



NATIONAL PARKS & *Conservation Magazine*

The Environmental Journal

January 1974

The Prevention of Pollution from Ships

WHILE most conservationists will hope for the speedy ratification of the International Convention for the Prevention of Pollution from Ships which was signed in London on November 2 by 79 nations, after a conference which lasted four weeks, the document is definitely disappointing in a number of respects.

The problem as it had been stated by the Governing Council of the United Nations Environment Programme in June, was to seek the speedy and complete elimination of the intentional discharge of oil into the seas, and to minimize the probability of accidental discharges.

The United States delegation, which took a commendably advanced position in the Conference, had pointed to the importance of protecting the marine organisms which produce much of our atmospheric oxygen, the oceanic fisheries, the productive estuaries, and beaches and shorelines everywhere.

ONE achievement was that the Convention regulates the "white" oils, as well as the "black" oils. The former include light fuel oil, gasoline, kerosene, and jet fuel. The adoption of a single standard represents an environmental victory.

Basic to the negotiations was the question of segregated ballast. Tankers carry oil one way, seawater as ballast the other. The ballast water is pumped out toward the end of the return journey, and with it residues of oil.

One alternative is to have separate ballast tanks. The decision was for segregated ballast for ships of more than 70,000 dead weight tons contracted for after December 31, 1975, or delivered after December 31, 1979. But many large ships are now under contract, and will be delivered before the last date. They should have been included, and other measures will now have to be taken.

The smaller ships normally carry the light oils. Because the cargoes are changed, they may have to wash their cargo tanks after each voyage. Facilities or discharges will be necessary for this purpose; segregated ballast does not solve the problem.

The United States and the Soviet Union urged that double bottoms be required. Such construction protects against discharges after grounding, and the space between bottoms can be used for ballast. The Conference rejected the proposal.

THE alternative to segregated ballast is the system known as Load-on-Top. During the return journey the oil residues rise and float on the water. Water is pumped out from under the oil for gradual discharge into the sea. It could be retained on board and discharged into shore facilities; this would have little advantage unless the facilities removed the oil before the water was released.

With the Load-on-Top system, the load, or oil, which is on top, remains in the tank after the water has been pumped out, or it can be pumped into an oil tank on the ship, or conceivably into shore facilities. Experience shows that the oil thus reclaimed (aside from being valuable in the fuel shortage) pays for the equipment and the operation of the system. But many companies refuse to use the system.

The Convention requires all tankers to have Load-on-Top capability. Nonetheless the Convention permits the intentional discharge of oil at sea. True, it requires the installation of automatic discharge monitoring and control systems to keep a record of discharges and shut them off when specified limits are exceeded.

BUT THE specified limits leave much to be desired. A discharge of 60 liters per mile will be allowed up to 1/15,000ths of the cargo for existing ships and 1/30,000ths for new tankers. The significance of these standards is merely technical and economic; they have no connection with ecological factors. Adherence to these standards may not protect the general marine environment to any significant extent. They represent a compromise at the Conference.

The Mediterranean, the Baltic, Black, and Red Seas, and the Persian Gulf are designated as no-discharge areas. And no discharge will be permitted within 50 miles of land.

All states agree to require reception facilities for oil at their ports. But no standards are established, and reception could be followed by immediate discharge.

If oil discharges at sea are to be eliminated entirely, as they should be, facilities for washing oil tanks will have to be provided at the delivery port in case cargoes are to be changed, or the return journey is too short to allow oil and water to separate. Washing will take turn-around time, the costs of

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weathered american chestnut trunk
jack jeffers photograph

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COVERS Treasures of the Big Thicket, by John L. Tveten
A dazzling variety of plant and animal life and scenery is on display in Big Thicket country in southeastern Texas. Winter sunrise along a quiet bayou silhouettes trees draped with Spanish moss (front cover). Eight major plant associations have developed in the region during thousands of years of ecological succession. The small-mouthed salamander can be found under fallen logs and among moist leaves (back cover). Reptiles and amphibians proliferate in the Big Thicket, as do more than 300 species of birds and a profusion of mammals and insects. This area has been proposed for many years for some kind of federal protection. (See page 4.)

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THE BIG THICKET

A TEXAS TREASURE IN TROUBLE

*A unique natural area is dwindling away
while agreement is sought on the best
method for protecting it*

article and photographs by
JOHN L. TVETEN

THE BIG THICKET of southeast Texas is a treasureland of biological diversity. Within the Big Thicket can be found every plant community known to exist in the entire southern evergreen forest range. This "biological crossroads," as the Big Thicket is often termed, is a transition area between the moist eastern woodlands, the arid southwest, the tropical coastal marsh, and the central prairie. Plants of the East meet those of the West. Northern species grow next to tropical ones. Such a mixture of plant forms occurs nowhere else. Forests of pine, oak, magnolia, and beech contain world-record trees of many species covered with Spanish moss and flowering vines. Swamps of cypress and tupelo are flanked by stands of giant palmetto. About thirty species of ferns carpet the forest floor. Botanists identify some forty orchids and find fascination in four types of carnivorous plants. The Big Thicket, too, is the land of alligators, bobcats, deer, and snakes. The endangered red-cockaded woodpecker makes its home in the mature pines, and reports of ivory-billed woodpeckers—once thought to be extinct—persist. The now rare red wolf has been reported here.

Transcending the plight of any single endangered species found in the Big Thicket is the threatened extinction of the Big Thicket itself. Big Thicket is perhaps the most ecologically significant region in the United States that remains unprotected, and it is dwindling fast.

The persistent song of the chickadee and the ringing call of the pileated woodpecker are drowned out by the whine of chain saws. The life of an opossum crossing a forest trail is ended by a speeding truck loaded with logs. A wet bog, the home of wild orchids and carnivorous

plants, is drained of water and its diversity of life and becomes a cultivated field. Deer trails beneath towering pines and spreading magnolias are bulldozed into streets for another rural subdivision or secondary housing development.

The relentless destruction goes on and on while the timber industry, local residents, conservationists, bureaucrats, and politicians continue their decades-long search for a mutually acceptable plan for protecting a portion of the Big Thicket for future generations.

From an original virgin expanse of 3.5 million acres before the onslaught by the timber industry in the 1850s the Big Thicket has been reduced to somewhat less than 300,000 acres that have not been destroyed by the chain saw and the bulldozer. The uniquely diverse forest of the Big Thicket is being destroyed and replaced by single-species tree plantations of slash or loblolly pine at a rate of nearly fifty acres a day.

Claims that the Big Thicket is virtually the same today as it was in 1935 or earlier are made because the total number of forested acres, 2,100,000 has remained the same. However, this argument ignores the fact that less than 300,000 acres of this total are of the same varied and diverse character as the original Big Thicket; the remainder of the area is now either a barren desert of slash pine or individual pockets of housing developments. Scientists have said that the monotonous forest of pine plantations in the Big Thicket area cannot support the diversity of mammal, bird, reptile, amphibian, and insect life found throughout the other Big Thicket areas still covered by their native plant species. Pine plantations are operated for the maximum yield of the species



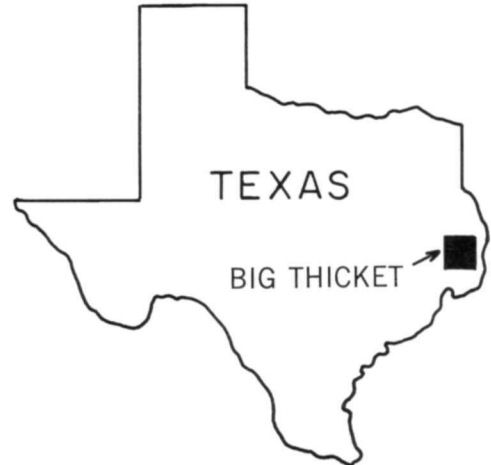
In the areas of the Big Thicket that have not yet been spoiled by man a feeling of peace and solitude pervades. Above, a quiet pond flanked by feathery cypress trees dozes through a hot summer afternoon. At right the wide bases of a stand of tupelo trees are mirrored in a Big Thicket swamp. The area pictured below was once a quiet place where endangered plants and animals made their home. Now the stillness has been disrupted by the roar of a bulldozer clearing pines and oaks for a new subdivision. Such destruction takes place in Big Thicket on a daily basis. And as each new home is built and each new tree is felled, the prospects for preserving even a portion of this remarkable and ecologically significant area are that much dimmer.





