed. Now that these new plants are coming on line and boosting rates, customers are scurrying for efficiency improvements—better motor controls, lights, and the like. By doing so they have cut growth in demand to 1.7 percent per year, a quarter of what it was in the 1960s. Customers can save a kilowatt hour for a fraction of the cost of generating one, Lovins says.

What's more, the effects of the 1978 Public Utility Regulatory Policies Act are beginning to be felt. The law requires utilities to buy power generated by wind, small hydroelectric dams, cogeneration, and similar privately owned technologies at a fair price. In California, utilities already have firm of-

fers for private power generation equal to about half their peak load. In Maine the figure is 22 percent; in Vermont, 14 percent. And in Texas, private supply will exceed demand for electricity during some hours of the day, says Clark Gellings, head of the Electric Power Research Institute's demand and conservation department.

The Southeast and Northwest have the largest surpluses of electricity, while the Midwest and Northeast are not as well endowed, according to Gellings. But there are enough high-voltage transmission lines to allow for an exchange of much of the surplus. With many utilities offering their excess power at bargain rates, utilities see few-

TAXES TO SHRINK ENERGY WASTE AND THE NATIONAL DEBT

IN THE FIRST FEW MONTHS of 1986, certain forces on Capitol Hill saw the opportunity to impose a relatively painless tax—one that would be hidden from consumers by a huge drop in the international price of oil. With a gaping federal deficit and the threat of budget cuts mandated by the Gramm-Rudman deficit-reduction act, the incentive for an oil levy was strong. For advocates of energy efficiency, the tax was also a way to stabilize energy prices and thus maintain the incentive to conserve—a way to avoid price fluctuations that would interfere with sound, long-term energy planning.

Bills have been introduced in Congress calling for a tariff that would tax imported crude and refined petroleum products \$5 to \$10 a barrel. Another bill would establish a \$22-per-barrel floor on the price of imported oil. Besides raising revenue and encouraging efficiency, these tariffs are aimed at rescuing the domestic oil industry, whose profits have been slashed by dropping prices. In testimony before a House committee, one oil executive warned that the industry would be in danger unless a tariff is imposed. "If . . . foreign oil can be bought for anything like \$15 a barrel, there is absolutely no way our domestic industry can compete," L. Frank Pitts of the Pitts Energy Group said. "Our domestic industry will literally go down the tubes."

Observers doubt that an oil-import fee can pass, however, because it would benefit the oil-producing states at the expense of the Northeast and other regions dependent on imported oil. "An import tariff is a total nonstarter," says Brooks Yeager, a Washington lobbyist for the Sierra Club. "New England and other oil-importing areas are not willing to accept it, and they have the political moxie to keep it from happening."

Another proposal, endorsed by the Energy and Economics committees of the Sierra Club, is an excise tax on

imported and domestic oil. Such a tax avoids the regional inequities of an import tariff, but it could hurt the oil industry—already in bad shape because of the price drop—by discouraging consumption.

An increase in the gasoline tax is another option, says Michael Totten, a top aide to Rep. Claudine Schneider (R-R.I.) "The administration is still posturing that it would veto an increase," he says, but "it's very appealing because each penny-per-gallon increase would raise about a billion dollars." Totten acknowledges that it's unclear whether Congress would approve such a measure.

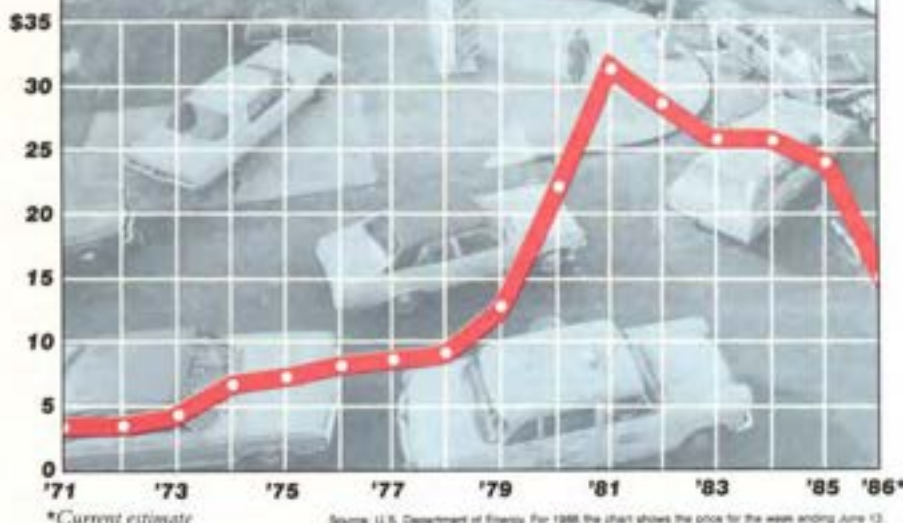
Business leaders have united against higher energy taxes. The U.S. Chamber of Commerce warned that such a move "would reverse one of the biggest boons to the American economy in years." Says David Koenig, a tax attorney for the Chamber, "We feel that businesses and individuals are taxed enough." Specific industry groups have also spoken out against the levies—including the Chemical Manufacturers Association, the American Trucking Association, and the Society of the Plastics Industry—as has the Citizen/Labor Energy Coalition, an alliance of consumers and workers.

When international oil prices climbed past the \$15-per-barrel mark this spring, pressure to impose a tax eased. "The question had been which kind of tax would be enacted," says Totten. "Now the chances don't look as good as they did a few months ago."

What's more, energy tax proposals are just a small part of the byzantine process of budget-balancing and tax reform under way on Capitol Hill—a volatile environment in which far bigger changes to the tax code than an oil levy are being considered. "They're haggling over \$10 billion in the defense budget this afternoon," Totten says wearily. "That's just about what we'd raise with a gasoline tax." —S. Z.

OIL'S RISE AND FALL Average U.S. price per barrel

Oil prices climbed steeply upward from 1978 to the heights of 1981—only to plummet back down in 1986. While the current abundance of cheap oil is temporary, the gas-guzzler and the ethos it symbolizes may be gone for good.



er incentives to promote conservation.

Utilities should not abandon conservation, however. The cost of electricity-saving devices is less per kilowatt hour saved than the cost of producing a kilowatt hour of electricity—even if the plant cost nothing to build, Lovins says. By his calculations it would be cheaper for them to pay for energy-saving devices in homes, factories, and offices than to pay for fuel, operations, and maintenance at their plants.

Besides, efficiency programs reduce the uncertainty utility planners face, says Ralph Cavanagh, a senior attorney with the Natural Resources Defense Council. People will continue to use energy more efficiently; by helping them to do so, a utility can better predict demand, he says.

IN THE LONG TERM, the key to making conservation programs useful is to incorporate them into utility planning—to set and meet goals for conservation and thus eliminate the need to build new power plants when the surplus disappears. Some power companies taking this rigorous approach to conservation are Pacific Gas & Electric, Southern California Edison, Bonneville

Power Administration, the Tennessee Valley Authority, Florida Power & Light, and General Public Utilities, the owners of Three Mile Island. A 1983 survey by the Electric Power Research Institute found that 300 utilities were operating more than 1,000 efficient-use and load-management programs, but most of them still do not take efficiency seriously enough. Some have started to encourage use of electricity during times of the day when their generators are idle.

Bonneville expects to conserve enough energy to displace four large power plants by 2004. Meanwhile, it has a power surplus that is expected to last into the 1990s, which it plans to sell to California while putting conservation programs on a back burner for a few years. Lovins thinks Bonneville should proceed with its conservation efforts, however, concentrating on commercial and industrial savings, which cost half a cent per kilowatt hour, instead of residential savings at two or three cents. Lovins says the half cent per kilowatt hour is less than it costs the utility to run its steam power plants.

Among the utilities' biggest challenges are spreading the word about conservation and making sure people

can afford the improvements. Pacific Power & Light is conducting an experiment in Hood River County, Ore. The utility has outfitted some 3,000 homes with as much weatherization as was deemed cost-effective, including fiberglass in the ceilings and basements and triple-glazing on the windows. This cost the utility an average of \$4,300 per home, which will likely translate into two or three cents for each kilowatt hour it saves—less than it would have cost to generate that power. Utility officials may replicate the experiment elsewhere if it proves successful.

Florida Power & Light has also built energy savings into its resource plans. Some successful programs include rebates of up to \$600 for replacing an old, inefficient air conditioner—sweetened with a \$75 rebate to the contractor who sells the replacement. Similar incentives are provided for attic insulation, window film, and solar water heating.

Such efforts are still the exception. The country has a long way to go before it can boast of a truly energy-efficient economy. But falling oil prices are not likely to keep nationwide efficiency levels from growing. After all, the oil glut is a sign of energy conservation's success, not a harbinger of its demise.

The shift to an energy-efficient economy is well under way in the United States. From light bulbs to automobiles, from refrigerators to furnaces, energy-efficient devices have become a part of the U.S. economy. Even though some factors—such as the oil crash and the utilities' surpluses of generating capacity—are hindering the spread of energy efficiency, many mechanisms already in place will carry forward the advances of the last several years.

