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Stabilization

THAT A NEW governing value is about to replace an old object of worship in the management of the economic affairs of society becomes apparent to all who would see. The change has been molecular thus far, but now breaks through into visible and irreversible form. It shows the qualities of a profound psychological conversion. The new value is stabilization; it replaces expansion.

The transformation may be viewed as the cresting of the tides of the expansion of Europe which began 600 years ago. The pull of the ebb tide has been at work for a long time, unnoticed. The moral reversal could be completed in a decade; the economic follow-through in a century.

A differential stabilization is meant, the emergence of a rational selectivity with respect to the goods and services sought by society. In a world still largely impoverished, an expansion of the production of many goods will be needed for a long time. But a contraction in other commodities will also be essential, if only to make the production of genuine necessities possible.

SYMPTOMATIC of altered attitudes is the recommendation of the United States at the UN Conference on Population that the world strive for replacement level fertility by the year 2000. That sort of demographic transformation will be essential if the world economy is to meet the needs of the world's people. We realize, none too soon, that the resources of the planet are finite.

Rigorous necessity compels the change. World production of food is inadequate now for the present population of 3.8 billion. The optimistic projections used by the United States at the Population Conference forecast 6.4 billion people by the year 2000 and 8.2 billion by 2050 if replacement level fertility can be achieved worldwide by the year 2000. The doubling of world population, and more, before stabilization, will entail disastrous famines unless unforeseen miracles in production can be wrought. The effort must be made; it will bring us to the limits of the earth in food production.

AS WE WRITE, the returns are not yet in from the UN Conference on the Law of the Sea, with serious implications for the use and protec-

tion of the oceanic fisheries. Certain it is that these resources will be pressed to capacity in the next decade, and unless they can be protected at sustained-yield levels will be gravely impaired for the longer future.

The earth's forests have been over-exploited to the point of serious depletion in most countries, and the process continues. The forests, conservatively managed, could be perpetual fountains of water, oxygen, wildlife, paper, lumber, and even liquid fuels, as well as affording a beautiful life-environment. But there is a limit to the viability of the forest ecosystems.

MOST of the accessible metal ores are nearing exhaustion. An exponentially expanding industrial society will see the end of ecologically and economically workable reserves in many cases within a century, in some cases within decades. It is nonsense to say, as some have said recently, that the earth's crust holds a million times the reserves of metals thus far consumed. The problem is the economic and environmental cost of extraction.

That fossil fuels are in short supply has been brought home forcefully to many in recent months. Reserves of gas and oil in the United States are failing; world supplies will follow the same trends in due course. Coal can cushion a transition in America, but at considerable social and environmental cost, and not indefinitely. Shale oil extraction may need more water than available, and may consume more energy than produced. Nuclear fission may soon encounter serious barriers in terms of unacceptable environmental and genetic hazards which will preclude further development. Nuclear fusion, if it can be realized, will carry its own biological and environmental dangers. Sunlight will be the civilized power source; research and development should be pressed on a high-priority basis; net energy received and utilized from the sun will set the ultimate limits of production and population for the planet.

Only recently the industrial countries were alarmed by air and water pollution. Millions of people suddenly realized that they were about to be smothered and poisoned. Special interest propaganda and the narcotics of the Pollyannas have dulled this perception, but not for long. The reality of the dangers will not go away. Pollution abatement can be achieved by technological advance, but the technologies are expensive, particularly in

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COVERS Guadalupe Mountains, by Hiram L. Parent
From below the Guadalupe almost at the Salt Flats, the visitor has a comprehensive view of the mountain mass as it rises abruptly 5,000 feet above the surrounding Chihuahuan Desert of northwestern Texas. Spectacular 2,000-foot, sheer-cliffed El Capitan dominates the southern point of the triangular bulk. Visible across 60 miles of the Texas plains, El Capitan was a guidepost for Indians, pioneers, and goldseekers. Dedicated in 1972, Guadalupe Mountains National Park is wild and rugged, to be explored only by foot. (See page 4.)

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GUADALUPE: BARRIER REEF IN THE DESERT

Guadalupe Mountains National Park

contains the most extensive organic fossil reef in the world
and offers the visitor a rugged and challenging park experience

GUADALUPE Mountains National Park in Texas became a reality and a full-fledged member of the distinguished park family at the only dedication of a national park held during the 1972 National Park Service Centennial Year. The 121-square-mile area tightly encloses a wedge-shaped mountain mass and its southern point, the spectacular 2,000-foot, sheer-cliffed El Capitan. This sentinel of the Chihuahuan Desert is visible for a hundred miles across the nineteen-million-acre trans-Pecos Desert. The park's 77,582 acres encompass extremely varied, wild, and rugged terrain with elevations of 3,650 to 8,751 feet. It boasts the highest point in Texas, Guadalupe Peak, and borders the New Mexico state line. Relatively isolated, it lies nevertheless within five hundred miles of many large cities.

At the beginning of our visit to Guadalupe in the fall of 1972, my family wondered what outstanding scenic, scientific, historic, and prehistoric features had made this area part of America's treasure. What beauties lay hidden in the seemingly inaccessible mountain bulk above us? We resolved to explore firsthand the qualities that gave this area the stature of a national park.

Guadalupe Mountains National Park lies 110 miles east of El Paso and 55 miles southwest of Carlsbad, New Mexico, on U.S. 62-180, and comprises the northwest segment of the most extensive and significant organic fossil reef in the world—the limestone Capitan Barrier Reef, a remarkable geological horseshoe. Its mostly subterranean 400-mile extent encloses the 10,000-square-mile Delaware Basin of west Texas and southeast New Mexico, rich in oil

and gas. The fabled wonders of Carlsbad Caverns National Park in New Mexico lie in the same reef. Separated by only a few miles, the two parks are administered from a central headquarters in Carlsbad. They shared the same beginnings 225 million years ago when lime-secreting algae and other organisms were deposited on talus broken loose by storms at the shore of a prehistoric inland sea. Sediments were also deposited in a lagoon between the reef and the land. When the Delaware Basin was cut off from the rest of the ocean, mineral salts gradually filled and buried the reef. Subsequent upheavals of the earth raised the Guadalupes to their present lofty heights. The section northward from the reef slope was once the lagoon. The south face of the Guadalupes was the seaward face of the reef. The reef is also ex-

article by ANNETTE RICHARDS PARENT

photographs by HIRAM L. PARENT

posed in the Glass and Apache mountain ranges to the south of the Guadalupes.

We decided to examine a cross section of this reef. The most spectacular display of the enormous reef-core, fore-reef, and back-reef is found in Guadalupe's McKittrick Canyon. We obtained a brochure and key from the Frijole information station and then drove ten miles over highway and private ranch road to the mouth of the "Canyon of the Black River." After we parked, we did what was to become routine when we penetrated this park—we set out on foot.

Some five hundred fossil species identified in the 1,900-foot, gray-tan-black-and-olive walls of McKittrick Canyon have made it a mecca for the earth's geologists. McKittrick Canyon contains a fragile ecosystem with an unusual overlap of plant

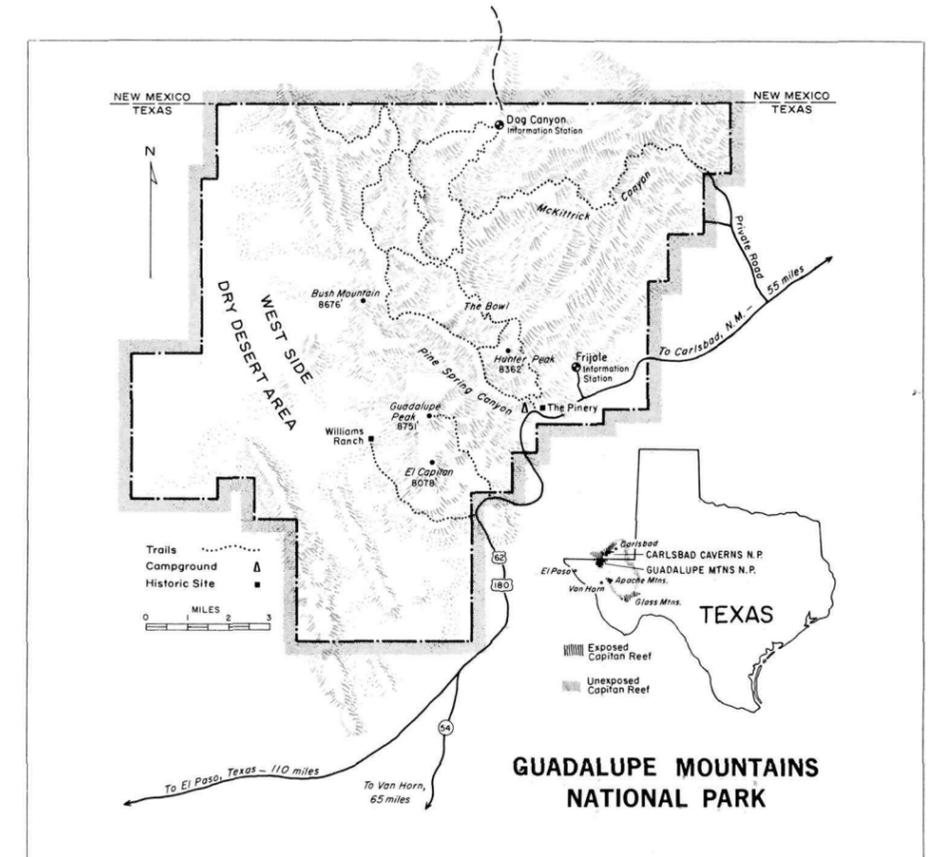
associations. Plants from several life zones intermingle in this scenic canyon with its sparkling year-round stream. Characteristic high-altitude trees grow alongside desert vegetation in a remarkable example of disruption of classical life zones.

More than a hundred plants that occur here cannot be found elsewhere for several hundred miles. One species of moss here is found in only one other part of the world, a small region of eastern Asia. An unusual species of tree is the Texas madrone with its satin-smooth trunk in varying hues of gray, purple, saffron, orange, and vermillion, depending on the season of the year. It sheds its bark but not its leaves. Also rare is the treelike Faxon yucca, which sometimes grows twenty-two feet high, and produces a large cluster of white blooms in April. Following the abandoned road up the bottom of

this amazing canyon for several miles was fascinating, we found, whether in a winter sleetstorm, on a still hot summer day, or on a brisk but sunny autumn afternoon of gold and scarlet.

Despite its usage by private enterprise until attaining its recent park status, the area is surprisingly unspoiled. Its relatively small size and delicate nature dictate that its development be very limited so as not to destroy it. Only on its southern edge is there a first-class paved highway. At present, the park has only one primitive campground—in Pine Springs Canyon with neither water nor electricity; a frame visitor information station on the highway at Frijole one mile from Guadalupe Pass; about fifty-five miles of rough, old ranch trails; and an unimproved road below the west face of the mountains. Horses are permitted in

The wedge-shaped mass of the Capitan Barrier Reef is an extraordinary and famous geological phenomenon.



restricted numbers on designated trails for day use only. A rider can cross the park in five to eight hours. Trails have received limited maintenance but are cairned. They are rocky, narrow, and often steep—not for the tenderfoot. No other visitor facilities are available.

In preparing to explore Guadalupe, we found that water and extra clothing must be carried in order to be prepared for sudden weather changes. With no warning, several feet of snow can fall with unbelievable rapidity; a driving rain or hail-storm can assail; gale winds of incredible force can knock one down; a fierce dust storm or roaring flash flood can overtake the unwary; or a raw, dense fog can muffle sound, reduce visibility, and confuse even those who are accustomed to it. Or a magnificent, clear-blue sky can permit a hot sun to beat down. Sunsets defy description, although many artists have attempted to paint them. The mountain mood can be gay and cheerful, melancholy and brooding, temperamental or serene. In a word, they are mountains.

AN EQUALLY FRAGILE but entirely different ecosystem from that of McKittrick Canyon is found in the Bowl, a northwestern sloping highland on top, the most nearly level and most densely forested portion of the park. It contains a relict forest of limber pine, ponderosa pine, Douglas fir, and a few aspens from a cooler, moister period dating back to Pleistocene times, the last Ice Age. For many miles no counterpart exists.

Can you imagine climbing up a 2,000-foot escarpment to reach a forest that logically should not be there; taking a trail from an area with a climate of the Upper Sonoran life zone to a land of pines and firs in that short vertical distance; or abruptly switching from a desert that has a few life-giving springs to an evergreen forest that has none?

Armed with ample rations and a generous supply of water, map, hats, sweaters, first-aid kit, sturdy hiking boots, and cameras—and with much enthusiasm, determination, and physical stamina—we set out to see the Bowl for ourselves. Our point of departure was the “dry-hole” well that is now the campground in the

mouth of Pine Springs Canyon at about 5,750 feet. It resembled a modern-day covered wagon encampment with its travel vehicles parked along its circular perimeter. The tops of the mountains were bathed in early morning pink.

Our eight-mile loop trail started west up the canyon floor through madrone, alligator juniper, big-tooth maple, walnut, oak, cholla, prickly pear, and an occasional ponderosa pine. It then climbed steep switchbacks up the north wall to the edge of the Bowl, a rise of some 2,000 feet. When we reached the top we could see El Capitan and 8,751-foot Guadalupe Peak, Texas' highest mountain, across the canyon. Shumard Peak, Bartlett Peak, and Bush Mountain loomed on the western horizon. Lush grass, tall pines, Douglas fir, oak, and alligator juniper stretched gently away toward McKittrick Canyon and Big Canyon.

As we walked southeastward on the rim between Pine Springs Canyon and the 670-acre Bowl, we could see the Diablo and Delaware mountains and the road through the 5,695-foot Guadalupe Pass winding down toward the white Salt Flats to the west. Farther west were the Cornudas and the Hueco mountains in the haze. Far to the north lay the Sacramentos. And to the northeast for forty miles curved the reef with Carlsbad Caverns visitor center perched atop the sloping Guadalupe Escarpment before it angles underground near Carlsbad. Huge trailer trucks on the highway below looked like tiny ants.

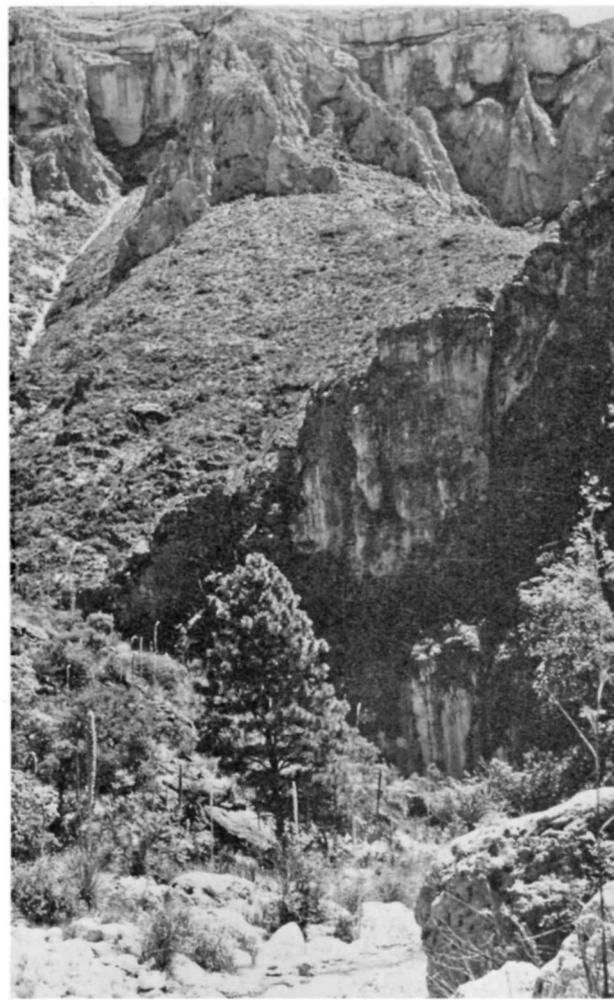
We struggled up the final 600 feet to the rocky summit of 8,362-foot Hunter Peak. There were 360 degrees of breathtaking views—mostly down—with Texas' Davis Mountains one hundred miles away to the south. We were intrigued by the relatively small area of this highland and at the same time by its uncompromising, man-defying topography. It is so little and yet so vast, affording such a superb panorama of the surrounding rolling desert plains.