BIG THICKET A BIOLOGICAL CROSSROADS

A diversity of animal life is found in the Big Thicket. At left a little blue heron perches atop a tree and displays his nuptial plumage. The copperhead at center has such effective camouflage that he poses an ever-present danger around fallen logs and in dry leaves. The Virginia opossum, bottom left, is the only marsupial found in North America. This species is a common sight throughout the Big Thicket region. A baby fox squirrel searches for food in an old stump in the picture at top on the opposite page. Center right a palamedes swallowtail rests on the sand. This butterfly is one of seven species of large swallowtails readily found in the Big Thicket. The Carolina chickadee below and right is just out of the nest and has some growing yet to do, but there is no question as to its identity. The fight to save Big Thicket is a fight to save the habitat of the many animals, birds, reptiles, and insects that live there. Because there is such a variety of life in the Big Thicket, the area is an invaluable study ground for scientists and students. In addition to being the home of the animals pictured on these pages, Big Thicket is the home of two endangered species—the ivory-billed woodpecker, once thought extinct, and the red-cockaded woodpecker.



planted to the nearly total exclusion of other plant life, with the possible exception of some grasses.

The effort to ensure preservation of at least a part of the Big Thicket has been a study in futility and frustration. The concept of a Big Thicket National Park goes back at least as far as 1927 with the formation of the East Texas Big Thicket Association. Upon conclusion of a biological survey of the region in 1938, local conservationists and state politicians conceived a plan to preserve 430,000 acres of wooded land in the region. In addition, the National Park Service concluded its own study in 1939 and recommended inclusion of the Big Thicket in the national park system. However, the outbreak of World War II interrupted normal congressional activities, and the recommendation fell by the wayside.

It was not until the early 1960s that the Big Thicket park concept again began to gain strength. The Department of Interior's 1961 West Gulf Coastal Plain Type Study again recommended consideration of Big Thicket as a possible addition to the national park system. The



Big Thicket Association of Texas was formed in 1964 out of the remains of the old East Texas group, but it seemed that the new association's efforts would be lost in the depths of Texas politics when former governor Price Daniel, a park supporter, was defeated by John Connally, a man known to be sympathetic to the timber company interests.

It is probable that the Big Thicket park concept would have been forgotten had it not been for the timely intervention of the federal government, primarily in the person of former Texas senator Ralph Yarborough, one of the few successful conservationist-politicians in Texas history. He introduced a bill in October 1966 to establish a Big Thicket National Park not to exceed 75,000 acres—later increased to 100,000 acres. However, at the same time the National Park Service was concluding a study of the region in which they recommended a 35,000-acre "string of pearls" park of widely dispersed tracts that represented the various plant communities and would be connected by scenic highways.





Big Thicket is not only the home of rare and unusual animal life, it is also the meeting place of northern and tropical species of plants and of arid species of the West and plants found in moist eastern woodlands. At top are water hyacinths whose shiny green leaves cover many of the bayous and ponds in the area. The pitcher plant, center, is one of several kinds of carnivorous plants that can be seen; the tall pitcher stands waiting quietly for lunch to come along. The delicate fringed orchid at left is one of approximately forty species of orchids that dwell within Big Thicket.

The lumber companies immediately endorsed the plan and began to campaign for the smaller park in an effort to undercut Senator Yarborough's bill. Conservationists' jubilation at this new apparently affirmative stance of the lumbermen ended when they realized that the 35,000-acre concept was not ecologically feasible for preservation and when they recognized that the lumber companies had stepped up cutting schedules and were even cutting over some of the areas that had been endorsed for preservation.

Senator Yarborough campaigned vigorously for passage of a Big Thicket National Park bill until he left the Senate in 1971. As a result of his efforts a bill finally had passed the Senate on December 16, 1970, but Congress adjourned before Congressman Bob Eckhardt's similar bill could make it through the House. From that point to the present several diverse Big Thicket bills have been introduced, including a total of ten separate bills in the ninety-second Congress. Among these bills was Congressman Eckhardt's 191,000-acre park proposal, which was well conceived and ecologically sound, though it never received serious attention.

Recently, during the ninety-third Congress, the House Parks and Recreation Subcommittee reported a Big Thicket bill that apparently has the support of the National Park Service. The bill would establish a protected area of some 84,000 acres to be called the Big Thicket National Biological Reserve. The bill seems to have the support of the Office of Management and Budget, a seemingly necessary prerequisite these days. Many local as well as national conservationists still hope that the acreage to be protected can be increased to at least 100,000 acres. Establishing a "biological reserve" seems to be a compromise between the absentee timber company owners and the real estate developers on one hand and the National Park Service and conservationists on the other. The timber interests have been very effective in resisting the establishment of a large single tract as a national park in East Texas. Yet they have recently begun to realize that the pressure for some form of protection in the Big Thicket is inevitable. The reserve concept embodies the designation of seven tracts of several thousand acres each connected by ribbons of land following stream basins. This "string of pearls" concept protects worthy tracts essential for preservation of the unique character of the Big Thicket as well as the streams essential to the life of the Big Thicket ecosystems. The main purpose of the reserve would be to preserve outstanding representative sections of the Big Thicket for scientific study rather than to provide solely for outdoor recreation opportunities.

The Big Thicket of East Texas deserves to be seen and savored by all who love the world around them. It can be saved only by a concerted effort of all who share these values—or it may be destroyed by those who do not. ■

John L. Tveten holds a Ph.D. in organic chemistry. He presently works as a freelance nature photographer and writer. He has photographed wildlife across much of North America as well as in Mexico and parts of South America. His Texas residence provides ready access to the Big Thicket where he spends much of his time photographing the plants and animals found there.

BEGGARS AND BUMS



A burro solicits a handout from Phillip McNeil at Custer State Park, South Dakota.

RICHARD McNEIL

IN OUR

by RICHARD McNEIL
& ANNE LaBASTILLE

Artificial feeding of wildlife in
our great natural areas creates many
unnatural problems . . . and dangers

NATIONAL PARKS AND FORESTS

Simultaneously last summer Dick and his family traveled halfway around the world to see wildlife, and Anne stayed put at a cabin near a large state park writing about wildlife. Simultaneously last summer Dick carried his youngest child screaming to a doctor after she was kicked by a feral horse in New Forest preserve, England, and Anne patched up a friend who was grazed by a whitetail deer's hoof while she was feeding it bread crusts at a campground. Simultaneously last summer Dick had to rescue his eldest son from attack by a red deer at a wildlife reserve in Scotland, and Anne watched a tourist with camera almost get clawed by a bear in a park garbage dump.