Changes in patterns of energy use affect deeply ingrained ways of living and working, so it's not surprising that they take a long time to happen. The transition from wood to coal took about 50 years, as did the shift from coal to oil and natural gas. It would be unwarranted to lose patience after only 13 years on the path to sustainable energy use. ■

SETH ZUCKERMAN co-authored *Energy Unbound* (Sierra Club Books, 1986) with Hunter and Amory Lovins. He has reported for *Newsweek* and taught energy policy at Stanford University.

A Mini-School Makes a Major Difference

Cynthia Runyan

SOMETIMES IT RAINS as a group of high school students pedals back to the Twin Cities, the wind in their faces and a steady drizzle dampening their backs. Sometimes other students have hiked through the Grand Canyon being pelted by sleet. Still other times rain pours down on young canoeists as their paddles dip into the icy waters of Northern Minnesota's Boundary Waters Canoe Area.

Is this any way to run a vacation? Not really—but then, students at Minnetonka (Minn.) Mini-School know that a trip with Doug Berg is seldom a carefree jaunt. Nor is it meant to be. Rain or shine, they proceed as scheduled, no matter how tired and unwilling the participants. By trip's end, if not sooner, they accept what they would have resisted hearing at the start: It's all been for the good.

Berg is an English teacher, not a tour guide. But for the past 16 years he has introduced his students to backpacking in Yellowstone, the Grand Canyon, and the Smokies; winter camping in the White Mountains of New Hampshire; canoeing in the Boundary Waters and Ontario's Quetico Provincial Park; and bicycling throughout Minnesota and Wisconsin, to name only a few of the experiences he's shared with them. The fact that most Mini-Schoolers are troubled students who've lost the knack of cooperating with teachers, fellow students, and the world in general makes

Doug Berg lends a hand to help his students over rough spots, inside the classroom and out.

the successful completion of these trips all the more remarkable.

The semi-autonomous alternative education program operates out of classrooms on the Minnetonka High School campus. The backgrounds of Mini-School participants often include family problems, poor grades, drug abuse, or truancy. Because they are having a hard time succeeding in the classroom, their self-image is often as badly damaged as their academic standing.

"It's not that they have learning problems," Berg says of his students. "Their problems are ones of adjustment rather than intelligence. . . . A kid may be truant a lot, get into trouble with school

authorities, start breaking the rules, and wind up suspended. Naturally, he or she will fall behind in the classroom while all this is going on. At this point you're banging your head against the wall if you try to teach these kids algebra or geometry. That's not their main concern. We have to work on changing some behavior and attitude problems before we try to accomplish anything academic."

Norm Garneau, one of Berg's Mini-School colleagues, confirms this viewpoint. "The kids here are similar in that they have experienced little or no success in their high school careers," he says. "They are largely lacking in motivation

"It's the give and take of outdoor life that made me aware of how a wilderness setting can change the way a person deals with life."





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and self-esteem. They may arrive at that point for different reasons, but the common factor is that the mainstream is not working out for them."

What does seem to work for many of them is the less structured, more personalized approach of the Mini-School. Though the program may be best known in the Minneapolis suburb of Minnetonka for its three- to 21-day field trips, it also includes a classroom component where students earn credit in basic academic subjects, acquire personal living skills such as budgeting, basic math, job interviewing, and written communications, and take part in extracurricular activities such as the *Com-Mini-Cations* newspaper.

The Mini-School instructors agree that outings are a particularly effective tool. Every February Garneau leads a trip to Florida, where the participants—already happy to escape the Minnesota winter—have a chance to camp by the Gulf of Mexico, bicycle in the Everglades, and snorkel at Key Largo. Other faculty members have organized cultural expeditions to museums and theaters in New York City.

But the longest, most challenging trips seem to be the ones organized and led by Berg. "In many cases, especially with the shorter trips, it's just an opportunity to get to know the kids out of school," he says. "Most of them don't trust adults very much; they haven't had positive relationships with authority figures." Longer trips go beyond getting acquainted—they involve real physical challenges and emotional development.

In the solitude of wilderness, far from the problems of home and school, Berg can begin to orchestrate some meaningful changes in a troubled person's life. In this setting his students can think about where they are in their lives and where they're headed. "When you're out in the wilderness, your problems become those of day-to-day existence," he says. "It gives us a common ground for communication."

The experience is also useful for teaching people to work together and gain confidence in themselves. In this way it is similar to the successful Outward Bound programs operating in outdoor environments around the country. Berg and program co-founder

Randy Nelson participated in a three-week Outward Bound expedition in Quetico Park in 1970 in preparation for the start of the Mini-School program that fall. Berg says he was able to bring what he learned about group dynamics on that trip to the Minnetonka program. "Randy and I agreed to see if we could develop a kind of outdoor experience that would make our program different from other programs of its kind," he recalls. "It's succeeded beyond our wildest dreams."

Outward Bound places individuals together in physically demanding wilderness conditions, where safety and even survival depend on skill and group cooperation. "You're put in a situation where you must work closely with others under stressful conditions, and deal with the problems that an experience like that brings up," Berg explains. Similarly, students on his Mini-School outings learn, for instance, that everyone on a canoe trip will reach the destination sooner if the stronger paddlers split up to assist the slower ones. Others may discover that the needs or desires of the larger group should sometimes take precedence over individual preferences.

"It's the give-and-take of outdoor life that made me aware of how a wilderness setting can change the way a person deals with life," Berg says. On the longer outings particularly, personal strengths and shortcomings are thrown into bold relief. Berg continues to be pleasantly surprised at how peer support and team spirit help to modify many students' more negative traits.

"When a Mini-School trip goes well, a group that is generally uncooperative, disorganized, and unmotivated comes together and takes pride in itself. The kids look out for each other, are polite to each other, and help each other. These are goals for any trip, and on any given trip some of this happens—sometimes to a great extent, sometimes not.

"When it does happen, it's really a neat feeling," Berg continues. "Then I as the teacher am included in the group and feel a closeness and bonding with the kids I've never experienced elsewhere. It's happened to me many times, and I've never felt as able to educate positively as when it does."

Continued on page 70

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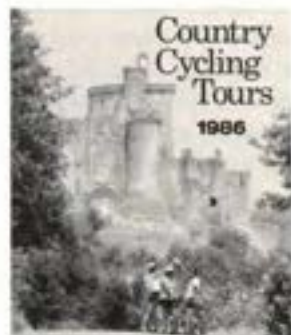
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"It's hard to know why or how the chemistry works the way it does," Berg says, "but over the years our relationship with the kids has been super. Our kids trust us. They don't think we're going to give them anything they don't deserve, and they know we won't rip them off or violate their trust in any way. We accept them as individuals."

Regardless of the problems they often encounter along the way—unreliable transportation and inclement weather are recurring challenges—the students always get through their experiences in good shape. A very real sense of pride is generated by the successful completion of a trip; for many, it's the first taste of success they've had in years.

Melissa Quigley was one such person. She entered the Mini-School with a drug problem, and described herself some time later as having been "angry, defiant, and really into being cool." Shortly after joining the program she went on a two-week Mini-School canoeing/cycling trip to the Boundary Waters. On these trips Berg takes a group canoeing for a week while Nelson travels with another group on bikes. Canoes are exchanged for bikes at a predetermined point, so Berg's group can cycle the 350 miles back to the Twin Cities while Nelson's group canoes.

"I got so much out of that trip!" Quigley recalls. "It was refreshing to find a place where I could be competent. I hadn't had much success in school before that, but in Mini-School I was able to become successful as a student as well. During my senior year I went back into the mainstream and carried a B average. I just hadn't known I could do that before."

Quigley credits Berg with a major role in her dramatic turnaround, which included seeking treatment for her drug problem. "He put a lot of faith in me, though I know I sometimes let him down," she says. "Before Mini-School, authority types had always tried to

make me conform. Doug surprised me by telling me I was an okay person. I was willing to let him try to help me."

For Quigley and many other Mini-Schoolers, an added benefit of the trips is an introduction to the outdoors. Quigley has gone on to become an expert rock climber and instructor, and at



In his leisure hours Doug Berg enjoys canoeing the waters near his year-round home on Lake Minnetonka.

27 she is one of the top climbers in Minnesota. Though not all Mini-School grads find careers in the outdoors, the lessons they learn there often stay with them forever. "We're teaching the kids that the outdoors isn't something to be conquered," Berg explains, "but that it's a great place to find yourself. We also try to get across the idea that it's something that needs to be cherished and valued and protected. That's hard for these kids to understand: They're used to leaving a trail of garbage behind them wherever they go."

"I usually find that by the end of a canoe trip the kids are very sensitive. If someone drops a candy wrapper on the trail, they'll hear about it from another kid—probably because we emphasize

protecting the environment so strongly. It's something that's never come across to them before. I don't think it's too hard to teach most people these values once you get them away from the main road and the campground."