From Hunter Peak, we descended to the northeast along the edge of the Bowl and then plunged down Bear Canyon. We covered more than a hundred switchbacks, and the grade must have been at a forty-degree angle in spots. We went through

grassland, the snags of dead gray forests, and brush; under huge boulders; past dramatic rock formations; beneath sizable trees gathering the moisture necessary for survival in the bottom of this steep defile; out onto the more gently sloping desert with cactus, catclaw, and grass; and finally to Upper Pine Springs with its cool shade trees, trickling water, and weathered sheep-shearing shed. We followed an old road across the furrows of one mountain under Hunter Peak, down past an old ranch with its sheep pens, and across the broad-bouldered dry wash of Pine Springs Canyon. At last we reached the campground.

This trip took nine hours. We returned footsore and weary but exhilarated not only by our physical accomplishment but also by sightings of deer, chipmunks, mountain chickadees, nuthatches, and flickers and by distant horizons, azure skies, and tremendous vistas of fall colors in canyon bottoms.

HAVING ENJOYED the east side of the park, we decided to explore its lowest section on the west in the dry Lower Sonoran life zone. This meant following approximately eight miles of meandering rough dirt road below the pass to Williams Ranch. Dating back to about 1920, the ranch house stands at an elevation of about five thousand feet. The ranch sprawls beneath towering perpendicular western cliffs of the geologic fault-scarp of the Guadalupes. We secured directions and a map and borrowed a key to the gate opposite the turnoff of U.S. 54 to Van Horn ten miles west of the Frijole information station. Although a four-wheel-drive vehicle is recommended, our carry-all managed with careful maneuvering to transport us over the rock, sand, and gravel track. We drove alongside stunted desert vegetation of creosote bush, mesquite, sotol, lechuguilla, acacia, Parry agave, and cactus in the foothills below the peaks. The bumpy trip gave us an appreciation of the fortitude of the early pioneers and the hardships they endured in eking out a living in this inhospitable terrain. The house and corrals of Williams Ranch are tucked in splendid isolation under the forbidding limestone



A WEALTH OF NATURAL HISTORY . . .

Guadalupe Park offers the camper and hiker a rewarding experience in rugged and unspoiled country. A backpacker (top) slowly makes his way down the steep trail from the Bowl into Pine Springs Canyon. McKittrick Canyon (right) is world-famous for its cross section of the Capitan Barrier Reef containing more than five hundred fossil species and for its unusual overlap of plant associations. The 670-acre Bowl on top of the reef (below) contains a relict forest of limber pine, ponderosa pine, Douglas fir, and a few aspens—a forest dating back to the last Ice Age.



backdrop reaching some four thousand feet above to the summits.

Although the park may be comparatively small (only about a tenth that of Texas' only other national park, Big Bend), it is still a day's expedition of some 250 miles round-trip via Carlsbad to gain access from the north through New Mexico. Twelve miles northwest of Carlsbad on U.S. 285 along the Pecos River, we turned southwest on paved State Route 137 toward Lincoln National Forest and El Paso Gap. We climbed gradually and steadily up the northeast slope of the Guadalupe Mountains through pinyon, juniper, and an occasional madrone. The pavement ended at a cluster of mailboxes fifty-four miles from Carlsbad.

Here we turned left on Forest Road 8540, known as Rim Road—aptly named, for a thousand feet below on our right lay grassy Shattuck Valley, hemmed in by mountains on all sides with the cut of El Paso Gap on its far side. We passed several awe-inspiring overlooks. After twelve miles, the improved gravel road ended. We parked and on foot followed a primitive road along easy grades through the forest to Wilderness Ridge. We

skirted an old cooking pit where the Mescalero Apaches roasted the mescal from which they derived their name. After one and a half miles, we peered down into North McKittrick Canyon's winding wild depths, its stream, its forested north-facing slopes, its impressive fossilized walls. Here, bared at our feet, was the exposed Permian reef core with the park stretching beyond it to the southwest—a sight well worth the drive and walk!

At various times we explored afoot the springs that sustain wildlife and offer the benefits of solitude along the base of the southeast escarpment—Guadalupe, Frijole, Manzanita, Chozo Springs to name a few. These areas are off-limits to cars, campers, and picnickers to protect the delicate environment from abuse and overuse. Many kinds of aquatic life thrive in these desert pools. Birds and animals find welcome shelter in the surrounding vegetation. Wildflowers abound.

THE GUADALUPES were occupied by man at least ten thousand years ago. Human remains have been found in shelters with extinct animals such as Taylor

bison, four-horned antelope, musk ox, and primitive horse. These mountains, which were probably named for the Virgin of Guadalupe by early Spaniards, were the scene of a surprising variety of history that was made in their foothills, slopes, and craggy strongholds. They figured in the Salt War, the Lincoln County War, and the Civil War. They hosted survey parties for a wagon trail and a railroad to the West Coast. They gave shelter to men crazed by California's gold fever. Settlers seeking their fortunes in the West came by. Apache chiefs Victorio and possibly Mangus Colorado and Geronimo wandered through. This rocky fortress was one of the last refuges of the Mescalero Apache. The 115-year-old stone ruins of the old Butterfield Stage's highest station at the Pinery lie here within two hundred yards of a modern transcontinental highway—the only such ruin so close to this present-day, 2,795-mile thoroughfare. Emigrants, freighters, renegades, squatters, soldiers, and drovers paused here. Cowmen, sheepmen, and goatherds explored the mountains' secrets and took refuge in their caves. Intriguing tales of gold mines and hidden gold

SCENES OF MAN'S PAST . . .

The Butterfield Overland Mail Line, which operated between St. Louis and San Francisco, once crossed the Guadalupe. The stone remains of the 115-year-old Butterfield Stage Station at the Pinery are still visible (right). Many mescal pits (below, right) still remain, reminders that Indians once roamed and lived in this rugged country. In these pits the Mescalero Apaches roasted the stalk of the mescal, a large agave, for a delicious and nutritious meal. The Williams Ranch (far right) dates back to about 1920 and stands at an elevation of about 5,000 feet beneath the western cliffs of the Guadalupe. A trip through Guadalupe National Park gives the visitor an appreciation of the hardships endured by the early inhabitants who attempted to eke out a living in this inhospitable terrain.



caches still survive. Many an airplane has ended its days in the treacherous wind currents of these mountains. And many an illegal immigrant from Mexico still arduously works his way through these formidable mountains en route north.

In the 1920s two oilmen appeared who were to become the fathers of this new park. Geologist Wallace E. Pratt, later to become vice president of Humble Oil Company, fell in love with McKittrick Canyon and subsequently bought some 16,000 acres there. Judge J. C. Hunter of Van Horn, Texas, acquired about 43,000 acres and grazed some 4,000 angora goats in the area. After his death in 1945, his son, J. C. Hunter, Jr., of Abilene, Texas, increased the ranch to around 72,000 acres. Mr. Pratt and Mr. Hunter both were remarkably conservation-minded. Both built cabins in McKittrick, and both preserved the beauty of canyon and high country. Judge Hunter imported wapiti or American elk, planted bluegill and trout, reintroduced Merriam turkey, and limited hunting. By 1961, Mr. Pratt had completed a donation of 5,632 acres of McKittrick to the National Park Service with the hope that the federal govern-

ment would purchase more in order to create a national park to preserve forever this living outdoor museum for the enjoyment of all.

In 1966, forty-one years after the first recorded recommendation that Guadalupe be made a national park, President Lyndon B. Johnson signed a bill authorizing the establishment of Guadalupe Mountains National Park. By 1970, most of the remaining acreage and mineral rights had been obtained. It was opened to the public in 1971. Today 46,850 acres in the heart of the park are proposed for wilderness designation, which would further safeguard the fragile ecosystems of the area from development and overuse.

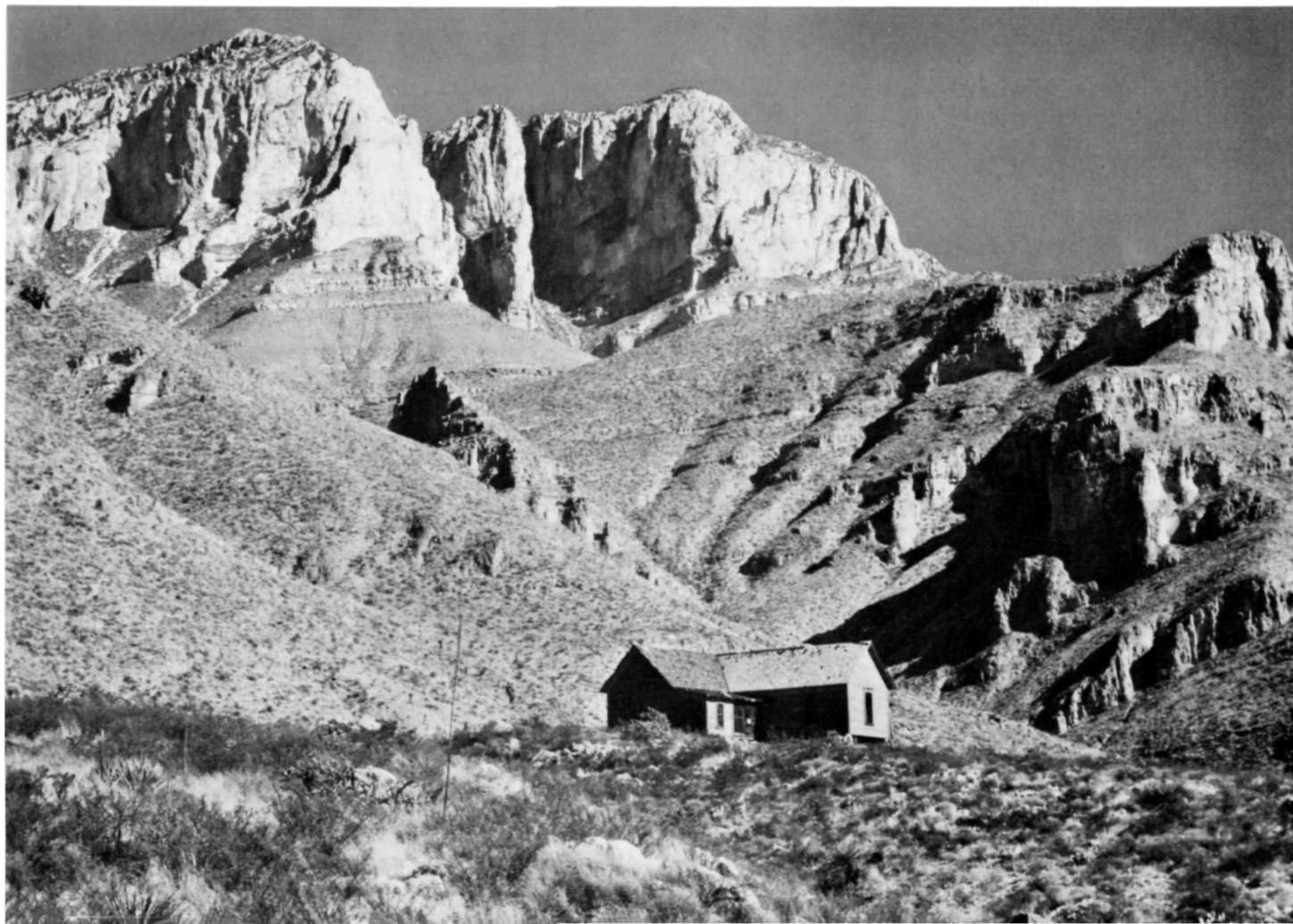
WORD of this new sparkler in the crown jewels of America has spread rapidly. And despite its primitive state—or perhaps because of it—visitation, hiking, backpacking, and camping have accelerated phenomenally.

The firewood, cave shelters, and springs of the Guadalupe lured Indians, Spaniards, Mexicans, and finally white settlers as they traversed the enormous, barren, and relatively waterless Staked Plains of Texas.

Guadalupe Peak was known as Signal Peak for obvious reasons. Raccoon; mountain lion; antelope; porcupine; striped, hog-nosed, and spotted skunk; rock squirrel; ring-tail cat; black bear; kit and gray fox; and more than two hundred species of birds ranging from golden eagles to hummingbirds have been identified here. The Guadalupe are and always have been a wildlife sanctuary. And now they are a sanctuary for all who seek respite from the hectic pace of civilization and feel the need to return to something more fundamental and wild and glorious.

If you are a windshield tourist, do not expect much, although even a glimpse at high speed will register indelibly on your consciousness and trigger your imagination. But if you are able and willing to hike, to look, and to listen, then wild, rugged, and unspoiled Guadalupe Mountains National Park can be soul-restoring and inspiring. ■

A Park Service wife presently at Carlsbad Caverns, Annette Parent is a painter and freelance writer. At times she and her husband Hiram collaborate on articles. His photos grace this article.



a bright future for SOLAR ENERGY

All life depends for its existence
on the light of the sun.

Now we must look to this great benefactor
as a source of plentiful, clean energy.

by ALAN CRANSTON

IT HAS become fashionable to herald solar energy as an idea whose time has come. Actually it is an old idea, dating back hundreds of years. But the thought that we can and should be more fully benefiting from the energy of the sun really dawned on the nation last winter as we collectively shivered through our first peacetime fuel shortage.

Solar radiation is man's most abundant energy source. Enough solar energy strikes 0.5 percent of the land area of the United States to meet the total energy needs of the country projected through the year 2000. The average yearly incidence of solar power amounts to 17 thermal watts per square foot, which results in a daily average of 410 thermal watt-hours of energy per square foot, approximately twice the amount needed to heat and cool the average home.

Despite its abundance, the widespread use of solar energy has been impeded by two unavoidable problems: solar energy is intermittent, and it is diffuse. Because the sun doesn't shine at night or on cloudy days, the ability to store solar energy for use during these sunless periods becomes essential. Moreover, because solar energy is not concentrated but diffuse, it takes a sub-

stantial amount of land to collect enough solar energy to operate a central power station. For example, to collect enough solar energy to operate a conventionally sized power station (1,000 megawatts) would require the use of nearly nineteen square miles of land.

However, such central power stations may not be the best way to collect solar energy—at least not in the near future. A built-in advantage of collecting solar energy where it's used is that transmission is unnecessary. Thus the problems of diffusion and intermittency can be overcome, in part, by small-scale applications. Many household, commercial, and even industrial consumers could be served by individual rooftop solar collectors, rather than by a single large-scale central power station. The initial capital costs associated with such installations and the higher costs of constructing many small units, as opposed to one large one, would be offset by savings in the cost of transmission and distribution of solar energy.

THAT WELL-KNOWN and practical definition of "energy" as the "capacity to do work" is particularly applicable to the work of the sun, which is, of course, essen-

tial to all life on earth. Solar radiation not only warms the earth to life-sustaining temperatures, but also drives the hydrological cycle of evaporation and precipitation, powers the winds and the ocean currents, and is captured by photosynthesis to fuel the earth's biota. Wood, wind, falling water, and fossil fuels—man's historical energy sources—are all *stored solar energy*.