Such events are common occurrences nowadays in national parks and equivalent reserves and sanctuaries all over the world. When wildlife and people meet on a no-hunting, no-trapping, no-fishing basis, curious relationships develop. Wildlife loses its wildness, and people promote its tameness.

The fact is that most wild public recreational areas are filled with animal beggars and bums, and the humans who come to see them are being cheated in a subtle and insidious fashion. They are not only cheated, but misinformed and miseducated, mauled and bitten, infected and frightened.

Perversely, it is the humans who are causing this rapidly growing problem. Most people visiting national parks and forests set up a situation resembling a welfare state among the local animals. They offer free food, handing out, for example, bread to deer, bananas to monkeys, marshmallows to bears, crackers to trout, chocolate to alligators, and sandwiches to seagulls. By giving them food, people dull the animals' natural instinct to forage for survival, and they minimize ancient predatory urges. Animals generally obey the law of conservation of energy. Inevitably they choose the easiest way to obtain food. Why should a bear spend all day picking berries, ripping apart logs, seeking out grubs,



RICHARD MCNEIL



ANNE LABASTILLE

and scavenging river banks when it can simply stand by a road or in a dump to receive dinner?

There are also reduced environmental pressures in national parks, sanctuaries, and reserves that tend to increase the numbers and variety of beggar animals. When hunting, trapping, and in some places fishing are prohibited, these human predation pressures are eliminated. Less predation may lead to decreased wariness and wildness and reduced mobility, which makes it easier to approach wild animals and to turn them into beggars.

What kinds of animals become bums? We assembled a list based on our respective travels, which have covered a good share of the earth. Some prime examples are the bighorn sheep of Banff National Park in Canada that hug the highway, causing even Greyhound buses to halt so that travelers may feed and photograph the sheep. The polar bears of Churchill, Canada, have recently taken to prowling dumps for scraps rather than stalk the ice floes for seals. Canada jays and Clark's nutcrackers in Rocky Mountain National Park literally besiege picnickers and campers in their efforts to panhandle. Wapiti elk in Yellowstone hang out around hot springs where tourists are quick to offer food. Bears raid garbage cans in many parks from Shenandoah and Great Smoky in the East, to Rocky Mountain, Yosemite, and Glacier in the West. At Waterton Lakes National Park in Alberta the herbivorous mountain goats, ground squirrels, moose, and

Top, a mature deer submits to petting at National Bison Range, Moiese, Montana. Center, a photographer foolishly approaches a black bear, degraded to a life as a scavenger of garbage. Below, the usually elusive bighorn sheep accepts food offered at Jasper National Park, Alberta, Canada.



RICHARD MCNEIL

mule deer have become accustomed to seeking out generous visitors instead of vegetation. Wild boars emerge from the forest in the Netherlands Hoge Veluwe park to beg along the roadsides. In Florida's safari parks, monkeys reach through wire fences for handouts rather than through tree branches for fruits. In Singapore's public parks wild monkeys are bold enough to walk right up to park visitors. Chachalacas at Santa Ana refuge, Texas; parrots on Kapiti Island and rainbow trout at Rotorua in New Zealand; néné geese at the Wildfowl Trust in England; purple gallinules in the Everglades—all these have learned to beg.

In short, many different mammals, birds, reptiles, and fish have become bums and beggars. The animal species most likely to succumb to this condition are herbivorous or omnivorous, terrestrial or semiaquatic, and usually nonmigratory types. These species seem to find it easiest to develop a dependency on man.

Many of us have known the tremendous thrill of observing a wild animal at close range. And we may have



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Top right, at Glacier National Park, Montana, Phillip McNeil feeds a Colombian ground squirrel, a well-known beggar in many parks. Center, American bison accustomed to man's presence have at times charged photographers crowding too close. Bottom right, although the fawn is cute now, as a mature beggar it could inflict severe injury with its hooves. Below, the Clark's nutcracker is a familiar beggar at many a campground table.



ANNE LABASTILLE



used an artificial lure to detain the creature while we admire, record, snap, smell, or listen to it. We rationalize this action by saying, "I came so far and never saw this particular animal before, and if I can just snap one picture. . . ." So we throw a candy bar to the coyote and change the F-stop on the camera lens. We may justify our handout with, "How great for the kids to see a real wild whatever. They've never been away from the city before and have been reading all about this in school." And some of us awestruck wildlife enthusiasts go all the way to Africa only to stand behind steel rails in Addo National Park and watch elephants coaxed near with baskets of rotten oranges.

By turning wild animals into beggars, we certainly do enjoy and learn from them. Such close observation might be the single most memorable experience in our lives of really "being close to nature." We may notice behavioral traits, physical beauty, or muscular power that renew within us a respect and reverence for life in its many forms. A child may form a lifelong interest and dedication to conservation or zoology by seeing "tame" wild animals close up. Would it be right to deprive people of these learning opportunities?

A strong argument exists for denying this experience. This statement refers to animals in natural areas, not to the birds at suburban bird feeders or to squirrels in city parks. An important ethical argument is that our behavior causes a loss of dignity to wildlife. A "kept" animal is a degraded animal. It has lost a degree of independence and prowess by accepting favors from humans. Very many degraded specimens make for degraded nature. By adding the human factor to a natural area's functioning, the ecological balance and food web may be disturbed.

Another argument against creating dependency in wildlife in natural areas is that this practice grossly misleads people about the nature of wild creatures. Visitors to national parks may believe that the main purpose of the park is to protect the "tame" animals, not to perpetuate nature in its wild state. Tourists begin to think that the normal habitat of bears is garbage dumps and campsites. City children may mistakenly assume that the diet of birds, rabbits, and deer is bread, carrots, and crackerjacks. Both kids and adults can assume the distorted belief that any wild animal is cuddly, safe, a friend of man—a dangerous view if one tries to touch! More important, the public may never realize the presence of predation and its very necessary and useful function. By failing to learn of the very real struggle for survival that faces every species and in which it must succeed or die, people are deprived from formulating a realistic attitude about life. This more realistic attitude, which if extrapolated from wildlife to human existence, could perhaps ease some of our own struggles in life. Whether or not a person arrives at such a philosophical view from observing wildlife, it remains true that he or she is cheated when confronted with animal bums.

A practical reason against creating "tame" wildlife is that such animals are more likely to kill or injure people because they are in closer contact with them than wild

animals are, and they have lost their innate fear of man. Temperate-zone national parks and forests sustain dozens of accidents each year, mainly from bears mauling and deer kicking people. Visitors to tropical parks and sanctuaries may suffer monkey or parrot bites. Pecaries, elephants, and lions are also unpredictable when semitamed.

Occasionally, disease and parasites may be spread to humans from wildlife contact. Rabies, which affects any warm-blooded animal, is a real danger. Plague, which can be carried by those cunning little ground squirrels and prairie dogs, is also a serious disease. Tularemia and Rocky Mountain spotted fever may occasionally be picked up from hares and rabbits, woodchucks and chipmunks, to name a few vectors. Ornithosis, or parrot fever, is carried by some parrots, parakeets, and lovebirds. Any number of fleas, ticks, lice, mites, and other insect parasites afflict wild animals. Only rarely, though, could a person pick up these pests without intensive handling of the animal.