Few outside the Mini-School program recognize the enormous commitment of

time and energy that has gone into operating it. In addition to being a full-time job, it has required thousands of hours of staff volunteer time. Keeping the program afloat has been "a constant fight to exist," a state of "perpetual precariousness," and "a struggle to survive," according to the staff. It could have gone under on many occasions—a major budget cut in the early 1980s was but one storm the program has had to weather—but at such times the employees have dug in their heels despite staff reductions, lost funding, downgraded classroom space, transportation problems, and the normal demands of working with troubled students.

"I don't think Doug and I ever planned to be around this long," co-founder Nelson says. "But then, none of us knew what would happen to a program like this." The rewards include seeing teenagers begin to turn their lives around—learn to feel positive about themselves and others, stay in school, hold on to jobs, and function in a society they had previously found uncaring and hostile.

"Mini-School kids are notorious for copping out or taking the easy way out," Berg says. "Some of them get into the program for this reason, only to find that it's not as easy as they thought. What we try to show them is that the easy way is not necessarily the best way, and that the right way, tough though it may be, feels best." ■

CYNTHIA RUNYAN is a feature and education writer for weekly newspapers in the Lake Minnetonka area.

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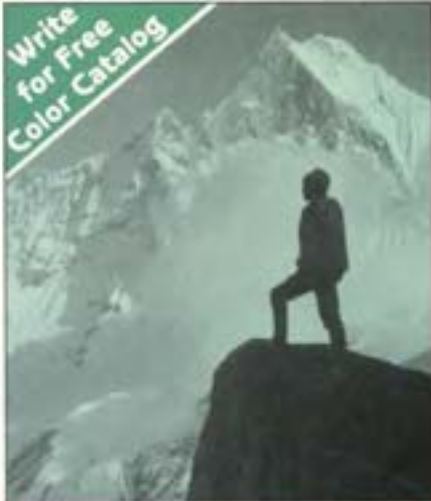
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The Cathedral Valley in Capitol Reef, a national park with a constituency that includes cows. Does that fact make it acceptable to rebuild two stock-watering reservoirs here?

Will the Feds Bow to Cows?

CAPITOL REEF NATIONAL PARK

Named for an outcrop shaped like the nation's Capitol dome, Capitol Reef National Park features a 100-mile-long jagged wall of colorful sandstone. Geologists call the formation the Water-pocket Fold. Ancient Indians gave the place a more picturesque name: Land of the Sleeping Rainbow.

In the northern end of the park, a narrow stream cuts a steep canyon across the reef. It is here, along Deep Creek, that the Bureau of Land Management has proposed rebuilding two livestock watering reservoirs within the boundaries of the national park.

The National Park Service is no stranger to grazing. Cattle and sheep forage on 2.4 million acres within 35 park units nationwide. In most cases the Park Service handles grazing permits on its own lands. At Capitol Reef, however, the BLM crosses park boundaries to

oversee grazing permits on lands that it no longer controls.

"It's bad enough that the BLM—the wrong agency—is managing any activities within a national park," says Ruth Frear, co-chair of the Sierra Club's National Parks Subcommittee. "But it's an outrage that the BLM is trying to make grazing a dominant use of national parklands."

The old, abandoned reservoirs in Deep Creek have filled up with silt deposits, and the Park Service has recommended the area for wilderness designation. But conservationists fear that the BLM project, which would require heavy equipment to build and maintain the reservoirs, would disqualify Deep Creek from further consideration. Ironically, the BLM's own regulations expressly forbid similar projects within its wilderness study areas.

The environmental assessment of the project released by the BLM late last year



failed to establish a need for the project, to analyze reasonable alternatives, or to evaluate the impacts of the reservoirs on wilderness values, says Terri Martin, Rocky Mountain regional representative for the National Parks and Conservation Association.

While Utah conservationists have tried to convince both the BLM and the Park Service to abandon the Deep Creek reservoirs, Utah Senator Jake Garn (R) has been pushing the agencies hard in the opposite direction. The senator wrote to the Park Service regional office that the project offered the agency an opportunity to become "a good neighbor" to Utahns.

Despite the pressure from both sides, neither the BLM nor the Park Service has blinked so far. By mid-July the BLM had still not released a final version of the environmental assessment, and the Park Service, which will make the final decision, had not indicated which way it was leaning. Conservationists have threat-

ened to sue in federal court if the Park Service decides to go ahead with the project.

Meanwhile, the National Academy of Sciences has begun a study of the impacts of grazing in Capitol Reef National Park, a study mandated by Congress in 1982 when it decided to allow grazing in the park to continue for at least 12 more years. The study,

scheduled for completion in 1992, is supposed to investigate if not resolve the issue on a scientific basis. But Congress has so far neglected to appropriate any funding for the National Academy's study, which carries an estimated price tag of \$1 million.

"The final solution," the Sierra Club's Frear predicts, "will be a political one."

—James Baker

Peak Defenders Wage a Star War

MT. GRAHAM, ARIZONA

High above a sea of desert in southeastern Arizona stands the sub-alpine island of the Pinaleno Mountains. Cut off from any similar habitat for the last 11,000 years, the range is like "a great Pleistocene museum," according to Arizona Game and Fish biologist Tom Waddell.

Mt. Graham, the range's highest peak

at 10,713 feet, provides a refuge for the endemic Mt. Graham red squirrel, which the U.S. Fish and Wildlife Service has proposed for protection under the Endangered Species Act. Covered by the southernmost spruce-fir forest in North America, the mountain also boasts a population of rare spotted owls and some of the best black bear habitat in the western United States.

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says Paul Hirt of the Sierra Club's Grand Canyon Chapter. "In only one year of study, several other species have been found that are thought to exist only here. This is not an ordinary mountain."

Ironically, the interest that has spurred the first serious studies of the peak may also herald its demise. The University of Arizona has asked the U.S. Forest Service, which manages the Mt. Graham area, for permission to put 13 telescopes on Mt. Graham and surrounding peaks.



According to Lauray Yule of the university's Steward Observatory, "Mount Graham is one of the last great sites still available for astrophysical observation."

Other observation points in the Southwest, such as Kitt Peak near Tucson and Mt. Palomar near Los Angeles, are gradually being spoiled by light pollution from nearby cities. On the other hand, the view of the night sky from atop Mt. Graham is excellent, and should remain so for about a hundred years, according to a recent study con-

ducted by the Steward Observatory.

The telescopes being proposed for Mt. Graham and a few of its neighboring peaks include some of the largest and most sensitive ever made. They would enable astronomers to observe faint images and previously undetected radiation from deep in space. About the height of a ten-story building, the National New Technology Telescope (NNTT) would be the largest optical/infrared telescope in the world.

According to Yule, "This observatory will open a window on the universe not before available for discovery. From it, scientists will be able to explore the frontiers of space."

The NNTT alone would probably bring about 50,000 visitors to the mountain each year. In addition to the telescope, support facilities such as a powerline and all-weather road, dormitories, a visitor center, and waste-treatment and storage facilities would be built, along with a mirror-coating facility producing toxic wastes that would

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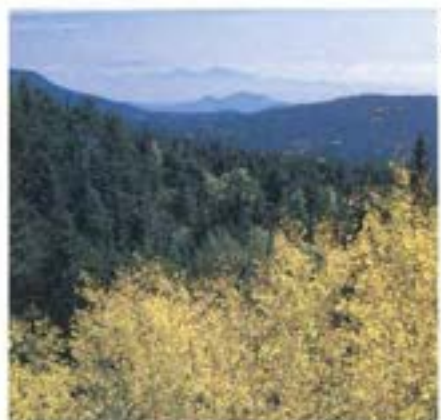
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Mt. Graham: a Pleistocene museum that some want to bring into the space age.

need to be hauled down the mountain's winding road. Helicopter supply flights would be frequent.

Environmentalists are reluctant to see another mountaintop developed in Arizona, which already has several observatories. And they are particularly concerned about the Mt. Graham site, which is surrounded by a proposed wilderness area and unusual flora and fauna. Twenty-four wildlife, outdoor, hunting, and conservation groups (including the Sierra Club) have formed the Coalition to Preserve Mt. Graham. The group claims that the university's enthu-



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ABOUT BOOKS

Jon Beckmann
PUBLISHER
SIERRA CLUB BOOKS

Sierra Club has a long history of publishing books. The first that I know of chronicled a pack trip to the Sierra in 1895. In the 1960s, with the advent of the Exhibit Format Series and the Sierra Club Calendars, a formal publishing program emerged, and it has had a distinguished and multifaceted life since then.

Pursue a few "trivial" questions about the Club's publishing over the years: (a) What's the all-time best-seller in both paperback and cloth? (b) What children's book won a National Book Award? (c) What is the physically largest book the Club ever published? (d) Which two preeminent nature photographers were associated with the first two titles of the Exhibit Format Series? (e) What title has been in print the longest? Answers below.

Publishing today thrives on great fictional escapes and on advice about how to get richer, thinner, and more lovable. Our publication lists, however, have only a few "where-to's" and no advice to the lovelorn or the entrepreneur. We are best known for our grand photographic celebrations of nature, but the heart of our program consists of books that are far more important to the human community and to the non-human world than any book on self-improvement could be. Several recent issue-oriented books are advertised elsewhere in *Sierra*, under the headline "Who Will Shape Tomorrow's Technology?"