To date we have been using solar energy only in these stored forms. We are faced with an "energy crisis" in part because we are consuming them at a rate that far exceeds their rate of replenishment. Today's challenge, therefore, is to harness the direct energy of the sun.

In December 1972 a panel of experts organized jointly by the National Science Foundation (NSF) and the National Aeronautical and Space Administration (NASA) issued a report assessing the potential of solar energy as a national energy resource. The scope of the panel's review included the full range of possible applications of direct solar energy, as well as power from the wind, ocean thermal differences, and useful energy from replenishable organic materials (bioconversion).

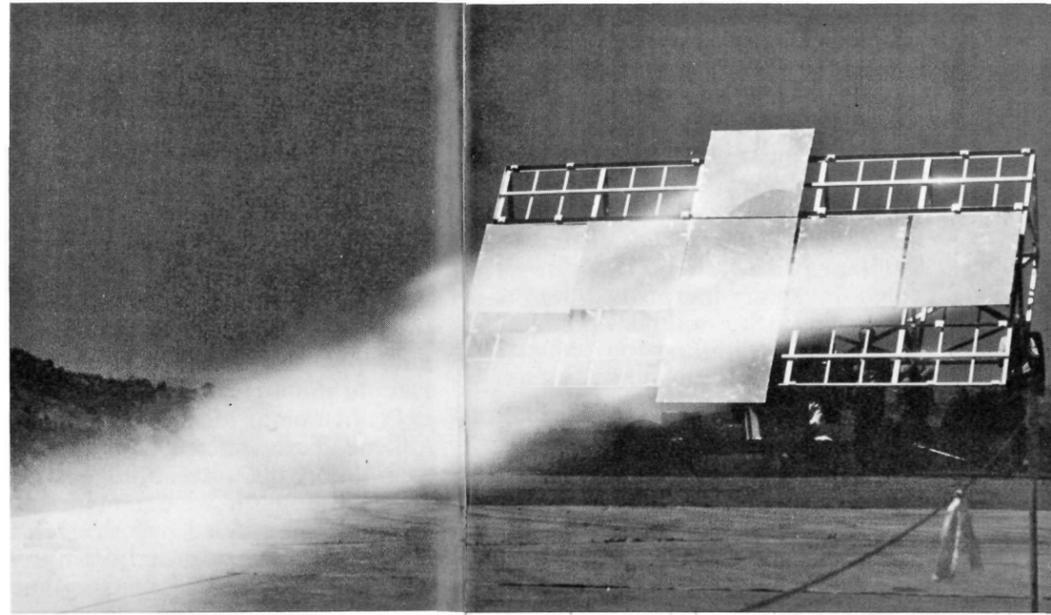
Three broad applications were identified by the panel as most

promising from technical and economic standpoints: (1) the heating and cooling of buildings; (2) the chemical and biological conversion of organic materials to liquid, solid, and gaseous fuels; and (3) the generation of electricity.

In general the panel concluded that there were no technical barriers to wide application of solar energy to meet the energy needs of the United States and that although the cost of converting to solar energy is presently higher than the cost of conventional sources, the rapid escalation of prices for conventional fuels will soon make solar energy applications economically competitive. Based on these findings, the panel recommended that the federal government take a lead role in developing a research and development program for the practical and widespread use of solar energy.

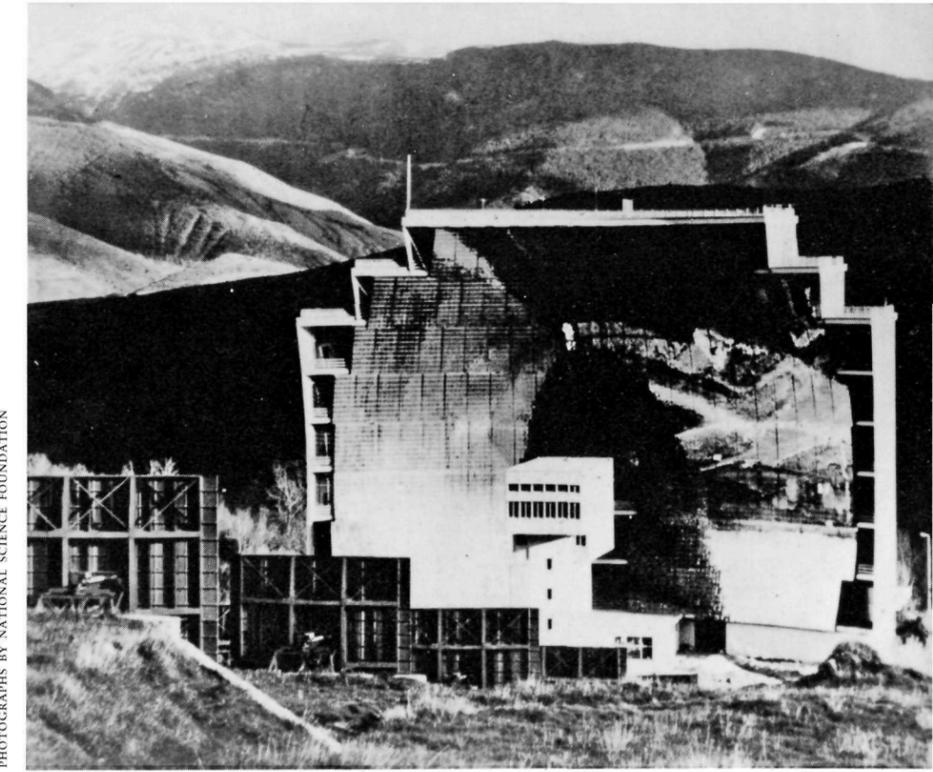
The National Science Foundation (NSF), currently the federal agency in charge of solar energy research and development, will spend nearly \$50 million for this purpose in fiscal year 1975. Many fascinating concepts for solar electrical generation, photovoltaics, bioconversion, and ocean thermal gradients are now being investigated.

NSF is now selecting the best



A solar mirror experiment (above) is being conducted in Denver, Colorado, by Martin Marietta.

PHOTOGRAPHS BY NATIONAL SCIENCE FOUNDATION



A large solar furnace at Odeillo, France, utilizes solar mirrors and shows great promise for industrial application of solar energy.

solar power plant concepts for further development and testing. One example is a solar mirror experiment being conducted by Martin Marietta Corporation in Denver, Colorado, under contract with NSF. Future solar power plants may consist of hundreds of similar solar reflectors pointed at a central receiving tower capable of converting the heat to electricity. A 500-megawatt design of this type, drawn up by the University of Houston and McDonnell-Douglas, would require a square mile of reflectors and a tower 1,500 feet high.

The biggest solar mirrors built to date are high in the Pyrenees, where the French have constructed two of them for metallurgical research furnaces. A large solar furnace at Odeillo, France, concentrates solar energy to very high temperatures and shows great promise as a future industrial application of solar power.

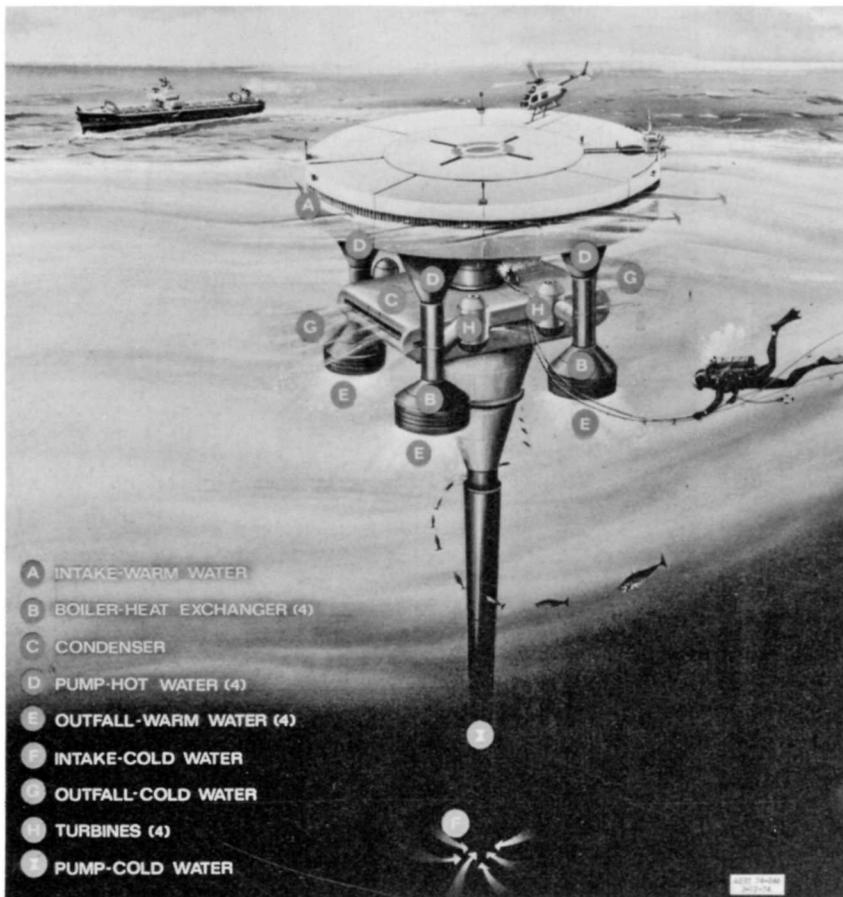
Another new—albeit more exotic—energy concept capitalizes on the fact that the largest solar collector on earth is the surface of the ocean. Tropical surface waters are a tepid 82° to 85° F, and they are separated by as little as 2,000 feet from a practically inexhaustible cold water reservoir of 35° to 38° F. The French physicist Jacques D'Arsonval

predicted in 1881 that we would one day extract our power from ocean thermal differences rather than from fossil fuels. Although the concept of solar seapower is still in the visionary stage, its great potential justifies continued work toward its development.

Wind power, used by the pioneers of the windswept Great Plains between 1880 and 1930, may return from obscurity to play a major new role in the United States energy picture of the future. Assisted by NASA's Lewis Research Center, NSF is building an experimental 100-kilowatt wind turbine generator on the windy shores of Lake Erie to demonstrate the viability of wind power in the 1970s and beyond.

Of the many proposed schemes for harnessing solar energy, however, the most promising for the immediate future is the solar heating and cooling of buildings.

RESIDENTIAL energy use accounts for approximately one-fifth of the total energy consumed in the United States each year. Of this amount three residential energy needs—space heating, cooling, and hot water heating—account for 70 percent. Furthermore, residential energy needs are growing.



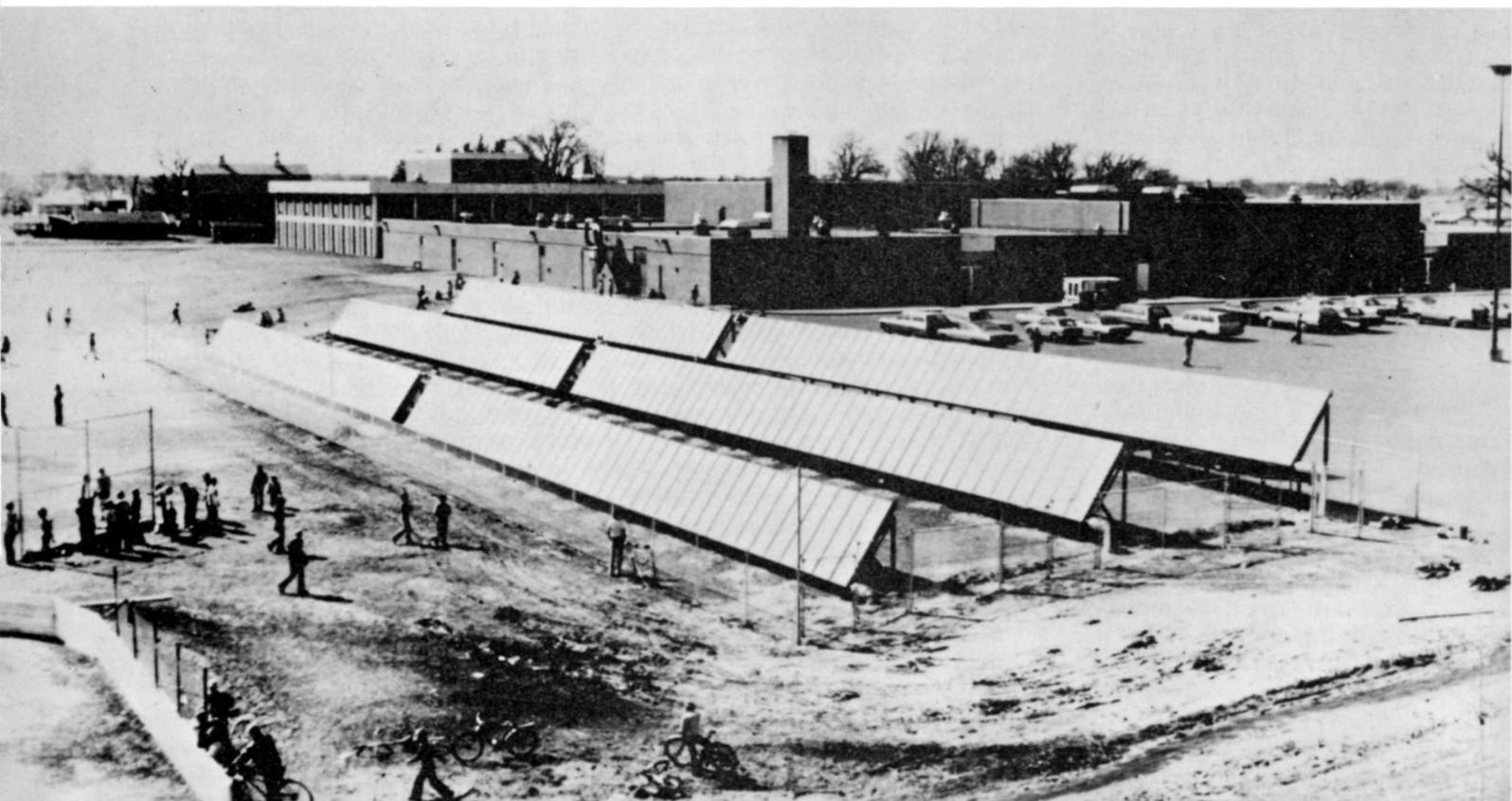
Ocean thermal energy conversion utilizes differences in temperature between the warm surface of the ocean and the cold depths.

Preliminary data from a study commissioned by the Ford Foundation's Energy Policy Project indicate that almost all American homes now contain five basic energy-consuming items: central heat, hot-water heater, stove, refrigerator, and electric lights. Almost all homes now have one radio and one television as well. Seven out of ten have washing machines. The use of other luxury items such as central air conditioning, dishwashers, and clothes dryers is rapidly increasing.

Moreover, the number of households increased during the 1960s at a greater rate (17 percent) than the population (11 percent), reflecting a greater affluence and a tendency toward smaller households. Residential energy use during this period increased by a whopping 50 percent!

Commercial buildings such as stores, schools, hospitals, theaters, restaurants, office buildings, and hotels consume slightly less than 15 percent of our total energy each year. However, commercial energy use is growing faster than any other energy sector. Since 1960 it has increased at an annual rate of 5.4 percent, re-

PHOTOGRAPHS BY NATIONAL SCIENCE FOUNDATION



flecting greater use of computers, elevators, escalators, electric typewriters, and duplicating machines, but also reflecting certain design changes in newer commercial buildings that contribute to energy waste, such as permanently closed windows, which make it necessary to operate mechanical ventilation around the clock.