It would be difficult to remove all animal bums from the national parks and forests and reserves of the world. It might not be wise in every case. But if an effort is made to cut down on wildlife welfare, strict laws prohibiting people from feeding animals will have to be passed and enforced. Administrators must provide better management and control over garbage dumps, campsites, parking lots, and other spots where people and bums usually meet. When artificial feeding ceases, most beggars will revert to normal feeding behavior. However, potentially dangerous chronic beggars will have to be carried off and deposited in backcountry where people seldom go.

A far more effective measure, in our opinion, is public education. Humans must be taught that animals have rights, too, and that visits to their habitats demand good manners. A visit to a national park or forest does not automatically mean that one will have a close look at wildlife. In natural areas, most animals are afraid of people and shun their presence. Therefore considerable walking and searching may be necessary to enjoy the sight of a truly wild creature, which is as it should be.

The act of feeding and taming a wild animal is contrary to the good of the species and the good of the ecosystem. Only when visitors and administrators realize this fact and act accordingly can we stop the growing numbers of beggars and bums in our national parks and forests and reestablish an ecologically sound state before these new behavioral patterns become genetically entrenched in our wildlife. ■

Dr. Richard J. McNeil, zoologist and wildlife scientist, is Associate Professor of Natural Resources at Cornell University. He has traveled abroad extensively and has worked and studied in several foreign countries. **Dr. Anne LaBastille** is a wildlife ecologist whose interests include rare and endangered wildlife, especially in the areas of Central America and the Caribbean. Research trips have taken her to Central America, the Caribbean, Washington, D.C., and to the Adirondack Mountains of upstate New York. Back-packing, camping, canoeing, and scuba-diving are her favored sports.

POWER FROM THE SUN

a new look at an old idea

Solar energy deserves more attention
as a promising source
of plentiful, clean, safe energy



by MICHAEL ALLEGRETTO

NEARLY EVERYONE is aware that man's reliance on fossil fuels as sources of energy is excessive and in the long run dangerous. Burning fossil fuels for heat and to generate electricity leaves a legacy of pollution that is harmful to people's health and is annoying to their esthetic sensibilities. Of the several fossil fuels only coal remains in enough supply to last more than a few hundred years at best, but it will not last without enormous strip mining operations to retrieve it. Nuclear reaction, touted as the heir apparent to the fossil fuels, is rife with safety problems and could be the most dangerous process yet conceived by man.

Is damage to the biosphere a necessary byproduct of power generation? Perhaps not. A possible—and conspicuous—alternative energy source is available: our sun.

Utilization of the sun's energy is not a new idea. In 212 B.C. Archimedes, aiding in the defense of Syracuse, set fire to Roman warships with sunlight reflected by an array of mirrors. A more peaceful application of Sol's power was developed in 1615, when a man named de Craux built a solar engine. This device worked on the principle that air heated by the sun's radiation will expand and exert pressure. In 1872 Charles Wilson constructed a solar-powered still in Chile. It supplied miners with 5,000 gallons of fresh water a day at no operating expense.

Around the turn of the century an abundance of solar research was in progress. By 1915 the U.S. Patent Office

had registered over a hundred solar inventions. But these devices did not challenge the popular steam engine, fueled with plentiful coal supplies. Nevertheless, limited progress was made, and today a variety of sun-powered devices exist.

Solar cookers are inexpensive and widely distributed in Japan and India. Made chiefly of aluminum and about the size and shape of an umbrella, the cooker focuses sunlight onto a grill. Food is cooked or water boiled with no soot, smoke, or ashes. The device, however, can be operated only during the day.

Resembling a cooker, though much larger, the solar furnace can easily attain temperatures in excess of 3,000° C. Hundreds of these furnaces find use in the United States and France, mainly for high-temperature tests. One, built by Dr. Felix Trombe for the French government, spans thirty-five feet and is sometimes used as a smelter and for "fixing" nitrogen out of the atmosphere for the production of fertilizer.

Solar water heaters were numerous in California in the 1930s and can be found today in areas remote from convenient gas supplies. Outside the house blackened pipes absorb solar radiation and transfer the heated water to a storage tank by means of thermosiphon circulation, the same process incorporated in a home water heater.

An especially useful application of solar energy is home heating and cooling. About 25 years ago M. Yanagimachi, a Japanese scientist, designed and built his own

house to be heated and cooled year-round by the sun. A six-by-ten foot black metal collector, covered with glass panes, is mounted on the roof. Solar flux soaks into the metal and is trapped by the glass, creating a greenhouse effect. Water circulating behind the collector gathers heat and stores it in a forty ton tank or releases it into the house on cold days. In summer the heat operates an absorption-type refrigeration unit that cools and dehumidifies the air. Other individuals have developed similar prototype systems. Dr. George Löf, for example, built a home in Denver in which solar heat is stored in cardboard cylinders filled with pebbles.

Building a solar heating system into a house is estimated to add about 10 percent to the construction cost. The extra expense is likely to be more than matched by savings in fuel purchases, especially because fuel costs are likely to rise substantially within the next several decades. Another cost factor is the necessity of installing a back-up conventional heating system. Current technology can store up to only about four cloudy days worth of heat. Operating a solar air conditioning unit is cheaper and cleaner than conventional methods; but because of the initial high cost, these units are not being mass produced.

THESE HEATING AND COOLING DEVICES make direct use of the sun's energy. Indirectly, the sun can be made to generate electricity. The implications of this fact are far-reaching, for electricity probably is the most convenient energy form.

The Environmental Action Committee of Colorado has made a comprehensive analysis of a thermal converter pilot plant. Basically the plant consists of a reflector, a boiler, and a typical steam turbine generator.

The reflector is a parabolic dish, twenty meters in diameter, composed of ninety-five triangular aluminum sheets. The boiler, two feet high by two feet in diameter, is secured at the focal point of the parabola. The two components are mounted on a yoke-type equatorial tracker to maximize focusing of the sun's rays. The heat is sufficient to produce steam, which is used to power the turbine and generate electricity. The steam can be stored in the form of superheated water under atmospheric pressure. When the pressure is removed, the water will boil into steam. The system also is cooled by water, which circulates back to the boiler, increasing efficiency and virtually eliminating thermal pollution.

This plant, which can be built today with available materials and construction techniques, would generate 2,200 kilowatt hours per day, enough for several dozen fully electric homes. It would cost \$24,000, with an additional \$10,000 required for maintenance over a thirty-year period. Thus, electricity from the pilot plant could be purchased for 0.3 cents per kilowatt hour. At present Colorado Public Service pays 0.4 cents per kilowatt hour for *fuel alone*.

On a grander scale are the three following solar-powered electrical systems. The major drawback they have in common is prohibitive cost. Technological advancements must be made for these systems to become economically feasible.

LAND Dr. Aden Meinel, director of the Optical Sciences Laboratory at the University of Arizona, and his wife, astronomer Majorie Meinel, envision an array of sun-powered turboelectric plants in the desert areas of the Southwest. The first plant, using flat-plate collectors and salt storage of heat, would produce 1,000 megawatts of electricity and distribute it through cryogenic superconducting transmission lines. It would cover about two square miles and cost \$700 million. Eventually 1,000 of these powerhouses would be constructed for a total electrical output of one million megawatts, which, if distribution problems were solved, would meet the needs of the entire country.