Poets have been called the "unacknowledged legislators of the world." Our authors aim at being acknowledged educators amidst today's media blitz of half digested data. They provide a needed environmental perspective for many of the questions that trouble us and the convictions that inspire us. Last question: What was the most recent publishing award received by the Club? Answer (f) below.

Answers: (a) *On the Loose*, Russell and Russell. (b) *A View From the Oak*, Kohl. (c) *Galaxies*, Ferris. (d) Ansel Adams and Eliot Porter. (e) *Sierra's Guide to the John Muir Trail*... Walter A. Starr. (f) A Carey-Thomas Special Citation for Creative Publishing of Books on Environmental Issues.

siasm is based as much on the site's proximity to the Steward Observatory as on the site's optical merits. It points out that astronomers have not yet made their decision about the best site for the NNTT. The government-funded group that has proposed the telescope, the National Optical Astronomy Observatories, is still considering sites in other states, including Hawaii.

"There are other places from which to study the heavens," the *Arizona Daily Star* recently editorialized. "The Pinalenos, on the other hand, are not just any mountain range."

The Coronado National Forest is preparing a draft environmental impact statement on the Mt. Graham proposal that will announce the agency's "preferred alternative." Although release of the statement was originally scheduled for last fall, it has been postponed several times and is now expected in October. A 90-day public comment period will be followed by the regional forester's final decision.

In the meantime, Mt. Graham awaits the verdict that will determine whether its future will be written in terms of biology or astronomy. —Dan Dagget

Feuding Groups Make an Oil Deal



Facing off over the question of oil development in the Bering Sea are William Johnson of Sohio Chemical Company (left) and Douglas Foy of the Conservation Law Foundation.



Bob photos: C. M. Kozak

THE BERING SEA

For ten years, attempts to find oil in the Bering Sea off western Alaska have produced nothing but controversy.

Eskimo villagers, commercial fishermen, and environmental groups all have a stake in protecting the sea's rich populations of fish, birds, and marine mammals. Through lawsuits and administrative appeals, they've temporarily kept oil developers out of some offshore federal tracts, but in other areas exploratory wells have been drilled.

Robert Redford's Institute for Resource Management, a non-profit group devoted to resolving environmental disputes, decided it was time to try a new approach. In 1985 the institute brought major oil companies, Alaskans, and environmental groups together to discuss oil development in the Bering Sea. Following a year of negotiations, the announcement came in May of an unusual agreement that could protect some offshore tracts and allow

exploration in others over the next five years.

Under the agreement, 240 million acres in the Navarin Basin, St. George Basin, and Norton Sound—including sensitive near-shore areas—would be placed off limits to oil companies. In return, environmental groups would promise not to challenge the leasing of 48 million acres offshore—as long as a committee of locals, environmentalists, and oil industry representatives could agree on lease stipulations to protect fisheries, marine mammals, and birds. Committee members would be chosen by the groups themselves. If they failed to agree on stipulations, environmental groups would be free to go back to court.

Interior Secretary Donald Hodel is under no obligation to accept the compromise plan, submitted as a joint comment on the federal government's offshore leasing schedule. But after meeting with a delegation led by Redford, Hodel praised the agreement as a "pioneering" deal.



neering" effort at reaching a consensus.

"Local people were hesitant to participate at first," according to Anna Phillip, program manager for Cenaliurrit, the Yukon Kuskokwim Delta region's coastal management program. "They didn't want to give anything up, same as the oil companies. But the more we discussed what had happened in the past, the more people said, 'Let's try it.'"

The unusual agreement was quickly touted by some participants as a step toward resolving offshore drilling conflicts in other states. But other participants, including Sierra Club Alaska representative Jack Hession, have their doubts.

"The Club doesn't see it as a model for the rest of the United States," Hession says. "In Alaska there were many blocks [of offshore tracts] to work with." In other states, smaller areas are involved—and environmentalists' and oil developers' highest priorities tend to overlap.

The two parties could not reach an agreement on the most controversial area in Alaska's Bering Sea: Bristol Bay, home to a \$1-billion-a-year commercial salmon industry. Bristol Bay was dropped from the Bering Sea negotiations and continues to be the subject of lawsuits.

"The agreement offers a temporary reprieve for the near-shore areas, which are vital to marine life and Alaska's beaches," says participant Michele Perault, former president of the Sierra Club. "It doesn't mean that those areas will be protected five years hence, however. We'll have to remain diligent."

—Tom Kizzia

The Post Office That Will Not Be

SAN FRANCISCO, CALIFORNIA

The United States Army is demolishing a partly built post office here. Not because it is old: Construction began only a year ago. And not because it is unsafe: It is up to code in this earthquake-prone city.

No, the nascent building is to be torn down because it should never have been

built in the first place. It is, in a word, illegal.

For years this site and some much larger tracts of land on both sides of the Golden Gate Bridge have been spared high-density development because they were owned by the military. At the behest of the late Representative Phillip Burton, Congress in 1972 designated these areas the Golden Gate National Recreation Area (GGNRA), to be managed by the National Park Service. Some parts of the GGNRA were left

under the Army's jurisdiction, however, and that's where the post office trouble began.

The structure lies within an Army-controlled portion of the GGNRA called the Presidio, perhaps the most beautiful military installation in the world. According to law, the Army may use this area solely for military purposes. Construction is allowed only to replace buildings that are torn down. In short, Congress had created these rules because it wanted to keep the Pre-



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Construction of the Presidio post office was well under way when a judge declared it illegal. The decision is an important victory for both San Francisco and the national park system.

sidio's highly valued open space open.

But last fall, local resident Margaret Moore was walking her dogs along the Presidio's Crissy Field, a scenic bayshore area heavily used by walkers, joggers, and windsurfers. "We'd been gone most of August," she says. "I took the dogs down for their walk and came upon a large sign reading 'Site of a New Postal Facility to Serve You, USPS Presidio Station.' I was appalled."

Moore began making calls. Few people knew anything about the new post office. Although the Army had told the GGNRA's Citizens Advisory Commission about the new building, it had never held a public hearing on the matter. Nor had it publicized the full extent of its plans, which included constructing a 38-foot-tall barracks, a child-care center, a bowling alley, a liquor store, a commissary, and other odds and ends—including a Burger King restaurant.

Representative Sala Burton, widow of Phillip, soon learned of the problem. She tried to persuade the Army to halt construction pending public hearings, which are required under various laws, but the Army refused, contending that its sketchy briefings to the citizens commission fulfilled its obligation to the public.

According to Sierra Club Director Edgar Wayburn, the Army "apparently failed to realize that the Presidio is entirely within the Golden Gate National Recreation Area, and acted as if this were just another Army post."

So Wayburn, John Hooper of the Si-

erra Club's Bay Chapter, and Amy Meyer of People for a Golden Gate National Recreation Area decided to take legal action. At their request, attorney Deborah Reames of the Sierra Club Legal Defense Fund warned the Army that if it didn't suspend construction the Club would sue. The concrete continued to pour, and on January 31 the Club filed suit.

Two weeks later, federal district court judge William Schwarzer suspended construction, finding it "abundantly clear" that the Army and the Postal Service were carrying out the construction in violation of the GGNRA's statute. "The Army made no effort whatsoever to comply with environmental regulations," the judge wrote in his decision. "The record shows . . . a course of conduct . . . that reflects . . . a patent violation of the law."

Judge Schwarzer instructed the parties to resolve outstanding points of dispute. Negotiations were long and difficult. But on July 16 the Sierra Club and the Army announced that the post office shell would be demolished, the barracks would be moved well back from its proposed site near the bay, and that a Burger King on the waterfront was a whopper of an idea whose time would never come.

"As a result of this settlement, the open space of Crissy Field will remain open—without barriers to obstruct one of the world's finest views," Wayburn says. "The price of a national park system is eternal vigilance." —Tom Turner

Sierra Club Books will publish a paperback edition of Wendell Berry's *The Unsettling of America: Culture & Agriculture* (\$7.95) in September. Berry's book connects the nation's abuse of its farmlands with problems of health, family stability, and emotional well-being.

Club members may order the book through the Sierra Club Catalog. Non-members may order it from Sierra Club Store Orders, 730 Polk St., San Francisco, CA 94109; (415) 776-2211. Please include \$2.50 for postage and handling. Allow four weeks for delivery.

1987 Sierra Club calendars are available for chapter, group, and section fundraising programs. New this year is the "Nature in Close-Up" pocket calendar, which features 35 color photos and is small enough to fit into a pocket or purse.

Ordering information and complete sample sets of the new calendars will automatically be sent to Club publication representatives on file with national headquarters. Others interested in receiving sample sets should contact Alan Weaver, Sierra Club Books, 730 Polk St., San Francisco, CA 94109; (415) 923-5616.

The World Wildlife Fund will celebrate its 25th anniversary this year by hosting the "Partners in Conservation" conference in Washington, D.C., on September 17. Participants will explore the future of U.S. involvement in Latin American conservation. Topics slated for discussion include the outlook for parks and protected areas in the face of mounting population and development pressures, data collection versus action, the consequences of industrialization, and the role of the United States in advancing conservation priorities.