The residential and commercial sectors—which together consume one-third of our annual energy budget—are prime candidates for the successful application of solar heating and cooling systems. Demonstrating the feasibility of this use of solar energy is the goal of a new law that I authored in the Senate. This law, the Solar Heating and Cooling Demonstration Act of 1974, involves the Department of Housing and Urban Development and NASA in a \$60 million government-sponsored demonstration of solar heating and cooling for residential and commercial buildings. With this boost, it is hoped that solar heating and cooling systems can become commercially available and widely accepted within five years.

At North View Junior High School in Osseo, Minnesota (below and left), a new solar heating system provides hot air and hot water under a NSF program.

In sunny climates, the sun can provide an average of three-quarters of the heating and cooling needs of a 1,500-square foot home utilizing 600 to 800 feet of the roof for the collector surface. If solar heating and cooling systems were built into all new homes and low-rise commercial buildings between now and the year 2000, solar energy could meet 4.5 percent of our total energy needs. By the year 2020, it is estimated that it could provide 8 percent.

These are significant savings. Most importantly, we know enough about how to capture the sun's energy for homes and offices to begin this task *right away*.

FOR SPACE HEATING, the solar collector is usually a black metal surface that absorbs sunlight and is covered by some insulating material, such as glass panes, to reduce the heat loss. The sun's energy is collected by heating air or water that is circulated through the collector unit during the day. Part of this heated air or liquid is stored for use at night or in inclement weather and part is used immediately for

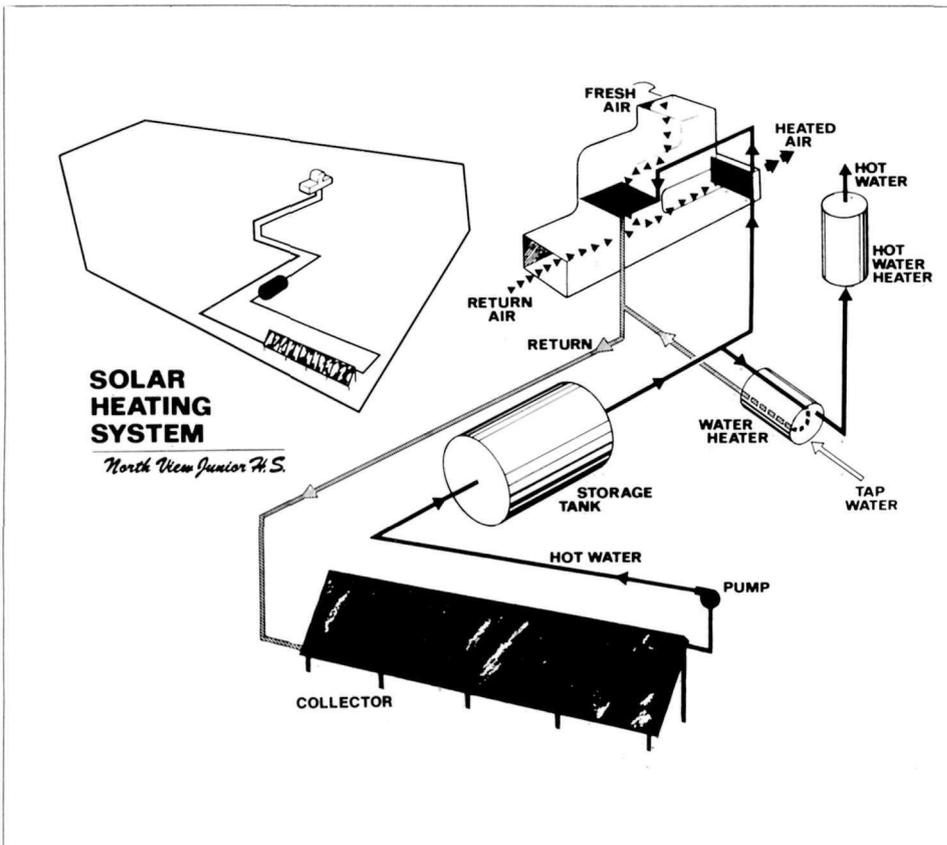
heating. Currently most solar heating systems require a backup conventional heating system to meet the heating requirements of an extended period without adequate sun. However, with the development of more efficient storage capacity, this backup requirement may be eliminated. Hot water, hot rock, and chemical storage systems are being experimentally tested.

For air conditioning, refrigeration systems that depend on absorption of the coolant fluid seem to be promising. For absorption refrigeration systems to work smoothly, however, temperatures of around 120° C or higher are necessary. Solar collectors that are more efficient than those now developed for solar heating must be developed before solar cooling becomes a reality. One possibility for improving existing solar collectors may be surface coatings of the type developed in recent years for space applications, which emit very little of the solar radiation that they absorb and which consequently attain higher temperatures than uncoated metal collectors.

Ideally solar buildings should be especially designed and built from the ground up to maximize solar energy's potential. However, for solar heating and cooling to have any substantial impact on our total energy requirements, we will have to learn how to retrofit existing buildings with solar heating and cooling systems. Under a program established last year by NSF, four schools in various climatic regions have been outfitted with solar energy heating systems to test feasibility.

THE UNITED STATES energy picture, long dependent on the combustion of fossil fuels, may soon be transformed by the development of solar energy applications such as those described here. Solar energy will not immediately provide the ultimate solution to our complex energy problems, but its bright future can no longer be ignored. Solar energy is, indeed, an idea whose time has come. ■

Alan Cranston, U.S. Senator from California, is author of new legislation authorizing research on the feasibility of solar heating and cooling systems.



REDWOOD NATIONAL PARK

CONTROVERSY



COMPROMISE

When will the federal government act to protect Redwood National Park from adjacent destructive logging?

by JOHN GRAVES

FOR MANY YEARS I've had a recurring dream in which I'm walking deep in a peaceful redwood forest. It is early in the morning. Coastal fog still fingers the treetops, and a gentle sun is starting to play checkers on a lush carpet of green ferns and moss. It is a rich dream for me, one that has returned even when I've lived in the midst of great cities.

One year ago, with a good deal of excitement, I moved to Humboldt County, California, the heart of coast redwood country. On the drive north from San Francisco, I passed through the incredible Rockefeller Forest in Humboldt Redwoods State Park and almost fell over trying to see a treetop while standing beside its trunk. "Wait'll you see the R-E-A-L-L-Y tall trees along Redwood Creek!" my friend and guide said.

A week after my arrival I rode with a friend and his two daughters to Lady Bird Johnson Grove in Redwood National Park near Orick. I was looking forward to finding lush forests like that of my dream.

How often it is that dreams and

reality stumble over each other. The grove itself was lovely, but chainsaws shredded the silence from just outside the park, and logging trucks barreled over dirt roads leading right through the park to nearby lumber mills.

"This is redwood conservation?" I asked myself.

GREAT FORESTS of redwood have existed on our planet for more than 160 million years. Once a bountiful tree, redwoods have been slowly retreating and disappearing following changes in the earth's climate and geology. The natural range of coast redwoods is now limited to the fog-shrouded valleys of California's North Coast. Here, the last pockets of coast redwoods, *Sequoia sempervirens*, stand against encroaching "civilization."

Many people who settled among the redwoods recognized the uniqueness of these ancient trees, and attempts to preserve redwoods date back to the 1850s. Yet despite early efforts, extensive transfer of redwood forests occurred from 100 per-

cent government ownership to complete private control.

Large timber syndicates bought vast sections of redwood timber lands and resold them for profit. The Humboldt Redwood Company of Edinburgh, Scotland, bought 55,000 acres of redwood land from individuals and sold it in 1890 to the American Lumber Company of Illinois. The price of raw timber land jumped from \$2.50 an acre in 1876 to \$150.00 an acre by 1888. By 1895, more than 80 percent of the 124,000 acres of private timber land in Humboldt County was owned by four large corporations. At the turn of the century, the bulk of redwood timber in Northern California was controlled by lumber interests, and the old groves of virgin forests began to fall more and more rapidly. Lumber companies saw the economic potential of this natural resource, and millions of dollars were reaped from the harvest of this untouched wilderness. Soon barren hills were all that remained where redwoods had stood proudly for millions of years.



U.S. FOREST SERVICE

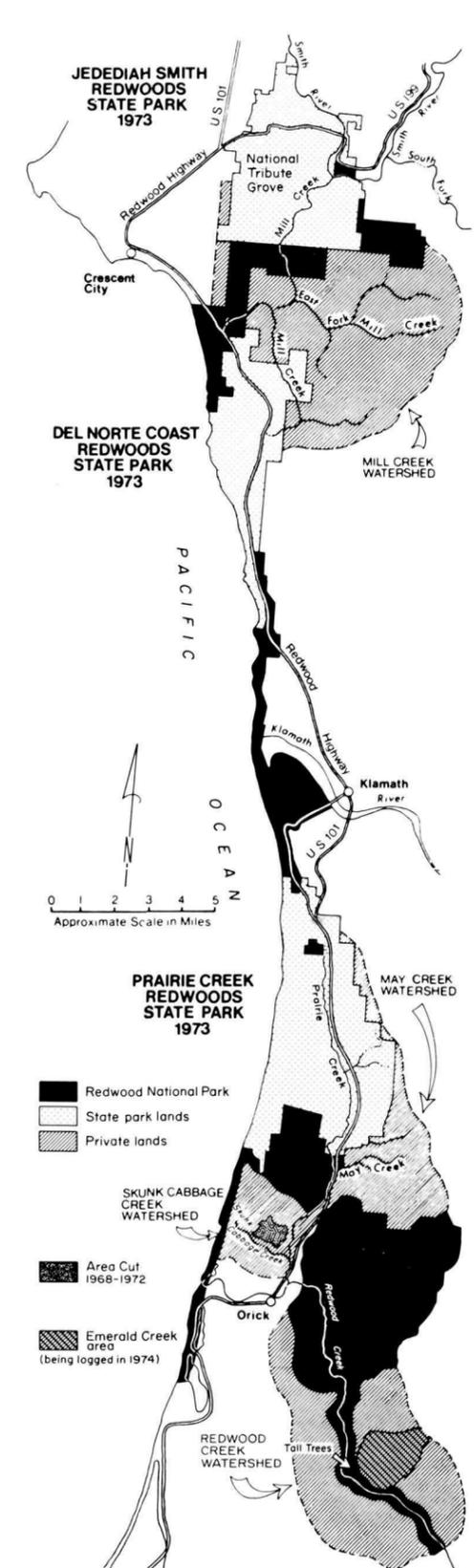
cent government ownership to complete private control. Studies by Richard Janda of the U.S. Geological Survey, later released in the findings of the so-called "Curry Report" by the U.S. Department of the Interior, and research by Dr. R. W. Becking of Humboldt State University under a Redwood Ecology Grant from the National Science Foundation, show that when surrounding forests are removed, as by clearcutting, the protective fog vanishes. Old trees start to lose foliage, tops die, and slowly entire trees weaken and fall in heavy winds.

Unlike other trees, redwood does not readily regenerate after clearcutting once the burls have been destroyed. Redwood plantings by lumber interests have resulted in failures in the 1920s and 1930s, and redwood artificial reseedling operations by helicopter have yet to yield conclusive results.

Within Humboldt Redwoods State Park, where many virgin redwoods once stood, clearcutting of watersheds outside park boundaries left the park no protection from heavy rains common to the area. Record rains and accompanying floods in 1955 and 1964 washed thousands of tons of gravel and logging debris from denuded slopes around the park into Bull Creek and sent them crashing into the magnificent Rockefeller Forest. Nearly four hundred trees that had been considered "safe" were undermined and finally lost as Bull Creek left its well-established channel and became a 300-foot-wide, gravel-filled torrent.

A national effort to protect the last redwoods seemed impossible until finally in 1963 a team from the National Geographic Society discovered the world's tallest tree, a giant over 367 feet tall, in a grove along Redwood Creek. The resulting publicity focused public attention on the plight of the threatened redwoods and provided impetus toward creation of a national park for redwoods.

Though strongly opposed by redwood lumber companies and local Chambers of Commerce, Redwood National Park was finally created in 1968 by Congress to be comprised of 58,000 acres of redwood forest. Although the timber companies



REDWOOD NATIONAL PARK

One of the greatest defeats in conservation history was the failure to include any complete watersheds with virgin redwoods within the park. (Adapted from a map by E. H. Rhodes, courtesy of Save-the-Redwoods League.)

failed to stop creation of the park, they refused to concede defeat.

Figures on redwood acreage are misleading. Approximately 150,000 acres are saved in redwood parks, so lumber companies claim there is no need for further concern. But only half the total acreage preserved is virgin redwood. Furthermore, in establishing Redwood National Park, little consideration was given to the natural division of watersheds; that is, a stream and the area it drains. Watershed protection is vital for the survival and welfare of redwoods.

BORN OF CONTROVERSY and compromise, Redwood National Park is the cruelest hoax to occur in over one hundred years of conservation efforts. Although corporate lumber interests could not prevent its creation, they almost caused it to be stillborn. The park's boundaries were gerrymandered by Congress and the National Park Service under pressure from the timber lobby, and they do not encompass ecologically manageable watershed units. Despite the lessons of Bull Creek, no complete watersheds with virgin redwood forests were included within the park.

Major highways and secondary roads (not to mention logging roads) crisscross the park. Four timber companies—Arcata Redwood, Simpson Timber, Rellim Timber, and Louisiana Pacific—own land adjoining 80 percent of the park's boundaries. Driven by the world-wide demand for lumber, these companies have stepped up their cutting right to the narrow 800-foot buffer strip around the Redwood National Park. Louisiana Pacific has even entered the buffer where it is cable-logging settings of eight- to twenty-five-acre clearcuts.

The Redwood Creek area—particularly the narrow corridor containing the Tall Trees Grove and the Emerald Mile—is the most vulnerable and worst ecologically manageable area of the park. This wormlike appendage cannot be protected without control of timber harvesting operations on adjacent slopes.

Although Congress created a park of 58,000 acres, that does not mean 58,000 acres of previously unprotected redwood forest would now be



safe. A little more than 27,000 of the 58,000 acres were already preserved in three California state parks and have never been turned over to the National Park Service by the State of California. Of the 28,280 privately owned acres acquired, over 40 percent had already been clearcut. After further subtracting second-growth timber and prairie land, the 58,000-acre Redwood National Park preserves only 10,640 acres of previously unprotected virgin forest—mostly around Redwood Creek—and at a cost of \$92 million!

IN 1972 A REPORT was completed on damage to the park by logging on adjacent corporate holdings. The Curry Report, completed by the office of the Assistant Secretary for Fish, Wildlife, and Parks, Dr. Richard Curry, documented damage in the Redwood Creek area in particular caused by the interaction of clear-cutting mostly upstream from the park and the area's unstable soil types.

"The basic fact is," the report states, "that present harvesting

techniques—clearcutting with tractor grading—produce a greater amount of ground surface disturbance and destruction than any other combination of practices heretofore employed or envisioned. Protection of the park is impossible without some controls which extend beyond present boundaries." Documentary proof was finally in, but the report was withheld by the Interior Department until suit by conservationists forced its public release in March 1973.

Although the park was created to protect redwoods, poor planning has left these last virgin groves in the Redwood Creek drainage unprotected and vulnerable. Damage to park lands has already been enormous; but the lumber industry, the National Park Service, and the Secretary of the Interior have all refused to heed warnings of environmentalists. The clearcutting of these privately owned forests adjoining Redwood National Park threatens our last virgin redwoods within park boundaries.