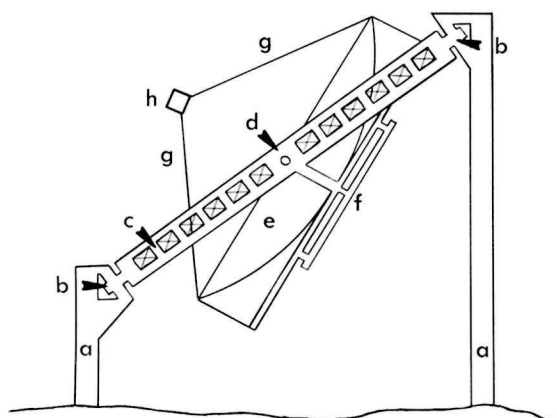
SEA Over 70 percent of the earth's share of solar radiation falls on the oceans. A number of scientists have suggested ways to use the sea for both collection and storage of energy. Consulting engineers Hilbert Anderson and James Anderson, of York, Pennsylvania, are leading proponents of sea thermal energy (STE) plants. The STE approach utilizes the temperature differences between warm surface sea water and the cold water in the ocean depths. Hot sea water is applied to make a "working fluid"—ammonia has been most commonly used—expand and turn a turbine to generate electricity. Cool ocean water is then used to condense the fluid so the process can occur over again. Although research has been going on for nearly a century—Frenchman Jacques D'Arsonval in 1881 was one of the first researchers—a new generation of effort is considered to be necessary to develop the STE principle to a practicable state.

OUTER SPACE A breathtaking vista is proposed by Dr. Peter Glaser of the Arthur D. Little research firm. He suggests orbiting two twenty-five-square-mile solar energy collectors. The collectors would change the sun's flux to electricity, thence to microwaves. The latter would be beamed to earth and reconverted to 10,000 megawatts of electrical power. What makes Glaser's system unique is that no generating turbines are required. His collectors are composed of solar cells, which directly convert solar energy to electricity.

Solar cells, used in camera exposure meters and space vehicles, are made from silicon, have no moving parts, apparently do not wear out, and cause no pollution. But they must be handcrafted and are expensive (about \$4 per square inch).

The potential of these solar cells for use on earth is tremendous. Consider the fact that one square yard perpendicular to the sun receives one kilowatt hour of solar energy every hour. The solar power which falls on Lake Mead, for example, is five times greater than the electric power generated by the Boulder Dam hydroelectric plant.

At present solar cells have an efficiency of from 6 to 10 percent. But 14 percent efficiency has been achieved in laboratory experiments, and efficiencies up to 50 percent have been theorized. Research is being done to make these cells economically practical.



SOLAR THERMAL CONVERTER

- a. Equatorial tracking system supports (north-south alignment, daily motion)
- b. Pivots
- c. Yoke truss structure
- d. Reflector-yoke gimbal
- e. Reflector
- f. Radial reflector support
- g. Boiler supports
- h. Boiler

The diagram is simplified and does not show pipes, generator, or storage tank. Solar Electrification describes this system thus: "Water is circulated through the system by a series of pipes. The water enters through the aluminum pipes under the reflector sheets, where it carries off the heat absorbed by the reflector. From here it is piped . . . to the tubing of the boiler. The outside of the boiler inner wall is covered with copper tubing arranged in an ascending spiral, and the roof of the boiler is covered with pipes of progressively higher alloys of stainless steel. When it reaches the boiler roof, the water is heated to steam and can be piped off to a conventional steam turbine."

William Cherry of NASA's Goddard Space Flight Center foresees a machine for coating thin sheets of material to be used as solar batteries. Mass production could lower the cost of the sheets to fifty cents per square foot. And Tyco Laboratories in Waltham, Massachusetts, has developed a process for producing small quantities of cells by ribbon-crystal growth. This process may shrink costs about 300-fold.

Cadmium sulfide solar cells may be our best hope for electrical conversion in the near future, according to Dr. K. W. Boer, director of the Energy Conversion Institute at the University of Delaware. Dr. Boer envisions shingling rooftops with these cells to provide electrical power for the home.

The United States is not the only country researching applications of solar batteries. On a recent visit to Russia Paul Rappaport of the David Sarnoff Research Center saw large-scale experimental solar cell energy farms. Russian scientists told him they have operated solar-cell-powered pumping stations in municipal water systems.

Britain and Germany are using solar cell arrays in satellites. And the Centre National d'Etudes Spatiales (France's space agency) is working on experimental cadmium-sulfide and cadmium-telluride cells.

WHY NOT NOW? L. S. King of the Centralab in El Monte, California, says a nationwide solar energy program could be developed by spending \$30 to \$50 million annually (equivalent to the cost of two 747 airliners).

Several obstacles lie in the path of such a program. The first is psychological inertia on a national scale. Though we as a nation are aware of a problem (increasing need for a source of clean power) and a potential solution (solar energy), we lack the motivation to act. But this kind of inertia can be overcome, as the success of our Apollo program testifies.

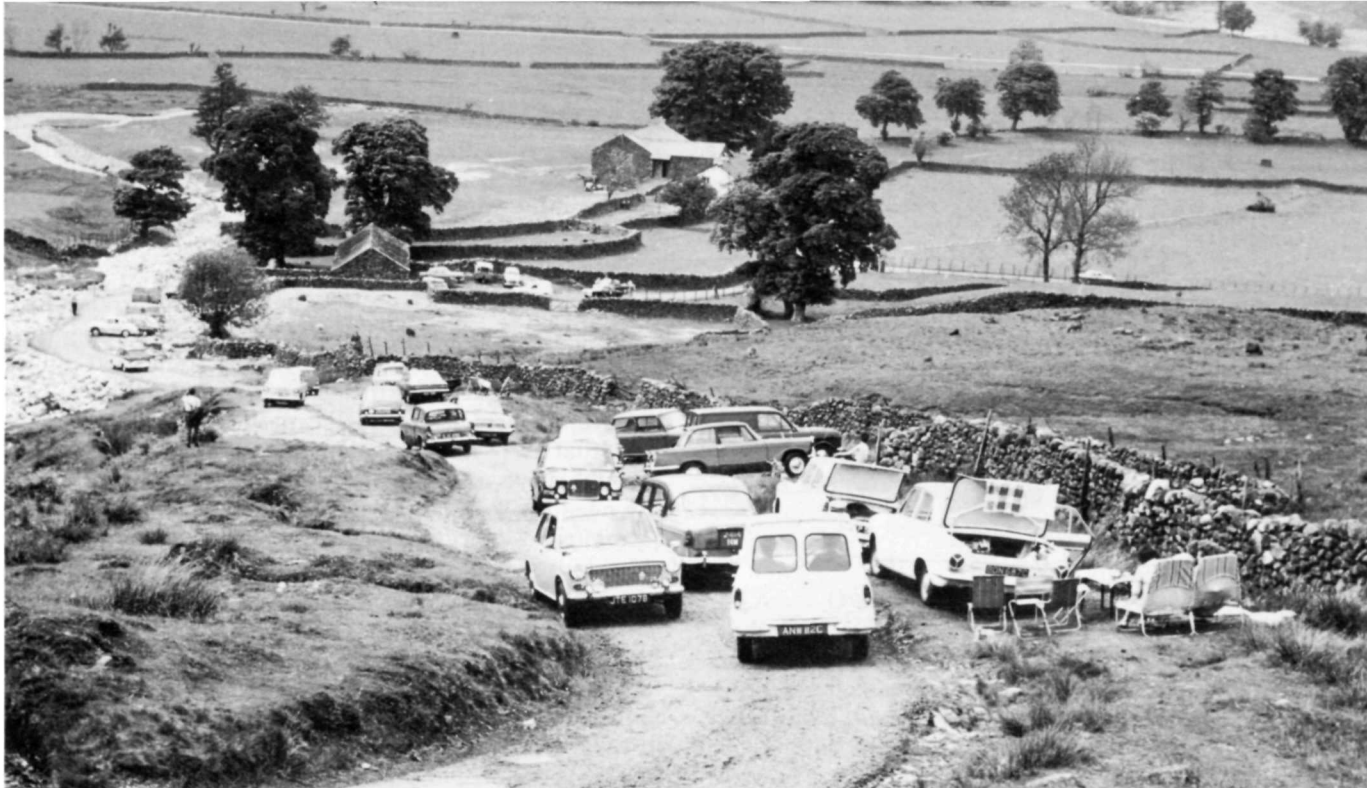
The next hindrance is finance. Although private industry is reportedly funding solar energy programs, the two major suppliers of capital for research and development (R&D) of alternative energy sources in this nation are the federal government and the electric utility companies. For fiscal 1973 the government has allocated over \$300 million for peaceful nuclear R&D and a trifling \$6 million for solar energy. Although billions of federal dollars have been channeled into the nuclear effort over the past twenty years, nuclear power generation has yet to prove to be an economically viable process. (It also has yet to prove to be a safe process, but that issue will not be addressed here.) Solar power—like other promising energy sources—has received and continues to receive such scandalously low federal support largely because solar power, it is said, is not technologically available for large scale application. Until the funding priorities are changed, however, it is unlikely that solar energy ever will be fully developed for widespread use.