Conference participants must register in advance. The registration fee is \$50 before September 2 and \$60 thereafter. Interested parties should contact the Conference Coordinator, World Wildlife Fund, 1255 23rd St. N.W., Washington, DC 20036; (202) 293-4800.

Home Sweet Home. If your house or apartment contains enough hazardous materials to be declared a toxic-waste site (see "Toxics on the Home Front," pg. 44), you might want to look into the following publications.

Debra Lynn Dadd, former editor of *The Nontoxic & Natural News*, will publish a new bimonthly newsletter, "Everything Natural," to provide information on products made from natural substances and materials with no known toxic effects. The first issue is scheduled to appear in September. A one-year subscription is \$18. Contact Debra Lynn Dadd, P.O. Box 390, Inverness, CA 94937; (415) 663-1685.

Home Safe Home is a compilation of hazardous products and alternatives, developed by the Western Toxics Coalition, 4512 University Way N.E., Seattle, WA 98105; (206) 632-1545.

Toxicants in Consumer Products (\$4.60) provides contents and related information about many products. It can be ordered from Metro, 821 Second Ave., Seattle, WA 98104.

"Healthy Lawns Without Toxic Chemicals" (\$1.25) and "Pesticides in Contract Lawn Maintenance" (\$2) can be ordered from the Rachel Carson Council, 8940 Jones Mill Rd., Chevy Chase, MD 20815. All orders must include payment.

The Tahoe Rim Trail, scheduled for completion in 1990, will allow hikers and backpackers to circumnavigate the Lake Tahoe basin on a 150-mile-long multi-use ridgetop trail.

Fourteen miles of trail had already been completed by volunteers through 1985; this year's goal remains to build another 14, despite the late-summer start imposed by the unusually heavy Sierra snowpack. Some volunteer work parties make four-day backcountry trips to work on trail segments, while others make one-day commitments.

Volunteers are needed to help make the trail a reality. For information contact the Tahoe Rim Trail, P.O. Box 10156, South Lake Tahoe, CA 95731; (916) 577-0676.



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Some Plants & Animals Set Traps for the Unwary

Gotcha!

Jim Gordon

When we think of predators, we usually think of animals that go out and hunt for their food—animals such as wolves, hawks, and snakes. But certain animals do the opposite; they stay put and trick their prey into coming to them. Plants do a similar thing when they lure birds and insects to help spread their pollen or seeds. Since plants can't move around, this type of trickery isn't surprising. What is surprising is that some plants actually trap and eat the animals they attract. And you thought that only happened in horror movies!

It's easy to understand why animals eat other animals. To stay alive, they need the carbohydrates, fats, proteins, vitamins, and minerals contained in their prey. What about plants? They generally make their own food out of sunlight, carbon dioxide, and nutrients found in the soil. But not all soils provide the full range of nutrients a plant needs. Plants that live in the acid soil of some bogs and swamps have to look elsewhere for nitrogen, an important nutrient. Insects are rich in nitrogen, so these plants have developed ways of capturing them.

Plants that don't have chlorophyll, which is used by other plants to make food, face a similar problem. They have to get their nutrients from other living things, often by attaching themselves to other plants. But there's one type of fungus that traps microscopic worms for food.

Of course, plants don't actually eat their prey the same way animals do. Instead of chewing up the insects they trap, they "swallow" them whole and then digest them, much as a snake's stomach and intestines digest a mouse. Some plants produce their own digestive juices; others let bacteria do the work and then share in the meal.

Plants and animals capture their prey in different ways. Some plants lure an insect with sweet-smelling nectar, then hold it fast with a sticky substance or trap it in a liquid-filled chamber. Others, such as the Venus's-flytrap, spring shut around an insect when it touches a part of the plant.

Animals such as spiders and caddis fly young (called larvae) spin webs to catch their prey, while the ant lion digs a pit and waits at the bottom for something to fall in. Flashlight fish attract their prey with beams of light, and the sargassum fish uses its dorsal fin as a fishing lure.

Only a few plants that capture insects end up eating them. Most simply hold the insect long enough for any pollen it has brought with it to fall off, and for the capturing plant's pollen to stick to its body. This can take anywhere from a few minutes to a couple of days. Some plants actually feed their catch so it will be strong enough to escape and pollinate other plants.

The idea of a trap is simple enough, and humans were quick to adopt it. But traps made by people are crude compared to those found in nature. ■

JIM GORDON is a freelance writer living in Burlingame, Calif.



Caught on the sticky stalks of a sundew leaf, a fly may yet break loose. But the more it struggles, the more likely it is to get thoroughly stuck. Glands on the ends of the stalks produce the sticky "dewdrops" that give the plant its name. They also secrete a nectar that attracts insects. Once an insect is caught, the leaf of the sundew slowly closes around it. Then the glands secrete digestive fluids that "eat" the insect. After several days the leaf opens up, ready to attract new victims.

David Cavagnaro/DPK Photo



Crab spiders don't bother to spin webs. Instead their colors help them hide in flowers—in this case a mule's ear—and wait for an insect to be drawn near by the smell of nectar. Often the spiders look so much like a part of the flower they're hiding in that they're almost invisible—to insects as well as humans. Crab spiders capture their prey with their strong front legs and kill it with a highly poisonous bite. But don't worry about smelling flowers: Crab spider bites aren't poisonous to humans.



© John Getach/DPK Photo





© Robert and Linda Mitchell

Butterworts work like nature's No-Pest Strips. If you look closely, you can see what appear to be pin-size dots covering the leaves. (The black things are insects.) These are glands that produce a fluid sticky enough to catch small bugs. To humans the leaves just feel slippery, like butter. The plant's leaves curl around the trapped insects; then smaller glands on the leaf surface produce fluids that digest the prey. Laplanders know butterwort leaves will curdle reindeer milk, and use them in making a dessert.



© Zig Lestryma/Animapix

Wiggling its lure to make it look even more like a tasty minnow, the well-camouflaged splitfin frogfish swims patiently in shallow water, "casting" for its prey. The lure, which is located at the end of a flexible piece of tissue and can be brought close to the angler fish's mouth, is actually part of the fish's dorsal fin. Angler fish that live in the depths of the sea where sunlight and prey are scarce do their "night fishing" with a specialized lure. The lure has luminescent cells at its tip, which cause the angler's "bait" to glow in the dark.



© Robert and Linda Mitchell

A Venus's-flytrap will spring shut when a fly or other insect touches one of the six short trigger hairs on the trap's surface. The longer hairs act as prison bars when the trap snaps shut. The plant is hard to fool, though: A bug must touch two trigger hairs (or one of them twice) within a few seconds for the trap to close. And while you can spring the trap using a pencil point, it won't stay shut for very long unless the trigger hairs are touched over and over by a struggling insect.



© Robert and Linda Mitchell

Orb spiders spin their webs in doorways or over paths, because that's where insects tend to fly. The basic parts of the web are made of dry silk, which is very strong. The spiders construct the spiral part with a combination of sticky silk droplets and stretchy elastic silk. When an insect flies into the web, it gets stuck on the spiral and is held there until the spider can scurry over and wrap it up.



Insects are attracted to the pitcher plant by nectar produced near the lip of the opening. Stiff hairs on the hood of the plant—the place most insects would try to land—point downward, causing the bugs to fall in. The slippery inner walls of the plant make it hard for insects to escape. Most victims become exhausted by repeated attempts to crawl or fly out of the plant. Eventually they drown in the fluid at the bottom of the "pitcher" and are digested by the bacteria that live there.

How do male and female fireflies find each other in the dark? By flashing an insect "Morse code" on their lanterns. But the females of *Photuris versicolor* also use their lanterns to trap food. They do this by mimicking the mating signals of other firefly species, but only after they themselves have mated. (Female *Photuris versicolor* never trap males of their own species.) The females can change the pattern of their flashes in less than a minute to answer signals sent by different firefly species.

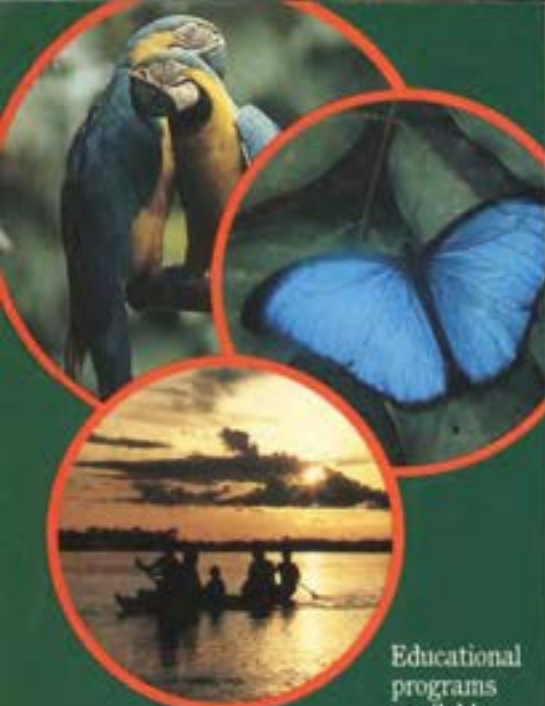
© Sterling J. Ross



Most plants produce sweet-smelling nectar to attract the bees and other insects that pollinate their flowers. Not so the carrion flower. Instead it smells like rotten meat, which the carrion fly finds irresistible. The fly normally lays its eggs in dead animals or garbage so that its larvae, which are called maggots, will have something to eat when they hatch. In this case the fly pollinates the carrion flower as it moves from plant to plant laying eggs, but its young will starve.