During congressional debate on



PHOTOGRAPHS BY DAVID VAN DE MARK

Logging on private lands adjoining Redwood National Park threatens the park itself. At far left, Louisiana Pacific's clearcutting on Bridge Creek contrasts drastically to park lands in background. At near left clearcutting on the east slope of Redwood Creek above the vulnerable "worm" of the national park threatens the last virgin redwoods in the park. The "fringe-on-top" effect is a screen of trees left next to the public Bald Hills road. Buffer strip forest is in the foreground, with park lands out of sight below it. All trees in this view are to be cut—except the fringe.

park proposals during 1966 to 1968, it was generally recognized that control of additional lands might be necessary to protect the park. Congress authorized the Secretary of the Interior to enter into cooperative agreements with logging companies to ensure park integrity and, if necessary, to purchase outright additional lands for protection of the park.

At this time no cooperative agreements to ensure park integrity have been made, and no plans for further acquisitions have been made. Six years after its establishment, Redwood National Park still has no approved master plan. The Department of the Interior has even failed to fill out the 58,000-acre area called for by the enabling legislation. During the six years since its creation, Redwood National Park has been left to the mercy of the lumber industry.

SOON AFTER my arrival in Humboldt County I decided to hike into the Emerald Mile and the Tall Trees Grove. Two weeks

later I was standing far above Redwood Creek on the grasslands below Bald Hills Road. It was dawn, and the hills were blue-black, silhouetted against the faint glow of first light. The sky was cold, steel blue, and I stamped my feet for warmth.

I reached the Emerald Mile in about an hour, stopping outside the park to eat breakfast. I rolled some large stones together, and soon strips of bacon were crackling in my pan. Clouds of steam rose from the iron pot where strong black coffee, scalding hot on the frosty morning, rapidly simmered. From my vantage point above Redwood Creek I could see the towering spires of the Tall Trees, still partly veiled by threads of morning fog. For a moment it seemed as though the trees were gigantic tent poles supporting a sky-blue canvas. "It's too bad you couldn't have made the trip five years ago," a friend had said. "Tall Trees is nothing like it once was."

Situated along the banks of Redwood Creek, Tall Trees Grove once contained the world's first, third, fifth, and sixth tallest recorded trees.

Now dissipating fog and excessive silt accumulating in Redwood Creek from upstream logging operations are slowly killing these record trees.

To save itself public embarrassment, Arcata Redwood Company, a subsidiary of the multifaceted Arcata National Corporation, provided riprap against bank erosion to undo some of the damage caused by their logging operations, but this measure did not work in the 1966, 1969, and 1974 floods. Their efforts were simply too little, too late; the trees continue to die back due to overexposure and loss of climatic protection.

By 1973 winds had broken an estimated twenty to thirty feet off the top of the world's tallest tree. Redwood Creek is shifting course closer to the Tall Trees, and the entire river is already showing signs of long-range damage by sediment aggradation due to addition of large soil masses. Massive slipping of slope banks is occurring in many areas of the creek where upslope clearcutting has drastically altered water yields. Sediment has filled the normal creek bed in many areas, caus-

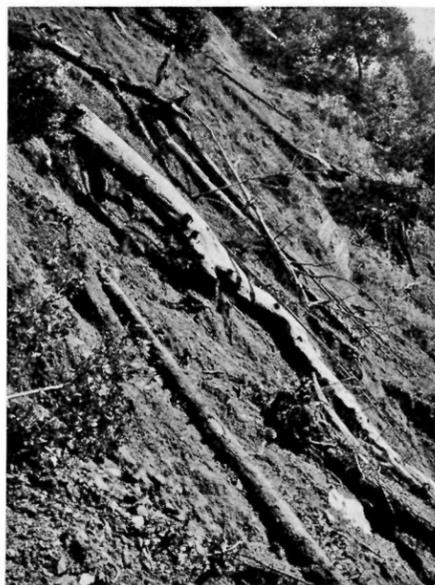


CALIFORNIA DIVISION OF BEACHES & PARKS

IT CAN HAPPEN AGAIN . . .

Clearcutting outside Humboldt Redwoods State Park in the upper watershed of Bull Creek (right) allowed rainfall to run off fast, carrying topsoil with it. The narrow stream became a roaring, gravel and debris filled juggernaut 100 to 300 feet wide that undercut the stream bank (above) and undermined nearly 400 supposedly safe trees in Rockefeller Forest in the 1960s.

Now Arcata's logging in the upper Redwood Creek drainage (below) is threatening the last virgin redwoods within national park boundaries, including the Tall Trees Grove and the Emerald Mile. Redwood Creek is shifting closer to the Tall Trees and is showing signs of long-range damage by silt accumulation, meandering, and undercutting of nearby slopes.



CALIFORNIA DIVISION OF BEACHES & PARKS



DAVID VAN DE MARK

ing it to meander and undercut adjacent slopes, resulting in additional slides.

An administrative report prepared for former Redwood National Park superintendent Jack Davis shows "almost a complete lack of resident fish populations." This report on the Redwood Creek Hydrologic Unit noted that Redwood Creek historically has been "of exceedingly high importance [as a spawning area] to the off-shore commercial fishing industry." In its present condition, the report concluded, "Redwood Creek has little to offer resident trout or juvenile salmon or in using it as a nursery area."

I PLANNED to hike out through Emerald Creek, a tributary of Redwood Creek, and meet my friend at his car. Emerald Creek and its drainage of roughly 1,800 acres was once the last virgin watershed on the north slopes of Redwood National Park. Entering the park at its union with Redwood Creek less than a mile above Tall Trees Grove, Emerald Creek was included in every proposal

for creation of the park—except the final one.

I moved up from the stream as it tumbled through a rocky canyon; below me three fallen giants bridged the stream bed, darkening the water and causing a sharp waterfall. Dense virgin redwood, some approaching the height of the tallest recorded tree, dominated the steep lower slopes.

Despite pleas of conservation experts, the Arcata Redwood Company began logging the upper slopes of Emerald Creek in 1969. The tan oak and Douglas fir forests were cleared away, and logging roads began to violate the cathedral of redwoods. Clearcutting of the lower slopes is now underway despite Emerald Creek's beauty and geologic similarity, both in unstable soils and steep banks, to Bull Creek and despite its close relationship to the Tall Trees Grove.

At the 1,500 foot level I broke through a stand of Douglas fir. Before me lay a no-man's land of broken limbs and dangling roots where once stood ancient forests. It took a

full half hour to clamber only two hundred yards to a vantage point on a logging road above.

Silently I sat and surveyed the carnage. On the opposite side of the canyon a huge tractor moved great mounds of soil aside to push the road closer still to Emerald Creek.

The destruction of the last virgin redwoods will not be the fault of wildcat loggers or ignorant and careless owners of small tracts of forest land. Rather, these highly destructive operations are the deliberate design of major national corporations. Lawsuits underway by the National Resources Defense Council, Northern California Association of Fly Fishermen, and a number of concerned local citizens are attempting to declare this off-the-park logging a public nuisance. But despite lawsuits and charges of negligence, government on both state and federal levels has taken no action against the lumber industry.

AT THE END of my climb I stood looking westward from Bald Hills Road. It was late in

the afternoon, and the sun was already starting to slide into the Pacific. My friend was waiting for me, and I took a last look at the valleys stretched out before me. The ridges, once proud with ancient forests, stood naked; the stubble foliage of a second growth decades in the making served as a mocking reminder of what once had been.

The wind was picking up again as we prepared to leave. Suddenly the ground trembled. From over the ridge, a heavily laden logging truck, an enormous redwood already sectioned and strapped to its back, rumbled past. I wondered how many centuries this behemoth had lived. In an instant it was gone. ■

John Graves is a free-lance writer who is presently working as a newscaster/announcer for a radio station in Eureka, California. He has completed degree requirements in Political Science at the University of Washington and is studying various subjects at Humboldt State University in Arcata, California. His works have appeared in *Osprey* and the *Northeast Environmentalist*.



FRANCES GRIFF

HELP PREVENT ANOTHER BULL CREEK

The Redwood National Parks Act confers on the Park Service the powers necessary to protect Redwood National Park from adjacent destructive clearcutting, by acquiring interests in land outside the park but within the same watershed to help assure that logging operations will not adversely affect the park's lands and waters. The government could require the practice of ecological forestry—individual tree selection or group selection—instead of clearcutting.

Federal action to protect the park is long overdue. *You* can help by writing the Secretary of the Interior urging him to acquire interests less-than-fee in the Redwood Creek drainage to regulate the type of logging allowed:

Hon. Rogers C. B. Morton
Secretary
Department of the Interior
Washington, D.C. 20240

The Creeping Hollygrape

by MILDRED FIELDER

ON SUNNY HILLSIDES and under the snow of western mountains grows the low creeping hollygrape. Its dark green leaves turn red or magenta through the winter but remain as strong and sturdy as ever. When spring returns, the leaves will become shiny green again, the early summer blossoms will be a yellow handful of beauty, and its autumn blue grapes will be welcomed by birds and people alike.

The bark of the creeping hollygrape roots was once said to be an excellent blood purifier in the days when people thought the blood needed purifying. Blood is life, they said; and if a body was sick, the superstition was that the blood must be purified. Whether it restored the blood or not is a moot question, but many settlers gathered the bark just as a handy tonic, not knowing exactly what its virtues were except that it was expected to change one's health for the better.

Others with more scientific minds gave it definite medication possibilities for stomach trouble or as a laxative. Actually the root bark is used medicinally even today to make a liver stimulant, to lower a fever, and to prevent returning paroxysms. The early settlers may have had something, after all, when they put it in their medicine chests.

Some botanists shudder at the insistence of people in the Black Hills, South Dakota, in calling this shrub the Oregon grape, asserting that the Black Hills species is properly the creeping hollygrape, *Mahonia repens*; but South Dakotans are not the only culprits in that regard. The creeping hollygrape grows in the Rocky Mountains, too; and there it is known variously as Rocky Mountain grape, Oregon grape, Oregon hollygrape, holly-leaved barberry, California barberry, and trailing mahonia. Actually the true Oregon grape, *Mahonia aquifolium*, is a

shrub that grows from one to six feet high in the northwest coastal regions. The creeping hollygrape generally hugs the ground and rarely reaches a foot high, although the Rocky Mountain species may grow from two to five feet in height. California also has several species of *Mahonia* that are closely related to the Oregon grape as well.

Wherever they are found, all the *Mahonia* plants have those good blue berries. If you can beat the birds to them, you have something that makes the richest, purplest jelly you can imagine. Of course, the Indians before frontier days gathered the berries to eat raw and fresh. If you can find enough patches to make wine, it is said that creeping hollygrape or Oregon grape wine is excellent, too.

The Indians had yet another use for the plant. They gathered the stems and all, then stripped the bark from the wood to make a yellow dye for their clothing or their porcupine quill decorations, wherever they needed yellow.

Today creeping hollygrape is added to Christmas wreaths and holiday table decorations, its burnished leaves providing an excellent contrast for Christmas greens. Perhaps the only factor that has kept the plant from extinction is that it is not easy to find. The best suggestion today is to buy your blood purifiers from the drug store, your yellow dye in packages, and your Christmas decorations at the corner lot—and leave this little winter shrub in the woods where it belongs. Then the attractive little beauty will be there to delight all who chance upon it. ■

Mildred Fielder is an award-winning poet and author of 16 books and more than 260 articles, including plant folklore, regional history, and juveniles.



Greenback cutthroat trout



Museum pieces won't do

An endangered native fish
is being restocked
in Rocky Mountain National Park

by JOHN GAGNON



JOHN GAGNON

James Mullen, a fish biologist for the Bureau of Sport Fisheries and Wildlife, electrofishes Como Creek, where greenback trout, a rare and endangered trout found only in Colorado and once thought extinct, were rediscovered in 1967. Dave Butts of the National Park Service waits with a pail to transport fish to the pickup truck for relocation, while Dr. Robert Behnke of Colorado State University, an authority on the greenback, watches. Mullen coordinated the greenback transplant in Rocky Mountain National Park.

A MAN SHOVED a long, white-handled net into the water and positioned it in the middle of the current. He placed another, with copper electrodes attached, near the first net. He pressed a button, which caused a buzz. In reaction to the shock from the electrodes, a tiny fish flashed across the pool, faltered, bellied up, and floated into the net. The man raised the net and sorted the fish out of wet, yellowed aspen leaves. It was dumped into a small green bucket filled with stream water along with several other fish from the creek. Three hours and a half-mile of brook later, eighty-two fish were swimming around in the bottom of several large garbage cans in a pickup truck. They were driven fifty miles to a stream not much larger than the stream they had come from. Eighty-one made it alive—a fingerling was eaten by a larger fish enroute. The fish were dumped by the bucketful into their new home, which was dotted with well-tended beaver ponds.

The fish were greenback cutthroat trout, a rare and endangered trout found only in Colorado. Their new habitat is Hidden Valley Creek in Rocky Mountain National Park just east of the Continental Divide in central Colorado. The shocking, collection, and transplant took place on October 16, 1973; it is the most recent effort to help preserve the greenback and to expand its range.

Like all national parks Rocky Mountain has a policy to perpetuate or reintroduce the wildlife species that are or were native to the region. The most notable of these programs to date has been the fostering of the park's elk herd, which numbers about seven hundred animals. In addition, the otter, to which the park played host until 1959, the moose, and the wolf are being considered for possible reintroduction. In 1967 stocking of fish not native to the region was discontinued, and the fish restoration program was undertaken.

The restoration of the greenback cutthroat trout is a dramatic beginning to the park's fishery program. The known number of greenbacks is in the hundreds. It used to be the only game fish on the east slope of Colorado, and at one time it was thought to have become extinct.

THE GREENBACK was pushed to the brink of extinction because of destruction of its habitat and invasion of nonnative trout. The habitat destruction assumed typical forms: siltation, warming, and dewatering of streams from timber cutting, erosion, and irrigation. The greenback is a delicate, fragile animal that needs optimum conditions of temperature, oxygen, and purity in its habitat. Dr. Robert Behnke, a Colorado State University associate professor and recognized authority on the greenback, states that because of the greenback's evolutionary reliance on these conditions, habitat destruction has made the fish ill-adapted to surviving under today's conditions. But even with the physical manhandling of the forests and streams, many miles of Colorado's high mountain waters remain relatively pristine. They were once greenback waters.

Now most of these waters have become an alien animal kingdom. They have been disrupted by intruders that have upset the ecological balance in a natural system in which they didn't evolve. Other trouts, introduced by man, contributed much to the near demise

of the greenback. Planting of eastern brook trout, rainbow, and nonnative cutthroat trout was superficially innocent, even beneficent, at the turn of the century, but it turned out to be devastating for native fish. Both rainbows and cutthroats spawn during the spring in response to rising water temperature. Their genetic instincts are geared to the laborious spawning ritual, not to selectivity of mates. If both fish are placed in the same water, crossbreeding will occur. By breeding with rainbow trout or nonnative cutthroats, the native cutthroat loses its identity. Genes are mixed, and the pure strain of fish is eventually lost as successive spawns occur and swarms of hybrid fish transfer their genetic impurity to each new nest of eggs.

This crossbreeding happened in Colorado where greenback and other native trout habitat was invaded by rainbow or nonnative cutthroat trout. Another blow was dealt when eastern brook trout were stocked in greenback waters. Interbreeding is not a problem when brook trout are introduced to cutthroat habitat because brook trout spawn in autumn in response to falling water temperature. But brook trout are extremely productive in comparison to cutthroats; and when the two fish are put together, brook trout monopolize the food supply. In one Colorado creek only ten greenback remained among hundreds of brook trout.