A look at the electric utility companies is not much more encouraging. They currently spend eight times as much money to advertise increased consumption of electricity as they do for R&D of alternative energy sources. These companies are content to operate plants such as the infamous Four Corners power plant, which is fed by the largest strip mine in the world and daily vomits forty-nine tons of dirt into the air.

The final obstacle is direct opposition from the "energy industry." This powerful force is composed of coal, gas, and oil conglomerates. Its economic interest lies in the exploitation of fossil fuels. Turned loose this industry would ravage Alaska for "precious" oil and destroy vast wilderness areas with nightmarish strip mines.

Such environmental rape simply is not necessary. We have at hand a prolific source of clean, safe energy. The sun is, in fact, the source of life itself, and it was worshiped by the ancients as a god. The very life styles of these individuals were influenced by the sun. Can we not do the same? Let us follow their primordial ways and gather our power from this fiery deity. ■

Michael Allegretto is a citizen concerned about environmental mismanagement. He has a background in chemical engineering from the Colorado School of Mines and works closely with the Environmental Action Committee of Colorado.



Uncontrolled traffic on a summer weekend in the Lake District National Park.

GEOFFREY BERRY

The Auto and British National Parks

by NICHOLAS POLE

A balanced transport system using railway and buses and limiting the use of private autos is needed to relieve congestion in the national parks

The industrial countries of the west are having a passionate affair with the automobile, but one that must be relatively brief. It is only since the mid-fifties that private car ownership began to grow at an extraordinary rate, and now by the mid-seventies we realize that our current rate of increase in energy consumption cannot continue. In Britain, just as in the United States, the energy crisis is now recognized as one of the major problems of the next decade. When already opposed to the car on grounds of congestion, urban disruption, accidents and pollution, it is tempting for the environmentalist to gleefully accept the bland conclusion that we are "running out of energy."

Yet even if the present crisis is really only a problem of shifting from an overwhelming reliance on oil to a wider range of energy sources, the fact remains that if oil becomes a luxury in the next twenty years, then the internal combustion engine will become a thing of the past. We will have to shift a lot of our transport load from cars and trucks to buses, railways, and bicycles. And yet, while the United States government makes tentative efforts at revitalizing its railroads through Amtrak, the British government still thinks that if railways don't pay they should not run.

Over the past twenty years hundreds of rural rail routes have been closed in an attempt to make the main lines run profitably. Cutting off a tree's branches will not make its trunk any healthier; but this is the theory that has been applied to British Rail. The closures have brought serious hardship to the small villages of the English countryside, especially because private bus companies have also begun to cut back their rural services. But an equally important result is that easy access to the countryside by public transport is gradually being denied to urban families.

The implications of this are grave, for in Britain barely half of all households own or use a car, yet cars account for 75 percent of all recreational travel. Even before considering the disastrous effects that unrestricted use of cars is having on national parks, it is obvious from these figures that the role of the car in recreation must be limited if adequate public transport facilities are to be maintained and if the right of non-car-owning families to reach the countryside is to be preserved.

Car ownership is still growing extremely fast in Britain and at present rates would double by the year 2000. The government is busily coping with this demand by building a national network of motorways that when complete

will bring millions of motorists within a few hours drive of one or more of the national parks. Visitors to Dartmoor, for example, are likely to double by 1981 and the number of motorists within three and one-half hours drive will increase by 385 percent. The motorways could therefore have a significant impact on the nature of recreational motoring.

At present, the distance traveled on weekend trips in Britain is usually much less than in the United States. Thirty-eight percent of weekend trips are under 50 miles round-trip and only 27 percent are more than 100 miles. One study, in fact, found that "all surveys emphasize the reluctance of the British recreational motorist to utilize fully the very great potential mobility given him by the car." Given the usual nature of the British motorist's pleasure trip, this is not surprising. It has been defined as "a rather aimless drive through what are hoped will be pleasant roads and views in order to picnic and enjoy the beauty of the countryside without having to take an appreciable amount of physical exercise"; in other words, cruising around and enjoying the scenery. In Britain you never have to go far to reach open fields and narrow country lanes, and even London is surrounded by an undeveloped "green belt." But with the motorways it will become more tempting to take the car farther and "cruise around" in the spectacular scenery of one of the national parks.

The growing ownership and use of cars, and the increasingly easy access to national parks have of course combined to produce unprecedented congestion in areas of great natural beauty—congestion that is aggravated by the clearly defined peaking of pleasure trips on Sundays and at the summer holiday season. The costs of this congestion do not fall on motorists alone, although their enjoyment is ruined as much as anyone's by the noise, fumes, and visual intrusion of "other peoples'" cars. Besides bothering farmers, motorists spoil the pleasure of

walkers, horse riders, and cyclists, and are a serious threat to their safety. Furthermore, the growth of recreational traffic, even though it is not a year-round phenomenon, induces local authorities to increase road capacity, disfiguring country lanes by applying current highway design standards.

Obviously, even at its present level, recreational traffic is one of the most serious threats to British national parks. The government's advisory agency on the parks—the Countryside Commission—recognizes this and traffic management experiments have become an increasingly important part of its work. But the Countryside Commission is itself subordinate to the Department of the Environment (a title which has become ironic to British conservationists in the few years since its creation), which still believes in a car-dominated transport system. Furthermore, administration of almost all the national parks is in the hands of local county councils whose main concern is for their residents. Because tourism is the dominant industry in many national park areas, the local councils are more anxious to widen roads and welcome more cars than to preserve the natural beauty these tourists come to seek.

Officials of Dartmoor and Exmoor, the two national parks in England's southwest peninsula, have suggested strategies to deal with the expected doubling of motoring tourists by 1985. These suggestions simply involve providing car parks, lavatories, and picnic sites at the main centers of attraction while discouraging drivers from entering the "Quiet Areas" by advisory signposting. If such proposals are adopted, the hapless motorist soon will find the main tourist routes cluttered with cars, and is bound to drive off in search of less congested scenery. Signs telling him that roads off the main route have not been improved are not likely to discourage him—indeed, he may interpret them as a sure way to get off the beaten track. It is doubtful whether such schemes are even a

Tarn Hows in the Lake District National Park, Lancashire County, northwest England.