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Technology Out of Reason

The Whale and the Reactor:

A Search for Limits in an Age of High Technology

by Langdon Winner

University of Chicago, 1986. \$17.50, cloth.

Carol Polsgrove

GROWING UP in the 1950s, Langdon Winner saw his hometown of San Luis Obispo transformed. He remembers the day a bulldozer roared in to cut a four-lane freeway through the heart of the California coastal town. He remembers the machines the shoe store used to X-ray children's feet through their Buster Browns. He remembers the glow around the word *progress*. "We don't know where we're going," people said in those days, "but we're on our way."

Somewhere along the line, Winner decided this was a bill of goods he wasn't going to buy. He had doubts, after all, that the steady production of new things added up to a better world. And so, as an adult and a political science professor, he joined the ranks of scholars who question the technological faith.

We are sleepwalkers, says Winner in *The Whale and the Reactor*, "technological somnambulists wandering through an extended dream." If politicians tried to change our lives as radically as technology does, we'd rebel. But when technology dictates change, we assent with barely a murmur. Even when we do try to anticipate the consequences of our decisions, our attempts are half-hearted and biased by hidden assumptions.

Consider risk analysis, for instance. A process that pretends to scientific neutrality, risk analysis actually favors technological change: The very word itself—*risk*—implies the possibility of gain. Unlike the words *hazard* or *danger* or *threat*, the word *risk* suggests daring and courage. "What does one do with a risk?" Winner asks. "Sometimes one decides to *take it*. What, by comparison,

does one do with a hazard? Usually one seeks to avoid it or eliminate it."

Or consider those seaside conferences on technology and values. "Out comes the brandy. Out come the cigars. And out comes the after-dinner speaker, an old trooper, usually a distinguished scientist or engineer, often someone who helped pioneer an advanced weapons system of some sort." Bemoaning world hunger, environmental distress, and the very weapons he helped make, the speaker has much to say about "human" values—"perhaps," says Winner, "to distinguish them from the values representative of projects in which [he] has been engaged until now."

Aside from the hypocrisy of such sermonizing, the talk about values is not likely to produce sound social decisions, Winner says. Throwing concepts, beliefs, feelings, desires, and principles into one box labeled "values" suggests that "all such things are personal, arbitrary, irrational sentiments." Thus, key technological decisions, such as the adoption of nuclear power, become questions of your values against mine, your risk-taking against mine. Decision-making itself becomes a matter of bargaining.

So accustomed are we to discussing politics in these terms that we can hardly imagine anything else. But during the late 1960s and early '70s there was an attempt to create an alternative. The appropriate-technology movement hoped to change the prevailing political model while it changed the prevailing technology. Windmills and solar cells would go hand in hand with decentralized political power. Making technological decisions closer to home, people would be more likely to make them on the basis of what was right for the community as a whole.

Alas, says Winner, appropriate technology had serious flaws as a movement. It was ideologically muddy—and besides, a lot of the time the things it produced just didn't work. Worst of all,

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its advocates refused to face the facts of organized power: "The same judgment that Marx and Engels passed on the utopians of the nineteenth century apply just as well to the appropriate technologists of the 1970s: They were lovely visionaries, naive about the forces that confronted them."

The gist of this book is that, so far, all attempts to set limits on technology pale under the shadow of the dominant model: a consumer society in which all things—trees, mountains, animals—are potential commodities. So strong a hold does that model have that environmentalists themselves borrow its terms, even when they do not accept the model itself—maintaining, for instance, that species should be protected not for any intrinsic value they may embody but because they represent potential resources for human beings. "It is as if those who had come to worship at the temple had decided to change a little money on the side," Winner says.

What model would he prefer? That is unclear, although he seems sympathetic toward the advocates of "deep ecology," who hold that human beings are part of a complex ecological system (partners, not rulers), and that creatures other than human beings have rights. Deep ecologists cannot prove that such is the case; their appeal is an appeal to the heart.

For Winner himself, insight has come directly, through feeling and intuition. It came when he went back to his home countryside to visit the Diablo Canyon nuclear reactor. Looking down on the tiny cove where the giant domes rise from the sand, he saw a California gray whale offshore shoot a tall stream of vapor, then disappear under the waves, a symbol of "things as they had always been." Suddenly he knew that his experience with the reactor at that moment, "at a particular time and place," told him more than all the expert studies rolled together.

"To put the matter bluntly, in that place, on that beach, against those rocks, mountains, sands, and seas, the power plant at Diablo Canyon is simply a hideous mistake. It is out of place, out of proportion, out of reason. It stands as a permanent insult to its natural and cultural surroundings. The thing should never have been put there, regardless of

what the most elegant cost/benefit, risk/benefit calculations may have shown. Its presence is a tribute to those who cherish power and profit over everything in nature and our common humanity."

Blunt words indeed, and especially welcome in an academic analysis. True, it may seem the barest of whispers in the noisy roar of our world. But if enough people whisper, maybe one day they will make themselves heard.

CAROL POLSGROVE has written on environmental issues for *Sierra*, *The Progressive*, *Oceans*, and *Environment*.

You... You... Beast, You!

Females of the Species: Sex and Survival in the Animal Kingdom
by Bettyann Kevles
Harvard University Press, 1986.
\$20, cloth.

Jannie M. Dresser

BETTYANN KEVLES, a science writer for the *Los Angeles Times*, intends her new book for the general reader. By dividing *Females of the Species* into four sections describing courtship, mating, motherhood, and sisterhood patterns, Kevles turns our attention to the diversity of sexual and reproductive behaviors engaged in by females of various species.

Beginning with Charles Darwin and his theories of sexual selection, "a process he considered coequal with natural selection as a mechanism of evolution," Kevles goes on to encapsulate the evolution of evolutionary theory itself. Although Darwin asserted the importance of activity on the part of the female, many of his followers tended to insist on female passivity, a theory that culminated in *The Evolution of Sex*, written in the late 19th century by Patrick Geddes and his student, J. Arthur Thomson. This influential tract characterized passivity as a female quality and activity as a male one. Geddes postulated that the sexes are equal but complementary, crediting the male with being the more intellectual and exploratory sex. Geddes saw females as more emotional and re-

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ceptive—a distinction that women then and now regard as the root of many damaging social stereotypes.

A central issue in Kevles' work is the extent to which females do take an active role in courting, mating, giving birth, and parenting. "The notion that females exercise control over which males will father their offspring," she says, runs counter to the traditional thesis that females of virtually all species

have little or nothing to say about the matter. Citing evidence supplied through recent research, Kevles notes that for many species—from English moorhens to elephant seals—the female role is much more complex and initiatory than had been previously thought.

However, most of the text reads more like a delightful review of the sex lives of animals than a hard-core feminist handbook. As such it is fascinating, although

the author's encyclopedic approach discourages a straight read-through. (Fortunately, the structure of the book helps the reader handle the voluminous detail.) In recounting the sex lives of animals as distinct as angler fish, beavers, cockroaches, and dolphins, Kevles makes painstaking efforts to draw our attention to similarities and differences both within individual species and across relational lines.

AT A GLANCE



Alaska: Southeast to McKinley
by Andrew Jaffe, Lisa Tysen,
and Sven-Olof Lindblad
Rizzoli, 1986. \$35, cloth; \$19.95, paper.

Three walrus bulls idle away the hour in southwest Alaska, one of the regions between Ketchikan and the Aleutians depicted in more than a hundred color shots by 25 photographers. The area is blessed with an astonishing range of wildlife, including caribou, grizzly, and Sitka deer.

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The variety of reproductive strategies is astounding. There are hermaphroditic limpets, who become male or female depending on who they settle down next to. There are the sand-dwelling bonellia worms, the female of which catches a mate with her whiplike nose and swallows him whole; he then locates her oviducts and fertilizes the eggs. There are also representatives of monogamous relationships: mallard ducks, Amazon parrots, beavers, butterfly fish, and marmosets, among others. Kevles warns, however, that monogamy tends to produce stress in a species that practices it, for partners must learn to tolerate one another even when they are not mating.

The author continues to name names, adding species that practice homosexuality, incest, abortion, and both polygyny (in which one male maintains a harem of females, as is the case for ostriches and African mountain gorillas) and polyandry (in which a single female retains a group of males). There is also evidence of sexual violence—males fighting each other and in some cases attacking and forcing insemination on an unwilling female, which rarely results in pregnancy. Last but not least, there are animals who manufacture vaginal plugs, the bestial answer to chastity belts; animals who practice prostitution, in which a female trades sex for food; and the sexual division of labor. What is never at issue, it seems, is female virginity; in fact, in the animal world it is more likely that an experienced female will seek out an inexperienced male.