In 1967 a pure population of greenback trout was discovered in Como Creek, a small mountain tributary in Boulder County. Since that time, under the guiding hand of Dr. Behnke, the pure population has been planted in three other creeks—one of them Hidden Valley—in an attempt to expand their range. Other populations of greenback were known to exist before the 1967 discovery—two, in fact, in Rocky Mountain—but all had to some extent crossbred with other trouts and were not pure greenbacks.

Como Creek is typical of many streams where rare

trout are being rediscovered all over the western and southwestern United States. These drainages are usually small, isolated, and unobtrusive enough to have escaped stocking programs. In addition, natural barriers prevent upstream migration of fish stocked in lower reaches of the same watershed. Rocky Mountain National Park, however, isn't one of these unobtrusive areas. All manner of trout were stocked there—rainbow, brookies, browns, and Yellowstone cutthroats. And brook trout are the biggest initial hurdle for the Hidden Valley experiment. They had to be poisoned before the greenbacks were planted, but it is not known whether all of them were killed. Hidden Valley is a marsh area with myriads of sources of spring water coming in, and it contains many beaver dams. It is easier to poison fish in clean streams without beaver dams and marshes and springs. Park officials are waiting and watching now to see both how the greenback reproduce and whether some of the brook trout survive and become competition for them.

IF EXOTIC TROUT do not reappear at Hidden Valley, it will be the first wholly successful stocking of pure greenback. One effort in the park has already failed. Greenbacks were helicoptered into a high mountain stream in the park in 1970. A check was made this year, and no fish were found. David Butts, the park's resource management specialist, says that the stream seems to be barren. "It's just too high and may never have had fish," he explains. "We weren't really too confident about it; there are severe winter conditions there." The fish in such circumstances drift down to lower elevations—waters inhabited by nonnative trout. Another planting of greenback occurred in Black Hollow Creek west of nearby Fort Collins. It was the first such effort, and the fish are reproducing well. But, mysteriously, brook trout were caught in the creek this fall. Biologists

At right, Dr. Behnke (left) watches while James Mullen electrofishes a pool in Como Creek. In the center, a greenback trout lies stunned on the grass; it revived unharmed soon after the photograph was taken. Below, Dr. Behnke releases a bucket of greenback trout in Hidden Valley Creek, their new home (far right).



PHOTOGRAPHS BY JOHN GAGNON



are puzzled about their appearance, because rainbow inhabit the lower portion of Black Hollow and have been prevented from migrating into greenback waters by a small dam.

If brook trout do reappear in Hidden Valley above a road culvert barrier, as in Black Hollow, it won't be disastrous. The cutthroats will have a few years to increase in size and numbers before the brook trout present debilitating competition. And inasmuch as no interbreeding takes place, no purity will be lost. It will be a matter of electrofishing the stream, taking out the greenbacks, treating the stream again, and reintroducing the greenback or planting them elsewhere.

Once the greenbacks are successfully isolated in a stream, the next step will be to compare the total numbers of greenbacks introduced with the numbers a few years later. This comparison will provide a standard for determining what number should be planted in other streams to obtain a viable population. After that, a serious evaluation of other streams will be made to determine where intrusion of exotics can be controlled to allow greenback stocking.

Even before this systematic approach, however, park officials may try to isolate some greenbacks in a lake to determine how they respond in that environment.

Although Butts notes that the park's stated goal is to have all east slope streams and some lakes supporting the greenback some day, he also cautions that certain drainage basins present logistical problems in controlling the influx of exotic trout. This will put constraints on the program, he concludes, adding that "from a practical standpoint, we'll probably have a somewhat mixed population if you're talking about the whole park, but particular drainages may be pure."

Any fishing for greenbacks will be prohibited until their increased numbers warrant removing them from the rare and endangered species list.

The active program of stocking greenback is only a part of the park's native fish restoration program. The cessation of stocking exotic trout is another part. Park officials would rather have no fish than stocked fish. Park Superintendent Roger Contor explains this aspect of the policy: "Most of our lakes historically were barren, and that's the way they'll become. . . . I don't think we're looking at extirpating a population in a lake that might be reproducing just because it has stocked fish in it. But we wouldn't keep planting a high lake just because it had winterkill and became barren; we would leave it barren."

The fishery program may get another boost shortly. The Colorado River cutthroat trout, another rare but not yet officially endangered fish with a history similar to that of the greenback, is being considered for reintroduction in park waters in its native habitat on the western side of the Continental Divide. Park officials hope to embark on that program next year and are studying its feasibility now.

MAN HAS FREQUENTLY upset, even destroyed, nature by heedless use. Rocky Mountain National Park's response to the problem with its fishery program is testimony to the fact that now man must tinker benevolently. Aldo Leopold once wrote, "We console ourselves with the comfortable fallacy that a single museum piece will do, ignoring the clear dictum of history that a species must be saved in many places if it is to be saved at all." To the people trying to save the greenback, museum pieces won't do. ■

John Gagnon is a free-lance writer from Wellington, Colorado, who is interested in conservation and environmental subjects. He has a bachelor's degree in journalism and history from Wayne State University in Detroit, Michigan, and has had several years of experience writing for daily newspapers.



NPCA at work

A development threat to Great Smoky Mountains National Park was investigated firsthand by NPCA staff in August. Toby Cooper, NPCA Parks Assistant, and conservation writer Mike Frome led a hike through the threatened Cataloochee Valley to encourage citizen participation in preserving its wilderness qualities. The group then met with park superintendent Vincent Ellis to discuss a proposed access road and to preview the wilderness plan.

The Cataloochee Valley Access Road proposal would develop the valley with a 5.2 mile access road from Interstate 40, a small campground, a one-way motor nature trail, and a small visitor center. Designed capacity of the development would be 8,000 visitors per day. NPCA believes that the plan should be abandoned because opening this isolated valley to automobile traffic would quickly destroy a magnificent environment. Furthermore, the Park Service is advancing the proposal before completion and public approval of the park's master plan or its wilderness proposal. Apparently the Park Service plans to move ahead rapidly with the Cataloochee proposal because they left an exclusion in the wilderness proposal to allow for the roads and developments. Much of the Cataloochee Valley is potential wilder-



ness. NPCA members are encouraged to urge strict adherence to the master plan public review procedures and to support the presently undeveloped status of the Cataloochee Valley by immediately writing:

Ronald H. Walker, Director
National Park Service
Washington, D.C. 20240

Our animals are being poisoned on our lands at our expense. In recent meetings and follow-up correspondence, NPCA has urged the federal government in general and the U.S. Fish and Wildlife Service in particular to develop different standards for predator control on public lands from those operating on private lands.

Executive Order 11643 granted the Fish and Wildlife Service authority to apply chemical toxicants for controlling predatory mammals and birds in a defined emergency situation. An emergency, according to the definition in the regulation, exists where "control" cannot be effected by any other means. For instance, emergency situations exist in areas where aerial hunting is prohibited by state law; in low altitude areas with dense, bushy undergrowth where aerial hunting is impractical and roughness and limited access present obstacles to using mechanical traps; in summer pastures where high altitudes and dense wooding rule out aerial hunting and traps; and in fenced pastures including small farms with mixed agriculture where there is a difficulty in identifying property lines from the air and a danger in interference from sheep and other livestock. Action is then taken according to standard policy and procedures. For instance, sodium cyanide is applied with the M-44 gun in the program to poison coyotes.

Public land usage and management is becoming an issue debated between conservationists on one hand and the livestock industry, private ranchers, and other private interests on the other. NPCA emphasizes that the public lands were, after all, set aside for the public, not for domination by private ranchers and others. Furthermore, leasees of the public domain are already heavily subsidized, at public expense, because grazing

fees are substantially lower than those fees on similar private lands. This fact alone is unfortunate and represents a defeat for the public interest. However, compounded with the poisoning of public animals, on public lands, at *public expense*, it makes a bad situation many times worse. These animals are valued by the public, and NPCA will continue its efforts to halt the subversion of this public value by the private economic interests.

A particularly beautiful portion of the Snoqualmie National Forest in the state of Washington is the Naches-Tieton-White River area, which abuts Mount Rainier National Park in the southernmost portion of the North Cascades. In cooperation with the Cougar Lakes Wilderness Alliance, NPCA staff and members have focused attention on the future use and classification of this area of some 771,553 acres.

In the Naches-Tieton-White River area extensive forests of Douglas fir and ponderosa pine form a green carpet that blends with the mixed conifer and alpine vegetation of higher elevations and provides habitat for abundant wildlife. Landforms characteristic of the area are steep canyons, plateaus, rimrocks, and volcanic cones.

As diverse as the natural components of the region are, however, there is also a diversity of available resources. Resources can be considered as ranging from scenery and wilderness to forage and timber products. The Snoqualmie Land-Use Planning Team set forth four alternatives for the possible allocation of these resources. NPCA favored "Alternative A" over the other choices offered because it is the alternative most capable of meeting the needs and expectations of present and future generations of Americans. "Alternative A" would provide for substantial areas for potential wilderness designation, including Cougar Lakes; in addition, it would preclude the use of off-road vehicles on the historic Naches Trail Wagon Road.

However, "Alternative A" did not receive full NPCA endorsement. First of all, it was not clear whether "Alternative A" reflected the full wilderness potential of roadless areas in the study area, or simply included those areas having received official Forest Service "New Study Area" designation. It is NPCA's understanding that all roadless areas in the National Forest System, regardless of their current status, are to

receive further consideration for possible wilderness classification in the course of regular land-use planning procedures. Consequently, such wilderness potential should be included as an alternative presented to the public for review and comments.

NPCA's second reservation regarding alternative resource-allocation choices for the Naches-Tieton-White River area relates to timber management. More specifically, those areas to be included in a timber management plan should also be prescribed for group selection harvesting as opposed to large block clearcutting, which already pockmarks the Douglas fir forests of this region. Group selection would help maintain the natural quality of the area and provide other benefits that the dominant-use clearcutting method is less capable of providing.

After the land-use plan for the Naches-Tieton-White River area has been prepared, a draft environmental statement will be prepared for additional public review. Public hearings on the future management of the area are tentatively scheduled for March 1975. For additional information, write:

Land-Use Planning Team
Snoqualmie National Forest
1601 Second Avenue Building
Seattle, Washington 98101

The continual decline in the black duck population, which fell to a twenty-year low this year, prompted NPCA to urge the U.S. Fish and Wildlife Service to solve the problem and raise the black duck population.

Presenting recommendations at that agency's Director's Waterfowl Advisory Committee meeting in August, NPCA stated that the population decline has been apparent for the past ten to fifteen years and that the black duck population now stands at roughly 50 percent of its level in the mid- to late 1950s. The drop was particularly evidenced in the low number of black ducks found in the last winter inventory. Because there are approximately 800,000 square miles of largely unaltered breeding habitat for these birds in northeastern Canada and the eastern seaboard of the United States, this means that the breeding habitat has been understocked by about 50 percent.

Although biologists have made some good faith attempts to use regulations to return more black ducks to the breeding grounds, population trends continue

downward. In other words, each year the mortality of black ducks due to all causes slightly exceeds what fisheries' biologists call the "sustained yield" or "sustainable yield" of the black duck population, or the number of black ducks that can be lost in a given year while maintaining the population level of the previous year. Thus, management efforts over the past fifteen years have failed—failed to maintain a stable population and failed, in recent years, to increase the population.



In addition to hunting, there are many direct or indirect mortality factors, such as destruction of breeding habitat; habitat pollution from metallic wastes, pesticides, and *especially* from lead poisoning caused by lead shot; disturbance of breeding grounds; winter habitat degradation; competition with mallards in the southern part of the breeding range; and other factors such as predation. However, hunting takes 20 percent more of the annual black duck population, and hunting is the only mortality factor over which we can exercise immediate control at the present time.

Therefore, in NPCA's view, the U.S. Fish and Wildlife Service should immediately attempt this three-part solution to the problem: First of all, the Service should provide for an immediate reduction in the kill of black ducks near their breeding grounds. This would mean a mandatory delay of about three weeks in the normal season opening for hunting of black ducks. (In Maine, for example, this means not allowing the season to open until October 21 or later. Regulations would move that date back one week to ten days for every five degrees in south latitude.) Canada has already moved her season openings back in comparison to those in the United States. Second, NPCA recommended that the total season length for the black duck be held to no more than thirty-five days. (Currently the season length is scheduled to be forty-five days.) Third, releases of hand-reared mallards should be prohibited, to the fullest extent possible, in areas where mallards seem to interbreed with black ducks or where

they compete with black ducks for breeding sites, thus threatening to wipe out black duck populations.

NPCA Administrative Assistant for Wildlife John W. Grandy IV, who has conducted extensive research on the black duck and has previously participated in various capacities in setting regulations aimed at boosting the black duck population, emphasized that a drastic delay in season opening combined with a substantial cut in season length are the only techniques that have not been tried yet. NPCA believes that we must come up with immediate new solutions so that we do not force the black duck into the threatened species category.

Furthermore, over the long term we must do substantial research on other mortality factors, reduce known mortality causes such as lead shot poisoning, and preserve black duck habitat. The maintenance of high and healthy populations of black ducks must be the number one priority for areas in which the black duck occurs.

Keep America Beautiful? For a number of years NPCA, as well as most other national conservation groups, has been a member of the National Advisory Council of Keep America Beautiful, Inc. (KAB), a public-service organization with the espoused purpose of "the prevention of litter and the preservation and improvement of America's scenic and man-made beauty"—a worthwhile goal. KAB, formed in 1953 by a small group of U.S. companies, is now composed of more than 100 companies, trade associations, and labor unions, as well as the more than 80 national organizations that comprise the National Advisory Council. KAB's financial support is derived almost exclusively from individual companies in the container and packaging fields.

KAB's antilitter campaign is conducted primarily through a consciousness-raising educational program designed to reduce litter by encouraging people to dispose of it properly. Or, in the words of KAB President Roger W. Powers, "to encourage the individual to accept his responsibility for environmental quality."

Although NPCA fully supports an antilitter policy that attempts to reduce littering and litter accumulation by the systematic application of KAB's three "E's"—Education, Equipment, and Enforcement—this process does not go far enough in solving the problem, in

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NPCA's opinion. A complementary implementation of a mandatory deposit-refund system for beverage containers has proved to be an effective means of greatly reducing litter in at least one state (Oregon), and NPCA considers this an important step toward ultimate elimination of the litter problem.

In April 1974 NPCA communicated with Mr. Powers, expressing our philosophy but also our hope for a continuing dialogue. NPCA stated that, "While the various programs on litter reduction undertaken by KAB, Inc., are highly commendable, and indeed necessary, NPCA feels that this additional step of eliminating no-deposit, no-return containers is necessary to solve the litter problem." After several months with no reply from KAB, and with evidence that they were undertaking a major campaign to oppose deposit-refund systems, NPCA, in July 1974, again contacted Mr. Powers to request that this Association be removed from the National Advisory Council.

NPCA President A. W. Smith told Mr. Powers, "Over the past months it has become increasingly apparent that KAB, Inc., has little regard for members of its National Advisory Council or their advice. . . . it seems that the KAB is using its achievements in litter prevention education to cover its support for the container industries' efforts to oppose beverage container refund-deposit systems to restrict litter. In NPCA's view both educational efforts and a deposit-refund

system are necessary if we are to significantly curb our increasing waste of nonrenewable resources. . . ."

Other national organizations that have taken action similar to NPCA's resignation from the council include the Sierra Club and the Izaak Walton League of America.

Injuries caused by exotic wildlife are more widespread and serious than previously believed, current information shows. Proposed regulations governing the importation of wildlife that are injurious to human beings, agriculture, horticulture, forestry, and native wildlife were the subject of recent U.S. Fish and Wildlife Service public hearings. In general NPCA gave strong support to the urgent need for effective control of exotic (non-native) species, as evidenced by an historical record replete with numerous instances where exotic species have caused havoc to existing natural ecosystems of the United States.