BRITISH TOURIST AUTHORITY



small step in the right direction, for the solitude of the Quiet Areas is retained only at the price of sacrificing the main attractions to the demands of the motor car.

By far the most encouraging traffic management experiments have been the park-and-ride schemes, notably one initiated by the Countryside Commission in the Peak District National Park. The Peak Park, on the Pennine Hills close to the industrial heart of England, has the highest number of visitors of any of the ten national parks, and also has its own highly efficient and imaginative planning board. An experimental park-and-ride project was run for two years and is now a permanent feature. Motorists arriving at Goyt Valley, a popular wooded area next to a large reservoir used for sailing, park their cars at the approach to the valley and transfer to a minibus that takes them in on otherwise traffic-free roads. The public's favorable reaction to this project has proved that if a scheme is carefully prepared motorists will gladly accept restrictions on the free use of the car in the countryside. Visitors welcome the possibility of combining a walk with a minibus trip, and are freed from the need to retrace their steps to their cars. The result is that they stay longer, do more walking, and are able to feel a much greater involvement with the country than if they had simply been looking at it through their car windows.

Another park-and-ride experiment was run by the British Automobile Association during the summer of 1972. At three well-known beauty spots throughout the country the same car parks and minibus solution was applied, and even though an average of 85 percent of the motorists arriving at the experiments had no knowledge of them beforehand, the majority felt that their day had been improved by them. One visitor commented that "people would soon accept this sort of thing as normal if it ever becomes permanent."

A problem that remains in British park-and-ride experiments is the type of vehicle used. The standard twelve-seat minibus is far from ideal—it is cramped, its windows are small, and it emits unpleasant diesel fumes. However, the larger, forty-one-seat coaches appear out of place in narrow country lanes. No British traffic experiment has yet come near the enterprise of the Yosemite shuttle-bus scheme, either in financial outlay or imagination, and there is certainly room for specially designed, propane-powered buses in British national parks.

But at best, park-and-ride schemes can only transfer haphazardly parked cars from the immediate vicinity to carefully chosen parking lots. If the use of cars for recreation continues to grow at its present rate, then the need for such car parks will in itself threaten the beauty of the area. The real need is not only for public transport in the parks themselves, but for a drastic improvement in bus and rail services between the national parks and the main urban centers. In the United States it may be the exception rather than the rule to have a train station in a national park. But in Britain, where the railway boom of the nineteenth century brought inexpensive public transport to the remotest country village, it is a scandal that now three of our national parks do not contain a railway station at all and that even in those that do have rail links the access is often sadly inadequate.

To complement the needed improved public transport

access, numerous schemes to control private vehicle flow have been suggested. Among these are physical constriction of road width (the "hourglass" principle), with car parks available for motorists who would rather take a free bus; loading gauges at entry points to discourage very heavy vehicles; vehicle spacing by automatic barriers; and speed control by use of cobblestones and humps. It would also be possible to offer motorists the choice of paying a toll to reach a main area of attraction or of taking a free bus, the tolls being used to go toward the cost of the bus service.

We can optimistically envisage a truly balanced transport system ten or twenty years from now in which a family wishing to spend a day in a national park could dial a taxi-bus that would take them to the station, travel swiftly to the park by an electrified rail service, and on arrival be taken where they wished by a frequent and efficient parkwide service of specially designed buses. Although problems inevitably arise over carrying picnic baskets, coping with the needs of the elderly and handicapped, and making provisions for off-season use, the whole journey probably could be accomplished just as quickly as by car, and the environmental advantages would be overwhelming.

The Countryside Commission was set up in 1968 with the dual purpose of preserving the natural beauty of the parks and providing for their enjoyment by increasing numbers of visitors. The Countryside Commission is the first to admit that the whole emphasis of government legislation up to now has been to favor the car and almost to ignore non-car-owning families' need for recreational transport. It is through the commission that grants may be made for traffic experiments, yet its present total expenditure amounts to about 2p (5¢) per capita each year. Compared to the \$225 million annual budget of the United States national park system, the Countryside Commission is impoverished. At the moment it has the resources for only a few small-scale traffic experiments, and in its advisory role it has not yet had much success at persuading other park authorities to follow the Goyt Val-

Before and after: Two views of the Goyt Valley in the Peak District National Park, one before traffic management in the park was introduced



ley example. Park administration is due to be revised and made more efficient by sweeping local government reorganization in 1974, but many local authorities are using this as an excuse to delay consideration of traffic control schemes.

While lack of enthusiasm and money among local authorities is a problem, by far the most serious threat to the establishment of a balanced recreational transport system lies in the policy of the British government, which is still heavily biased in favor of the car. The ten national parks of England and Wales take up 9 percent of the total land area. In such a densely populated island as Britain the needs of recreation and conservation are bound to clash frequently with the demands of industry and development, but in most cases the Department of the Environment decides in favor of development. British national parks have no automatic protection from this; their designation as national parks is supposed to act as a check on the more incongruous forms of development, but this safeguard is by no means comprehensive or satisfactory. Thus the Department of the Environment has been able to approve plans to build a high-speed industrial route through the Lake District National Park and is now considering a motorway through the Peak District to link the industrial centers of Manchester and Sheffield. Meanwhile, the environmental lobby's demand that freight be transferred from new roads to already existing railways has been largely ignored. In this respect the outlook for British national parks is grim.

One of the most overworked phrases of the past few years has been "if present trends continue." Fortunately, it looks as if they won't. Britain is taking its energy crisis rather more sedately than America, because of new oil reserves discovered in the North Sea. Even so, it took the recent conflagration in the Middle East to shock the government out of its extraordinary complacency, and people are now talking seriously about a gradual shift from roads back to rail and public transport. We can be sure that in the long run such a move will have to be made; but in the immediate future a great deal of dam-

and one showing the result of closing the valley to all private cars. Minibuses now take visitors from special car parks along traffic-free roads.



British National Parks:

- | | | |
|--------------------|---------------------|-------------------|
| 1. Northumberland | 4. North York Moors | 7. Brecon Beacons |
| 2. Lake District | 5. Snowdonia | 8. Pembrokeshire |
| 3. Yorkshire Dales | 6. Peak District | 9. Exmoor |
| | | 10. Dartmoor |

age could still be done to national parks by providing facilities for the enormous potential flood of recreational motorists. It is congestion, of course, not fear about oil shortages, that has led to the park-and-ride experiments; but we cannot let congestion simply be its own control. What we need in Britain is a total ban on private cars in well-known beauty spots and severe limitations on cars in the national parks as a whole, providing alternative transport at such sites and for access to them. These measures would both enhance the visitor's enjoyment of the parks and work toward a badly needed change in our social attitude toward the private automobile. ■

Nicholas Pole is the director of the Cambridge University Transport Research Project, which recently produced a report called "Recreation Traffic in National Parks—Beyond the Car," upon which this article is based. Copies of the report are available from the Eco-Publications at 6 Cavendish Avenue, Cambridge, CB1 4US, England; price \$2.00 airmail or \$1.00 surface. Checks should be made payable to Eco-Publications.



GEOGRAPHY AND THE ENVIRONMENTAL CRISIS

Exploring Earthman's World is a series of essays, co-edited by Darwin Lambert and the editors and published intermittently, which is intended to foster the kind of man-earth relationship that will lead to creative ecological harmony.

by GENE WILHELM, JR.