The author places no particular emphasis on sexual pleasure as a factor in selection, which is typical of many writers on animal behavior. Often redeemed by its reproductive outcome, sex rarely gets a hearing as an activity directed toward pleasure for pleasure's sake. Instead Kevles tends to regard sexual behavior, somewhat ambiguously, as "sensations that incline the female to seek out sexual intercourse." Although she emphasizes that an attractive male usually wins the favors of a female in estrus, the author doesn't pay much attention to the relative sexual skills one potential mate may enjoy over another.

For centuries scientists have foisted their own particular biases onto their

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interpretations of animal behavior, often missing the reality of what was going on. In recent years the trend has been to look to animals for lessons on how we human beings ought to behave, which leads to tremendously mixed messages about what is "natural." Kevles concludes that "there is no directive in the lives of other animals as to how we should behave." But if animals have anything to teach us about sex, it is that there is no single, correct way to do it.

JANNIE M. DRESSER is a writer and editor in Berkeley, Calif., whose work has appeared in *Woman*, the *San Francisco Bay Guardian*, and the *Fresno Bee*.

Can-Do Strategies for Conservation

World Enough and Time: Successful Strategies for Resource Management

by Robert Repetto

Yale University Press, 1986.

\$16 cloth, \$5.95 paper.

The Global Possible: Resources, Development, and the New Century

edited by Robert Repetto

Yale University Press, 1986.

\$45 cloth, \$13.95 paper.

Mark Mardon

EVER SINCE the publication of *The Global 2000 Report to the President* in 1980, which Jimmy Carter commissioned to be the most detailed study of natural resources ever compiled, those who burn the midnight oil in resource-policy institutes have struggled earnestly to sway the thinking of the powers that be. Typically, the analysts are divided into two groups: the technological optimists (I call them TOs) and the environmental realists (ERs). The former promote progress at any cost, advocating exploitation of all the world's resources; the latter call for restraint and conservation, seeking to preserve something of nature's wealth for generations to come.

Global 2000 seemed to be a boon to the ERs because it tended to legitimize their views. "If present trends con-

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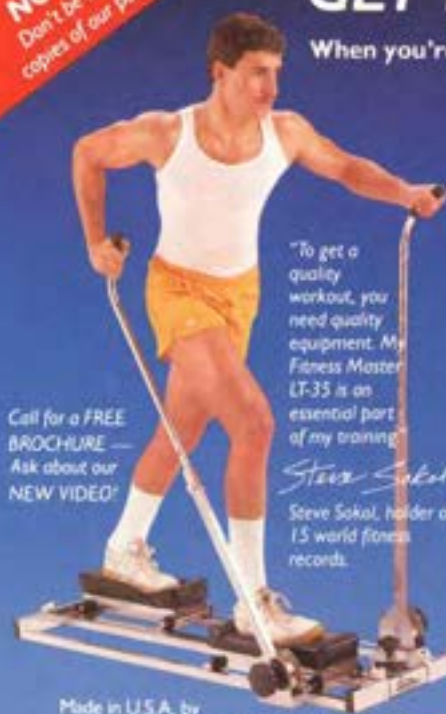
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tinue," it said, "the world in 2000 will be more crowded, more polluted, less stable ecologically. . . ." But their satisfaction soon turned to dismay in the face of biting attacks from the TOs, who derided the report as bleak pessimism, flawed in its conception, and a waste of taxpayers' money. The TOs said that accepting *Global 2000's* conclusions would place a serious economic drag on society. The attack was effective: The powerful were vindicated and the TO worldview became a cornerstone of government policy.

In light of this rebuff, two new publications from the World Resources Institute may have a profound effect on the ER viewpoint. *World Enough and Time* and *The Global Possible* breathe sheer light and optimism. They envision a grand future and point to bold ways in which humans can shape their world for posterity. Indeed, they so alter the usual thinking of the ERs that we may well have to change the acronym to EOs, for environmental optimists.

Not that these books are free of the inevitably dry prose and endless repetition that characterize institutional studies. They are, to be frank, full of such things. Robert Repetto, who wrote the first book and edited the second, has done his best to give them some momentum, despite the inherent weightiness of the subject matter. It is clear, though, that not even the denseness of the material could obscure the central idea of both books: that sustainable development is possible, and that we can manage resources so our children will have their rightful inheritance. Not only do the books tell us we can do it, they tell us how.

This is truly can-do environmentalism. Repetto spells out the possibilities: "Agricultural production can expand to meet all future demands . . . without exerting destructive pressures on marginal lands, water resources, or ecological systems"; "Economic growth can be sustained with markedly lower energy inputs . . . that do not imperil the climate or the natural environment."

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done, given the will of the powerful to do them. And it is clearly the powerful that these books are trying to persuade. The proposals presented here are aimed at motivating decision-makers in private organizations, businesses, the scientific community, international organizations, developing nations, and—most important—the governments of industrial nations. These are the ones who can say "yes, we can."

But there are certain imperatives: transition to a stable population with low birth and death rates; transition to high efficiency in production based on increased reliance on renewable resources; reliance on nature's surplus without depletion of its resource base; economic transition to sustainable development and broader sharing of its benefits; and striking a global political bargain that recognizes the common interests of all nations.

Not all these possibilities, Repetto says, are expensive to achieve. In some cases they represent a low-cost approach. One example is the 3M Company of St. Paul, Minn., which saved 60 percent (\$200 million) in annual operating and maintenance costs by reformulating products and redesigning processes to eliminate more than 90,000 tons of air pollutants, 10,000 tons of water pollutants, a million gallons of wastewater, and 150,000 tons of solid wastes each year.

Very little of what is presented here is new. These programs have been advocated elsewhere for many years. It has been suggested before that materials, credit, and technical support be given to help farmers restore degraded watersheds. Establishing comprehensive protected areas of rainforests to conserve genetic resources is not a new idea. It has been said that the educational and employment opportunities for women should be increased, both to improve their welfare generally and to contribute to a decline in worldwide fertility rates. And yet there is something in the enthusiasm and optimism—the vigor—of these books and their prescriptions for progress that is quite exciting. Hundreds of ideas are explored.

What Repetto and the contributors to *The Global Possible* have done is to take all the old, stale prescriptions and

breathe life into them. They have put them into a context that is believable, supportable, and feasible.

With *The Global Possible* and *World Enough and Time*, yet another institution has emerged to try to influence the

thinking of the powerful. With the brashness of can-doers, this time the ERs might succeed.

MARK MARDON, a director of the United Nations Association of San Francisco, is Sierra's editorial secretary.

BRIEFLY NOTED

Lonely Planet Publications is known for its "travel survival kits" geared to adventurers far off the beaten track. Three new guides—*Fiji*, *Trekking in the Indian Himalaya*, and *Tibet*—are available for \$7.95 each from 155D Park Ave., Emeryville, CA 94608. . . . A revised version of the USGS *Mt. Goddard quadrangle* topo map has been published by Wilderness Press (2440 Bancroft Way, Berkeley, CA 94704-1676; \$2.50 + \$1.50 shipping). The revision covers 43 percent more area than the USGS topo and is printed on lightweight, tear-resistant plastic paper for longer life. . . . Also from Wilderness Press: Jerry Schad's *Afoot and Afield in San Diego County* (\$12.95, paper), describing more than 150 hikes through the county's seashore, desert, and mountain environments. . . . The *1986 Pacific/Southwest Wilderness Digest* (\$7.95 from Antelope Press, 21740 Granada Ave., Cupertino, CA 95014) provides information about permits, trailhead quotas, fishing regulations, nearby supplies and services, and topo references for wilderness areas in California, Arizona, and Nevada. . . . Bicyclists touring the San Francisco Bay Area will enjoy getting to know the byways of nearby Yolo, Solano, Napa, and Lake counties. Randall Gray Braun's *Cyclists' Route Atlas* (\$7.95 from Heyday Books, P.O. Box 9145, Berkeley, CA 94709) has routes for riders at every level, from nine-mile warmups to 62-mile marathons. . . . Bay Area visitors without bikes can plan their vacations around Jacqueline Kudler and Arlene Stark's *Walking From Inn to Inn*, which describes 50 day-long walks between the wine country and Santa Cruz, adding lodging recommendations for both ends of each walk (\$8.95 from East Woods Press, 429 East Blvd., Charlotte, NC 28203). . . . At least one walk in each state is featured by Gary Yanker and Carol Tarlow in *America's Greatest Walks* (Addison-