The regulations (with the unfortunate exception of those concerning marine fish) are based on a scientifically accurate presumption—that exotic species will be harmful to U.S. ecosystems unless proven otherwise.

Exotic species may offer direct competition to native species for food, nest sites, or some other essential resource. This is the case with numerous exotic fish that have established populations in Florida. The infamous walking catfish,

A CITIZEN'S VOICE IN GOVERNMENT

Organizations like the National Parks and Conservation Association, which enjoy special privileges of tax exemption, may not advocate or oppose legislation to any substantial extent.

Individual citizens of a democracy, however, enjoy the right and share the responsibility of participating in the legislative process. One of the ways citizens of a democracy can take part in their government at state and federal levels is by keeping in touch with their representatives in the legislature; by writing, telegraphing, or telephoning their views; by visiting and talking with their representatives in the national capital or in the home town between sessions. Every American has two senators and one congressman with whom he may keep in contact in this manner.

The best source of information for such purposes is the official CONGRESSIONAL DIRECTORY, which can be bought through the Government Printing Office, Washington, D.C. 20402. It tells you who your senators and congressmen are and lists the membership of the various Congressional committees. It also gives full information on the personnel of the various executive bureaus of the government whom one may contact about administrative programs and policies.

The CONGRESSIONAL DIRECTORY for the First Session of the 93rd Congress is available in three editions, prices of which include postage: bound in hard cover, \$6.80; paperback, \$5.50; and thumb-indexed, \$9.35.

for instance, became well established after escaping by "walking" away from a fish farm, using their fins and tails to travel overland. The fish has a voracious appetite and apparently reduces entire freshwater communities to one common denominator—more walking catfish. Exotic species can at times become serious predators of native fauna.

Alteration of habitat is another environmental injury caused by non-native species. Feral cattle, pigs, and goats introduced into Hawaii have played an important part in the destruction of the native vegetation, thus destroying the habitat of many native birds. Parasites or diseases can be carried by exotic species and then communicated to native species of wildlife. Newcastle's disease, brought in by parrots and myna birds, killed more than 11 million chickens in California in 1973. Another way that exotic species may harm native species is through hybridization, which can introduce detrimental characteristics into the native population.

Exotic species can also have disastrous effects on humans and human interests in several interrelated ways. They may become depredators of agricultural or horticultural crops or may introduce diseases into domesticated animals. Livestock specialists blame starlings for millions of dollars of damage to western feedlots each year. The human health hazard from introduction of exotic species is illustrated by the fact that small turtles such as those bought in pet stores are estimated to have caused 40,000 annual cases of salmonella poisoning. Venomous fish set free in the wild have poisoned and paralyzed people.

Millions of exotic fish and animals are imported into the United States each year. NPCA stated that these proposed regulations, which are revised regulations under the Lacey Act, should be implemented as soon as possible. They would prohibit the importation of injurious wildlife into the United States except as permitted by the Secretary of the Interior for scientific, educational, zoological, or medical purposes. The proposal includes a list of "low risk" wildlife, which means that all species not listed as "low risk" would be prohibited from importation except under a strict permit system. It is important to note that such a low risk list would not stop interstate (within the continent) transportation of pets unless such is prohibited by other laws.

However, NPCA stated that it is unfortunate that the low risk freshwater fish list is so lengthy and filled with environmentally dangerous fish. This is probably due to pressure from private economic interests. While giving strong support in general to the regulations, NPCA urged that the fish list be revised and reduced. The Association is submitting detailed recommendations con-

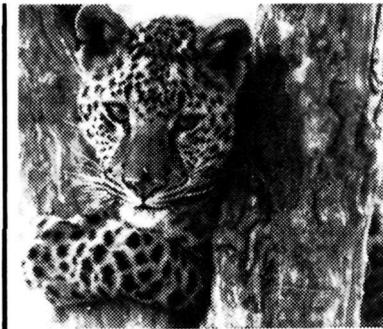
cerning the list to the U.S. Fish and Wildlife Service.

Readers who want to help restore the American chestnut are sending seeds to NPCA. If you know of any American chestnut tree with some apparent immunity to the "chestnut blight" that has devastated this species, please contact NPCA or see the September issue.

TIGER HAVEN

by Arjan Singh

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The future of the nation's largest wilderness area is at stake in a controversy in Minnesota, where developments affecting the Boundary Waters Canoe Area (BWCA) are posing a new set of concerns for conservationists.

In May a three-judge panel of the U.S. 8th Circuit Court of Appeals revised the federal district court decision that had ordered a permanent injunction against mineral prospecting in the BWCA, which is located in the Superior National Forest of northeastern Minnesota. The new decision does not necessarily mean that prospecting will now be allowed, but it rules that the original suit brought by the Izaak Walton League of America had been filed prematurely before the U.S. Forest Service could determine whether a particular exploration permit in question should be granted. The Izaak Walton League, which contends that the public interest in protecting public natural resources overrides private rights of mineral exploration, is expected to appeal this decision to the Supreme Court.

After the appellate panel's decision the Forest Service recently sent a revised proposed management plan for the BWCA and a companion final environmental impact statement to the Council on Environmental Quality. According to the acting supervisor of Superior National Forest, Don Eng, "Exploration for and the extraction of minerals will be limited or prohibited to the extent permitted by law where determined to be incompatible with wilderness or other environmental values."

This proposed management plan would allow seven existing timber sales in the BWCA to continue, as well as five motorized mechanical "portages" under special use permit authority. Although the Wilderness Act of 1964 makes special provisions for the BWCA that do not preclude timber harvesting and motor boat use in certain areas, some environmentalists contend that the Forest Service action essentially violates the act's purpose of protecting this wilderness.

In relation to the mining issue, strong adverse public opinion may well preclude any immediate exploration or mining in the BWCA, but the situation for national forest lands in close proximity to the wilderness area's boundary is different. The International Nickel

Company reportedly has made tentative requests to the Forest Service for the approval of open-pit mining. The requests have already set the wheels in motion for the preparation of a related draft environmental statement. Because the private parties hold mineral leases on lands within one-half mile of the BWCA, associated risks to the BWCA as well as other areas of the Superior National Forest would likely involve aesthetic deterioration, noise, impairment of water quality, and air quality deterioration from a possible smelter operation.

The Boundary Waters Canoe Area consists of more than a million acres of land and water, making it the largest unit of the National Wilderness Preservation System; it is also the nation's only canoe area.

The natural sanctity of the unique Pine Barrens forest of New Jersey is threatened by the same development pressures that have transformed millions of acres of other American natural regions into housing developments, shopping centers, parking lots, and bowling alleys.

Pine Barrens is nationally reputed as one of the most remarkable forests along the eastern shoreboard. As the late NPCA editor Paul M. Tilden described in the August 1971 Magazine, "It is a vast expanse of conifer and oak, still largely unsettled and relatively unspoiled . . . a sea of pine and various oaks, broken along swamp and watercourse by ribbons of southern white cedar and a few species of hardwoods." One of the area's most outstanding features is a seemingly inexhaustible underground reservoir eyed by many adjoining states as a possible future water source. The unusual nature of the forest; the dry, sandy, acid soil; as well as the distribution of many of its animals are the objects of constant ecological and scientific observation. Although the Pine Barrens offers a wide variety of recreational activities—hiking, photography, camping, nature study—the recreational benefits have taken second place to the natural resource conservation and scientific interest.

As the need for land increases, the seclusiveness of the Pine Barrens is becoming more and more threatened. Although small sections of the Pine Barrens are protected by New Jersey as state forests and parks, conservation efforts have been haphazard. Moreover, some residents are reluctant to turn the region into a national park or monument be-

cause of the changes it would impose on the economy and living conditions. However, without definitive protective measures, the Pine Barrens could easily be susceptible to development and eventual obliteration. Already many conservationists have been alarmed by certain developments in the region—developers eyeing the vast water supply; seven new retirement communities; an influx of new residents; an amusement park in close proximity to the region; discussion of plans to build an intercontinental airport and industrial complex as well as a city of 80,000.

Two years ago the state legislature created the Pinelands Environmental Council to review all major project proposals. In an effort to protect the region from any future development or environmental abuse, the council proposed a \$200 million Green Acres bond issue, which would provide \$100 million for land acquisition and the balance for facility development.

In support, individual state conservationists as well as environmental protection organizations initiated a statewide campaign that has resulted in passage of the bond issue in the state assembly in August 1974. Upon passage of the bond issue by the state senate this fall, the final decision about whether the Pine Barrens should be preserved or left open to intense development will be placed in the hands of New Jersey citizens at a public ballot this November.

The possibility of flood control measures on the Ozark National Scenic Riverways—whether these would be impoundments or channelization activity—erupted into a controversy recently. The area in question is the Jacks Fork River in Missouri, a major segment of the Ozark riverways. In 1964 Congress designated portions of the Jacks Fork and the Current Rivers to be preserved "for the purpose of conserving and interpreting unique scenic and other natural values and objects of historic interest" as free-flowing streams. In addition, the 1964 law authorized acquisition of up to 65,000 acres of land for the preservation of springs and caves, management of wildlife, and provision for enjoyment of outdoor recreation resources.

In early June Congressman Richard H. Ichord (D-Missouri) announced that he had requested the House Public Works Committee to authorize the Corps of Engineers to begin a flood control survey of the Jacks Fork River, which he said



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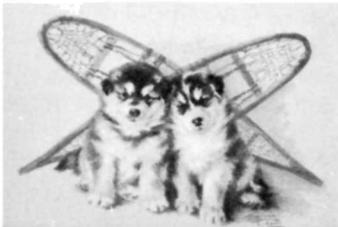
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he hoped would bring about impoundments for flood control to prevent future drownings along the river. (On April 21 a couple camping near the river at Alley Springs were drowned in a flash flood.) In a letter to the *West Plains Daily Quill* (a local Missouri newspaper) dated June 3, Congressman Ichord stated, "I am hopeful that ultimately adequate flood control and prevention can be assured the Jacks Fork region in order that no future tragedies such as that of April 21 need occur again." However, soon thereafter local park officials were quoted as saying that the flood could not have been prevented by any amount of flood control means; that the flood was due to extreme local showers of six or more inches of rain within one hour; that the campers in Alley Springs had been warned at least as early as fifteen hours before the flood came; and that there had been no substantial flooding on the Jacks Fork itself.

More recently, after much adverse comment from local residents and conservationists around the country in response to the suggestion of placing impoundments in this free-flowing stream of the Ozark National Scenic Riverways, Mr. Ichord has attempted to clarify his position by stating that "Such a survey certainly does not necessarily mean that a dam on the Jacks Fork River would be recommended as a solution to the flooding in the area, and indeed I do not believe that there is a chance in the world that a dam would be recommended in view of the river's status as

a national scenic riverway and in view of the types of flood problems which exist in the basin. In fact, I am quite certain, being familiar with the area, the recommendations will consist of small flood prevention measures not on the Jacks Fork but up the hollows and ravines from the Jacks Fork to be built under the auspices of the Soil Conservation Service."

Congress has adopted the principle (in Public Law 93-251) that nonstructural means of flood control are a viable alternative and in many cases preferable to structural ones. Controlling development in flood plains through well-planned land-use practices generally has been shown to eliminate the need for any flood control measures.

Recent discoveries about the "acid rain" that now falls on most of the northeastern United States have significant environmental implications for other industrialized regions of the world as well.

The research conducted by two ecologists associated with the Hubbard Brook Experimental Forest in New Hampshire's White Mountain National Forest shows that air pollution has caused an astounding increase in the acidity of precipitation in many areas of the United States and Europe. This increase ranges from 100 to 1,000 times normal levels. As explained in the *New York Times*, "Under normal circumstances, pure rainwater is only slightly acidic. . . . The acidity may be likened to that of a potato. In recent years, however, the

average acidity of rainwater has increased to about that of a tomato. In occasional extreme cases, rains have been found to be as acidic as pure lemon juice."

Ironically, the scientists believe that high-acid snow and rain can be attributed partly to the increasing use of anti-pollution devices that make many smokestacks seem to be no longer emitting smoke. The devices, which remove only visible particles of solid matter, still permit the escape of sulphur dioxide gas and various oxides of nitrogen that are readily converted to sulphuric acid and nitric acid in the air. Before the use of the devices, the solid particles that entered the atmosphere helped to neutralize the acid-forming gas molecules, but now they can no longer do so. Part of the problem is therefore technological, for there is no widely acceptable, reliable method available for removing sulphur dioxide from smoke. Sulphur dioxide emissions from automobiles and the combustion of high-sulphur fossil fuels are other important factors.

Acid rain is believed to be responsible for stunting the growth of forests and farm crops, and it causes corrosive damage to monuments and buildings. A number of lakes in the United States as well as in Canada and Sweden have become increasingly acidic in recent years, and some lakes have experienced fish kills associated with their high-acid levels. Although only some of the ecological and economic effects of the

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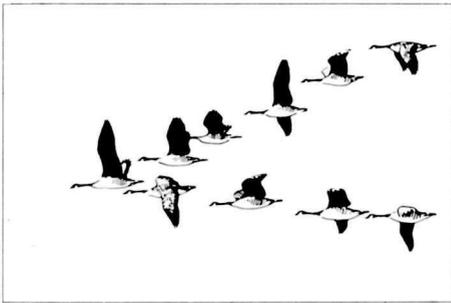
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widespread introduction of strong acids into natural systems are known at present, it is clear that they must be considered in proposals for new energy sources, particularly those of low-sulphur content, and in developing air-quality emission standards.

The Hubbard Brook research was conducted by Dr. F. Herbert Bormann, a forest ecologist at Yale University, and Dr. Gene E. Likens, an aquatic biologist at Cornell University. Hubbard Brook is also the setting for on-going research on the effects of the controversial practice of clearcutting on the environment.

What subtle sensory cues enable a bird to navigate its way to an unseen site and then home in with spectacular accuracy? Researchers at the New York State College of Agriculture and Life Sciences at Cornell University have found a partial answer to this question that has baffled scientists and laymen alike for years.



They have discovered that birds can sense small changes in air pressure, equivalent to a drop in altitude of less than 20 feet, and can "see" polarized light. (Polarized light is characterized by having all its energy waves vibrating in one direction.)

William T. Keeton, professor of neurobiology and behavior, and Melvin L. Kreithen, a postdoctoral associate, stress that their work adds evidence to the idea that birds live in a sensory world unknown to man. They speculate that the ability to sense barometric pressure changes and polarized light would be of major value to birds both when flying and on the ground.

They explained that migration takes place on relatively few nights of each season. In general, a falling barometer reading, indicating dropping pressure, implies favorable winds for fall migration, and a rising barometer is a sign of winds suitable for northward migration in the spring. If birds can detect changes in barometric pressure while still on the

ground, they can judge the best time for committing themselves to marathon migration flights. "Barometric information could also be of value to birds for predicting a night's weather, such as the passage of a cold front," Keeton and Kreithen said.

The Cornell ethologists also suggested that birds with a sufficiently sensitive pressure detector might locate thermal updrafts and air turbulence and use winds to their advantage.

The ability to sense polarized light would be a prime navigation aid to birds, they explained, because the plane of polarized light in blue sky is related to the position of the sun. The detection of sky polarization could be used as a navigation cue when the sun, which is known to provide compass cues, is obscured by clouds.