Wesley; \$10.95, paper). Half the hundred walks described are in cities or towns; the rest are in wilderness, countryside, and on the beach. . . . Heading to Expo? The boaters among you can investigate the Northwest's inland waterways with two new books from Pacific Search Press (222 Dexter Ave. N., Seattle, WA 98109): Betty Pratt-Johnson's *White-water Trips for Kayakers, Canoeists and Rafters in British Columbia* (\$13.95, paper), and Randy Washburne's *Kayak Trips in Puget Sound and the San Juan Islands* (\$9.95, paper). Meanwhile, swimmers and beachcombers can consult the *Washington Public Shore Guide* published by the University of Washington Press (\$25 cloth, \$14.95 paper). More than 700 points of access to saltwater recreation are provided. . . . Gait patterns, scatological analyses (with color plates), and other aids to identification make James Halfpenny's *A Field Guide to Mammal Tracking in Western America* (Johnson Books; \$11.95, paper) a useful guide for backcountry travelers. . . . New from The Mountaineers: a second, pocket-size edition of Ronald J. Taylor's *Rocky Mountain Wildflowers*, with photos by Bob and Ira Spring (\$5.95), and *Devils Tower National Monument: A Climber's Guide*, by Steve Gardiner and Dick Guilmette (\$6.95, paper). . . . *Woman of the Boundary Waters* is the story of Justine Kerfoot, who has lived on Gunflint Lake for 58 years, most of them as proprietor of Gunflint Lodge. Her story is interesting for its color, humor, and adventure (\$14.95 + \$1.50 postage from Women's Times Publishing, Box 215, Grand Marais, MN 55604). . . . The University of Washington's Institute for Environmental Studies publishes *The Northwest Environmental Journal* twice yearly. Subscriptions are \$12 per year or \$9 per single issue (Engineering Annex, FM-12, University of Washington, Seattle, WA 98195). ■

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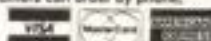
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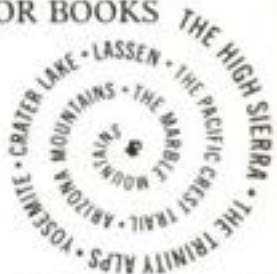
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QUESTIONS & ANSWERS

How long does it take for life to return to the site of a volcanic eruption? (Todd Wulf, Bellevue, Wash.)

Immediately after its eruption, a volcano is a hellish, forbidding place. Scalding hot steam and poisonous gases can spew from the crater for weeks, while flows of lava can lay waste to the surrounding area.

But once an eruption ceases, life begins its inexorable comeback, starting with the elemental organisms that thrive on the nitrogen and sulphur compounds dissolved in the boiling water and steam. Over time, more complex forms of life follow: Mount St. Helens, whose northwest face blew out in 1980 with a force geologists estimated at 2,500 times that of the Hiroshima nuclear explosion, is already seeing the return of some plants and animals. Still, most of these will find survival difficult for generations.

The famous Krakatoa explosion of 1883 provides an example of complete recovery following the most devastating series of eruptions. A volcanic vent that arose 50 years after the disaster now has thickets of vegetation on its flanks, while a dense tropical forest covers the slopes of a nearby remnant of the South Pacific island.

What exactly is a watershed? (Ann Milton, Juneau, Alaska)

A watershed is the entire area that delivers water from rainfall (along with sediments and dissolved materials) into stream or river systems. Watersheds range

in size from fewer than 1,000 acres to more than a million, but they all convert rainfall into streamflow.

The many elements that make up these complex ecosystems include plants and soil that hold water and discharge it slowly. When the relationship among these elements is disturbed (as when fire-damaged plants can no longer counteract hillside erosion), the rate of water discharge can be altered, often with disastrous effects. Many floods originate in this way.

Are insect repellents toxic or otherwise dangerous for human use? (Maria Tedesco, Miami, Fla.)

The strongest insect repellent generally available is an oily chemical solvent called diethyltoluamide (DEET for short). Developed by the U.S. Army after World War II, DEET became available in the late

1950s to American consumers who had previously wardoned off insects with such benign substances as wintergreen and eucalyptus.

While DEET is hard to beat when it comes to keeping insects from biting, the substance may cause allergic skin reactions, particularly at concentrations greater than 50 percent. Although many popular DEET-based repellents use less than 25 percent of the chemical by volume (one popular repellent, Off! Aerosol Spray, contains only 15 percent DEET), many others contain between 95 and 100 percent. Pure-DEET brands are popular with some outdoor enthusiasts who believe that the higher the DEET level, the better the protection.

Children are particularly susceptible to the effects of repeated applications; for that reason the Canadian government has stipulated that pure-DEET products

not be used on young children. For people of all ages, prolonged use may also result in absorption of a small percentage of the chemical into the bloodstream, with uncertain results.

"Frankly, it's overkill," Cutter Insect Repellent product manager Barbara Eber says of the growing tendency to use pure-DEET products. "Continued and repeated applications of almost any chemical is cause for concern."

What's being done with hazardous nuclear wastes while the government looks for a permanent disposal site? (Mark Reilly, Portland, Maine)

High-level wastes such as spent fuel from nuclear power plants are currently stored in on-site pools of water 30 to 40 feet deep, with temperature and radiation levels monitored regularly. These storage pools were not built to contain the 30 tons of "hot" material produced each year for an indefinite period of time. Some U.S. reactors are expected to run out of space this year.

One alternative to pool disposal now being considered is so-called dry storage, in which wastes are sealed in large-capacity metal casks and monitored in outdoor holding areas. The spent fuel can sit in these containers until safe, permanent disposal sites are found. These permanent facilities, when finally developed, will have to stand the test of time: Plutonium nuclear wastes maintain a deadly level of radiation for 250,000 years.



James Dreyer; photo by Ed Callaway

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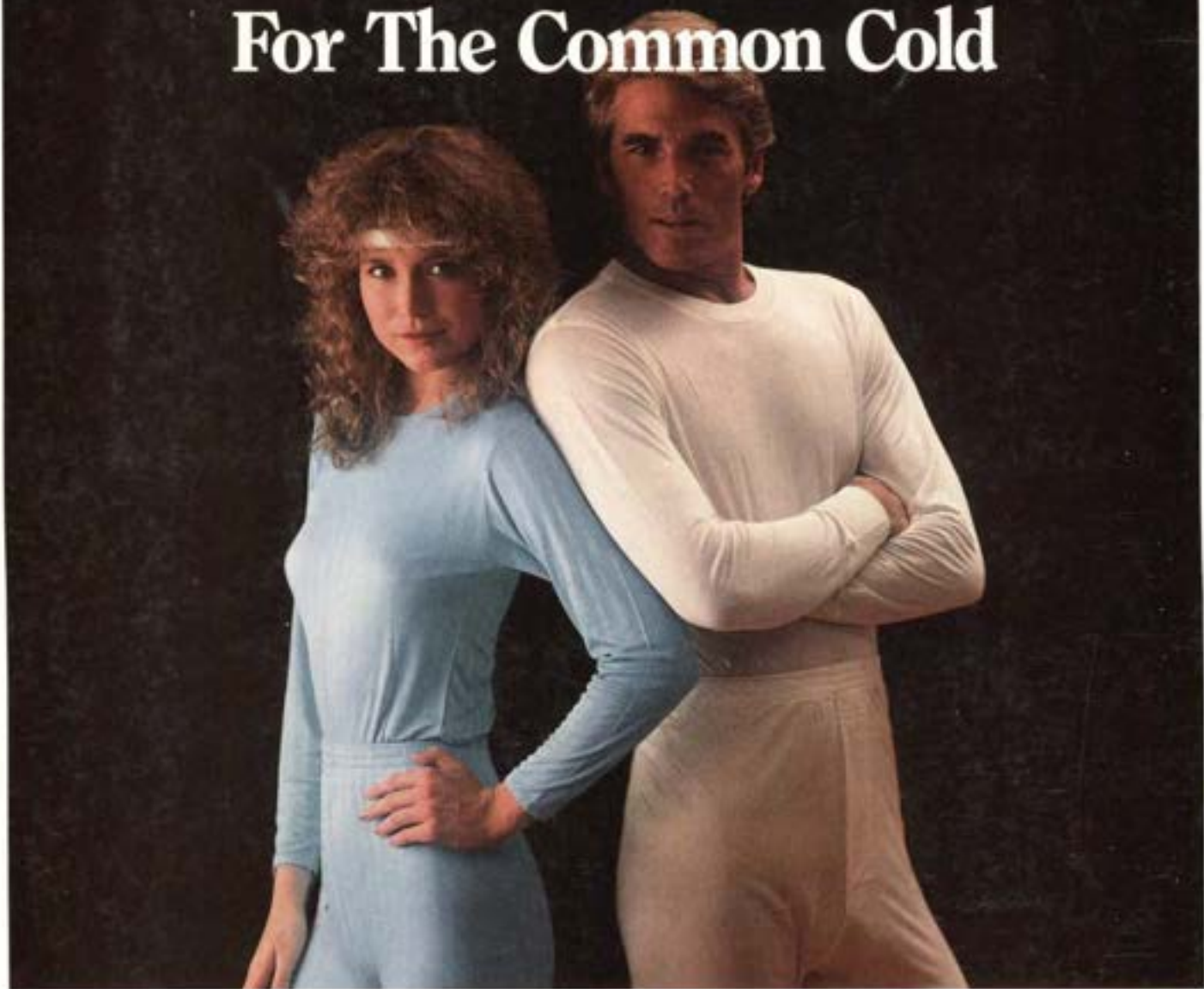
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