In additional experiments, Kreithen and Keeton will pursue their theories about how birds are able to perceive polarized light and pressure. Four years ago Keeton and his colleagues discovered that birds may utilize the earth's magnetic field as a navigation cue. But these and other scientific findings have yielded only a rudimentary explanation of why a bird's ability to navigate excels that of any device conceived by man.

More Notes. . . The Reserve Mining Company announced in August that it would reluctantly agree to a suitable land site for disposing wastes. The company dumps 67,000 tons of asbestos-laden iron ore wastes per day into Lake Superior, thereby posing a serious health hazard. It could be months before this court case is settled. . . Methods for making commercial grade products economically by recycling industrial wastes are described in three new reports published by the Interior Department's Bureau of Mines. For instance, mill tailings, roofing granule, and asbestos fines could be used to produce building bricks. Phosphorus furnace slag could be used in making ceramic wall tile, and waste lubricating oils could also be recycled. . . This is World Population Year, and October 24 is World Population Day, by resolution of the United Nations General Assembly. . . Amtrak provides year-round rail service to several national parks, including Yellowstone, Yosemite, Sequoia and King's Canyon, Grand Canyon, Rocky Mountain, Everglades, and Carlsbad Caverns national parks.

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reader comment

Havasupai and the Grand Canyon

With all my interest in the national parks may I say that I do not approve of some of their programs!

I have just sent wires to some of our representatives in Washington urging them to support Congressman Udall's proposal to grant the Havasupai Indians legal title to 185,000 acres of plateau lands above the Grand Canyon.

We are all for preserving lands for parks for the American people, but we must remember that the Indians are included and should be given grazing and living areas first.

*Florence M. Youngberg
Ross, California*

There was an article in our newspaper about the fact that the President wants to give part of the Grand Canyon National Park back to the Indians; of course as soon as they get it, they will lease it to developers, and then it will be ruined.

Now, I'm not against the Indians and do realize they should be given a chance at American affluence, but aren't Indians Americans too? Can't they enjoy the beauty and wonder of such a place along with all Americans?

If money makers get a foot in the door, the park will be ruined forever. The history of creation is in that area; let's leave it that way for future generations.

*Eunice R. & Leon D. Maxwell
Jackson, Mississippi*

This issue is complex and emotion ridden; perhaps we can clarify it.

The Havasupai Indian Tribe has claimed title to a portion of their aboriginal lands, including part of Grand Canyon National Park. This claim is linked to the Grand Canyon Enlargement Act, a bill now before Congress that proposes to add Grand Canyon National Monument and parts of Kaibab National Forest to the national park. An amendment to this bill that grants the Havasupai trust title to 185,000 acres of national park, monument, and forest lands was approved by the House Interior Committee.

The campaign to support a deletion of national park lands for the Havasupai has been charged with bitter debate.

But one fact often overlooked is that the Havasupai have already been paid for the land. In 1969 the Indian Claims Commission (ICC) reached an agreement with the Havasupai under a plan the tribe devised themselves to compensate them for all claims and rights to their aboriginal lands. They were paid \$1.25 million for 2.25 million acres of arid land, including a payment of \$700 to each member of the tribe, with the balance of about \$940,000 to be used for agricultural development, educational purposes, and tribal government.

Now the Havasupai are asking for a deletion of 185,000 acres of national park, monument, and forest lands. Granting this request would in effect be paying the tribe twice. The Havasupai would indeed be prime targets for courtship by commercial interests, and this possibility is of concern. However, such a deletion would set an ominous precedent of opening up other national parks to past claims, and the primary concern in this controversy is preservation of national parks inviolate from claim even if no incompatible use would be made of the land. National parks are the nation's most valued natural resources and are not intended to benefit only the original Americans, nor any other single group of Americans; they are national treasures set aside for the benefit of all Americans.

With these facts in mind and with the desire to help solve the serious problems of the Havasupai, but not at the cost of the integrity of Grand Canyon National Park, NPCA proposed a compromise in a supplement to earlier testimony submitted on invitation concerning the Grand Canyon Enlargement Act. This compromise would have provided title to a small area needed for housing, schools, and other facilities, and the perpetual use of a large area for grazing and historic and religious purposes. (See August 1974 issue, page 30.)

NPCA's proposed compromise was not adopted, and the amendment granting deletion will probably have been acted on by the full House by the time this issue is printed.

Foraging in the parks

We have been reading the lead story in your June issue about our sister park, Glacier. The enthusiasm of the author is infectious, and his photography is splendid—but some of the practices touched upon in the text are ques-

tionable, to the degree that we feel it important to write to you.

One of the author's main thrusts in the story is "living off the country." We believe it is dangerous to suggest that any National Park gives opportunity for this practice. As you know, the parks are receiving very heavy travel from backpackers these days, and many back-country areas are showing signs of damage even under the most scrupulous and disciplined patterns of use. Imagine how much more gravely these areas could suffer if the "foraging" habit were to become widespread.

Technically, fishing permits are required in most parks, contrary to the statement in the text. Frequently they are in the form of state licenses, or as in Yellowstone, in the form of a non-fee permit. . . .

The episode of finding and packing out elk antlers seems innocent enough, but unfortunately the privilege of removing antlers must be deprived to visitors for two reasons: (1) a large trade in buying and selling antlers has now grown, threatening a form of commercialism at Yellowstone, and (2) antlers in many parks make up a substantial component of the food chain and the recycling process. . . .

*R. Alan Mebane
Chief Park Naturalist
Yellowstone National Park*

We doubt that foraging is likely to endanger the national parks, as most people are rightly afraid of being poisoned, and relatively few can safely identify edible wild plants. Moreover, the article states NPS regulations on gathering wild plants for consumption.

We appreciate your pointing out regulations on fishing permits and on removing natural objects from parks. Glacier National Park requires no state fishing license and no park permit. However, regulations on fishing do vary widely throughout the park system, and visitors should ascertain the regulations of each park before planning to fish.

In addition, visitors should never remove any natural object from a park. Chris says, "had we known definitely that antlers were not to be removed, they would not have been. . . . Besides the fact that the antlers play a part in the ecosystem, I can also appreciate the fact that they are a splendid sight to see lying in the sand, their removal therefore denying all future visitors that privilege."

conservation docket

Several recent actions in the Congress should be of interest to NPCA members:

Strip mining: HR 11500 passed the House by a vote of 291 yeas to 81 nays on July 25. The bill, which makes provision for some regulation of surface mining operations, is now in joint conference with the Senate to resolve differences between it and the previously passed (10/9/73) Senate version, S 425. Both bills would eliminate highwalls along the edge of strip mine operations and would require regrading and backfilling of mined lands to the approximate original contour. The House version, however, does not require immediate elimination of spoil banks from strip mines on steep slopes. Moreover, the House bill provides a thirty-month interim period of gradually increasing environmental regulations. In addition, HR 11500 would use revenues from outer continental shelf oil and gas to finance abandoned strip mine reclamation, while S 425 would impose a tax-

per-ton-mined charge on active strippers for these reclamation expenses.

Dismal Swamp: HR 3620, to establish the Great Dismal Swamp National Wildlife Refuge, passed the Senate on August 7, 1974, having previously passed the House in June 1973. Both bills establish a wildlife refuge of 49,097 acres in the Virginia portion of the Dismal Swamp near the Virginia-North Carolina border. This land is in the process of being deeded to the U.S. by the Union Camp Corporation through The Nature Conservancy. Furthermore, the two bills authorize the Interior Secretary to acquire other adjacent swamp-lands as necessary to more fully preserve the natural beauty and integrity of the swamp.

Piscataway Park: On August 1 the Senate passed HR 4861, which had passed the House in February. Both versions of the bill amend the original Piscataway Park Act of 1961 in order to complete land acquisition in the Maryland park area that lies across the Potomac River from George Washington's home, Mount Vernon. The House-passed version of the bill prescribes the use of the legislative-taking mechanism

to acquire the remaining lands, whereas the Senate version instead would require the Interior Secretary to complete land acquisition, allowing him a time frame of one year from date of enactment. This confers the full scope of acquisition authority upon the Secretary, allowing him to first attempt to negotiate a sale, but to use the legislative-taking mechanism if necessary to complete land acquisition for the park.

Wilderness Additions: In May the House passed HR 12884, which would designate twelve areas in the National Wildlife Refuge System and three National Forest areas as wilderness under the Wilderness Act of 1964. In August the Senate amended HR 12884, deleting the twelve refuge areas while adding three more National Forest areas, and passed the bill. The proposed wildlife refuge wilderness areas *omitted* from the Senate version (but approved by the House) are Chamisso (Alaska); National Key Deer, Great White Heron, and Key West, which are merged into the Florida Keys Wilderness Area (Florida); Chassowitzka (Florida); Saint Marks (Florida); Wolf Island (Georgia); Breton (Louisiana); Moosehorn (Maine); Brigant-

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tine (New Jersey); Bosque del Apache (New Mexico); Chase Lake (North Dakota); West Sister Island (Ohio); and Cape Romain (South Carolina). *Added* to the Senate version were Eagles Nest in Arapaho and White River National Forests (Colorado); Weminuche in Rio Grande and San Juan National Forests (Colorado); and Mission Mountains in Flathead National Forest (Montana). *Both versions* would establish wilderness areas in Stanislaus National Forest—the Emigrant Wilderness (California), in Cleveland National Forest—the Agua Tibia Wilderness (California), and in Routt and White River National Forests—the Flat Top Wilderness (Colorado). These conflicting versions must now be resolved either by House acceptance of the Senate amendment or through joint conference.

Cascade Head: HR 8352, which would establish the Cascade Head Scenic Research Area in Oregon, recently passed the House. This area on the west-central coast of Oregon encompasses the Cascade-Salmon River estuary area, its coastal beaches, headlands, and forests. Approximately half of the authorized 8,910 acres is presently in Suislaw National Forest and half is in private ownership. To be administered by the Forest Service, the bill states that the area is set aside "to promote the protection and study of significant areas for research and scientific purposes, and to promote a more sensitive relationship between man and his adjacent environment." The Senate Interior Committee has reported out a similar bill, S 1943, and final action was pending at press time.

Wildlife Refuge Organic Act: Another bill that was recently introduced in the House is the "Organic Act of the National Wildlife Refuge System" (HR 15856), introduced by Representative John Dingell (D-Mich.) This bill was prepared to provide policy direction to ensure the future effectiveness of the National Wildlife Refuge System.

Since its inception in 1902, the refuge system has been dedicated to the preservation of natural habitats of rare, endangered, or threatened species through the use of federal lands. Today the system is a national network of public lands and includes all states except West Virginia.

Over the years, the system has grown sporadically and opportunistically in response to changing national moods and the need to acquire wildlife envi-

ronments. Although early legislation focused on funding and authorizing the establishment of wildlife refuges, it contained few directives for administering the wildlife refuge program. Consequently, as the system grew and expanded, a complete lack of systematic planning resulted.

Representative Dingell has proposed this legislation to alleviate that situation. The bill makes the following provisions: (1) policy direction for proper administration and management of the system; (2) review of all existing refuge areas to determine which areas need completion; (3) assurance that no wildlife species will become extinct due to lack of habitat; (4) upgrading of the system to perhaps full bureau status to ensure proper attention in establishing priorities and distributing funds; (5) protection from periodic land grabs by other federal agencies (i.e., the military, the Bureau of Land Management), and from phasing out of units by the Fish and

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Wildlife Service, by providing that these actions be accomplished by an act of Congress; (6) creation of a new land management principle. In the place of a multiple-use system (which assumes that in order for land to be valuable it has to be used), a multiple-value system would be initiated (meaning all land has value whether it is used or not). It would be the responsibility of land managers to identify those values and manage the land to assure that none is destroyed in the process; (7) classification of the various units of the system according to each unit's principal program function to provide for better planning and policy formulation; and (8) establishment of a National Training Academy to educate and train personnel of the system, as well as those employed in state conservation agencies, in ecological processes and modern managerial techniques.

At the present time, no action has been taken on this bill.

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THE SOCIAL COSTS of an indefinitely expanding economy are as serious as the economic and ecological costs. The frenetic acceleration of life brings with it a pervasive anxiety, an unsettlement, an instability in personal and communal life, which are dangerous and which now approach the intolerable.

The complexity of industrial and governmental organizations, and the gigantic size of the managerial institutions required, may already surpass the intellectual powers of the race. Not all the computers in existence can compensate; where human thought is an essential ingredient, they can only compound the problem. And collectivization, the submergence of the person in routine and regimentation, leads to despair, apathy, anger, alienation, sadism, and destructiveness—moods in which the annihilation of life on earth by nuclear holocaust might be welcomed by too many people.

THE PITY of it is that the industrial promise remains. Rightly chosen and used, the industrial techniques offer the liberation of men from poverty, insecurity, a lifetime of soul-breaking toil. Rather than to an indiscriminate and indefinite expansion, however, the management of industrial society must be geared to the real desires and needs of human beings. Among these is the need for leisure for self-development: for education, for the exercise of the skills of artist and craftsman, for the exploration of the arts and sciences, for fruitful social intercourse, and for meditation. To this end, industrial technology should be pointed toward the production of the more necessary commodities, not the stimulation of irrational desires. The norms of industrial operation should be standardization, simplification, and indeed automation, so that men can put the imperatives of commodity production behind them. Production must be stabilized, not only because it has economic and ecological limits, but because personal self-fulfillment demands time and attention which must not be squandered on acquisition.

THE ENFORCEMENT of environmental standards will be helpful in curbing irrational production. High auto emission standards, combined

with fuel price increases resulting from depletion and monopoly, will reduce the size and number of cars, and their dangerous velocity as well, and move us toward public transportation. The internalization of the cost of clean air will increase the price of electricity, which has been too low for a long time, and curb the squandering of energy resources. The last thing in the world which we need in the United States at this moment is to go back to air and water pollution in the name of expanded production and the growth of GNP.

Speaking of autos, we need no more. The heavy public subsidy which industrial countries have given to the private car for three-quarters of a century in the form of enormous hard-road networks must soon be reduced, lest we black-top the world and submerge it in traffic. By the same token, the huge subsidies given directly and unashamedly to the faltering airlines must be scrutinized severely; fuel costs may curb this extravagance if public reason and decision fail. In the revitalization of the railroads, on the other hand, the need for expansion, or for re-expansion, becomes apparent and illustrates the differential nature of the stabilization that must take place. The nation has also been submerged long enough in the lesser gadgetry—the household, schoolroom, office, and personal equipment that has become more of a burden than a benefit, to say nothing of the expense.

THERE ARE ISLANDS of extreme poverty in America. There is widespread malnutrition, even in America. Two-thirds of the people of the world live close to or below the level of constant hunger. These conditions must be changed. Decent housing is a luxury unknown to the majority of men. Even in the United States we cannot build housing for the poor, nor indeed for many who are somewhat better off. An expansion in the construction of good homes, as contrasted with luxury apartments, is obviously imperative. The gap between the rich nations of the earth and the poor cannot be sustained without serious worldwide conflict, economic and even military, and production levels must be raised accordingly in the poorer countries. All this is elementary.

But inevitable nonetheless are the restraints which will be imposed on economic growth by the ecological and economic realities of a finite planet, and even more fundamentally by the realities of human nature, by the nature of men themselves, who do not desire, even if they could, to live for hardware alone.

—Anthony Wayne Smith

HELP PROTECT YOUR PARKS

For many years, NPCA's main interest has been in protecting national parks from destruction of natural values by excessive roads, off-road vehicles, mining, airport construction, overt commercialism, and traffic abuse. Now we are advocating wilderness and other natural preserva-

tion in the national parks, methods of preventing destructive impacts of mass recreation, and additional funding for Park Service interpretive programs. The support of you and your friends through membership and contributions will go far in helping us accomplish these goals.

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