MANY ENVIRONMENTALISTS look mainly to ecology for solution of the environmental crisis. The contribution of ecology—both the rather new science and the still-newer philosophical view that grows from it—is indeed significant and may become more so. Yet it is possible and perhaps wise to ask, without belittling ecology, whether too much might be expected of the ecologist. It is necessary not only to blueprint a healthful ecosystem (an ecological function) but to persuade and help man to harmonize himself with it. To achieve that goal the efforts of diverse disciplines are surely required.

In becoming urban bound, contemporary man has loosened himself from his hereditary mooring—the land and its life—and has lost his feeling for it. Getting to know the land and its life all over again may be mankind's greatest physical and mental need today, and geography has a long background in meeting these needs—ever since the days of Greek description of *Ecumene*.

George Perkins Marsh, New England lawyer and geographer, was the first American to recognize and document the long-term adverse effects of man's alterations of the environment and the first to advocate sound ecological planning. Marsh was particularly concerned about the arid Southwest and the need for water conservation. In 1864 he predicted that a "Dust Bowl" would occur if sound conservation measures were not taken. He also advocated scientific forestry and wildlife management. In fact, his book *Man and Nature* was so far ahead of its time that Marsh might rightly be considered the pioneer of American ecology.

Carl O. Sauer, perhaps the greatest living American geographer, has illustrated in numerous writings how man has made use of nature with continually advancing technology. Man has transformed millions of acres of tropical and subtropical forests into grassland and farmland through the use of fire, and he has repeatedly exploited the earth's wild creatures and destroyed them.

Perhaps these observations present a more relevant picture of reality than the one that ecology suggests. Ecology represents modern man's most ambitious attempt to systematize what he knows of the profusion of biotic forms and their intricate relationships among themselves; yet, until recently, it considered man as a foreign organism in any ecosystem. Even now in ecological theory man has no privileged position; he is just another organism. This concept seems ideal to some of us—but is it realistic?

Geographers, on the other hand, believe that man is a cultural animal, endowed with the attributes of technological capacity and value system, who tends to break the orderly succession of life forces and make use of the stored wealth in plants, animals, and ground for his own ends. Geography stresses that man is the ecological dominant in nature.

The contrast between ecological and geographical views of man may be illustrated by shortcomings in efforts to solve en-

vironmental problems in the national parks. Shenandoah and Great Smoky Mountains national parks, for example, are managed like ecological islands of wilderness, even though they have been influenced by man for centuries, their meaningful background forever a blend of man and nature. But biological research in these parks still receives priority because both parks are classified as "natural areas." Although decades old, neither park has an overall coordinated research plan based on its priorities and needs. Research in human affairs, past or present, is negligible.

Ecology research projects in the national parks, laudable as they are, are not encompassing enough. Such studies stress plants or animals as individual organisms, as members of species, as units in a community of species, reacting to the natural environment. But even "natural" parks are not islands existing in isolation. The geographer's interest is in park vegetation, animal life, and people as elements taking up space in the park—scape—as factors in and functions of geological, biological, and human evolution. Geography studies the park environment in its entirety and often must cross park boundaries to do so. Today national parks are receiving internal and external human pressures of unparalleled magnitude that threaten their very existence. Park research must expand to encompass a regional approach to these problems, for they include man and environment interrelationships.

In considering whether human impact on national parks has been creative or destructive, geographers can only be anthropocentric, for in reality man is seeking his own good, not nature's. What man does to parkscapes is neither good nor bad in itself, but only by reference to mutable human values. And values, opinions, and attitudes of human conduct toward the environment have been defined and their historical development charted by geographers. Basically the attitudes are of three types: man's submissiveness to nature, man's dominance over nature, and man's harmony with nature. Knowing these general attitudes is helping geographers approach more scientifically the people problems facing the national parks.

In summary, geography has important qualifications, not yet widely recognized, for helping civilization solve the environmental crisis. It can develop public awareness, understanding, and appreciation of its traditional concern for man and his environment. It can motivate man to seek values that will lead him to an ecoethic that he so desperately needs. The environmental movement could more efficiently increase the harmony of man and nature by more thoroughly using the knowledge and methods of geography. ■

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the american paddlefish: signs of distress



*A strange, primitive fish of the
Mississippi watershed is threatened
by exploitation and dambuilding*

article and photographs by

BRANLEY ALLAN BRANSON

THE PADDLEFISH THRESHED with all its strength against the treble hook embedded in its tough hide, as if lashing out at its only enemy. The time of year was late March, when the first big spawners usually come upstream in response to the heavy rain that pelts the verdant land of Missouri, swelling the large rivers to nine feet or more above normal. I had come to this same place for two years in a row without witnessing successful catches of paddlefish at close range. I had never mixed with the fishermen themselves. Wild cloud manes tossed and streamed overhead and gusting winds sluiced up the valley, last gestures of a dying winter that the migrations of the big fish themselves signified.

The place I had come to was the Osage River above the Lake of the Ozarks dam, a few miles from Kaiser, Missouri—a part of the river still open for the migratory run to ancestral spawning grounds. At the Osage the waters were streaming from every creek and forested watershed. The river was turbulent and wild in places, sheet-slick and fast in others. The banks were lined with fishermen using short, stiff rods. The rest of their gear consisted of stiff-action reels with star-drags and fifty-pound test lines bearing eight to ten ounces of lead at the end. Above that, at one-foot intervals, were two treble hooks, the barbs honed down to needle sharpness. These lines, tossed from the bank or trolled behind boats, are jerked violently to snag the prey. This same shoal area had been used as a campsite by the Indians who gave their name to the river, and by the U.S. Army Corps of Engineers as a select site for dam construction, partially eliminating paddlefish spawning grounds by inundation.

Some 250 million years ago hundreds of species of fishes similar to paddlefish ruled the fresh waters of earth. Over the centuries, as ecological conditions changed, and as newer, better adapted, and more competitive species came into existence, paddlefish gradually became extinct. Only two species of paddlefish have survived to the present day. One of these, scientifically known as *Polyodon spatula* and often called spoon-bill catfish, is the species restricted to the large, silty rivers of the Mississippi watershed. The second species is the Chinese paddlefish, *Psephurus gladius*, of the Hoang Ho and Yangtze Kiang rivers. Both species, then, are truly living fossils, and both have had their modern ranges severely reduced by the activities of man.

Because of its uniqueness, the paddlefish is an especially interesting subject for biological study. The upper lobe of the caudal fin is supported by an upturning of the vertebral column—a sharklike characteristic—and the intestine has a "spiral valve" within it to increase the digestive surface area. With the help of scuba gear I learned that paddlefish swim like sharks, too, except that they move their paddles from side to side, presumably in search of food.

The paddlefish is a nocturnal animal. It has poor eyesight, and it makes nightly excursions from its daylight haunts near the bottom of deep pools to search for food. That food—mostly plankton—is sought by means of abundant taste buds imbedded in the paddle-shaped snout. Rafinesque and other early nineteenth century biologists thought the paddle was used to stir up the bottom as the big fish sought food organisms, but they were

subsequently proven wrong. Actually, the adult paddlefish, after locating swarms of plankton with its sense organs, swims back and forth with its mouth wide open, exposing the funnel-like throat bordered by long, bushy gill rakers, that are used to strain the microscopic organisms from the water. This adaptation is why sharp treble hooks rather than baited hooks are used to catch the fish. (Crafty old river rats, however, do occasionally catch eighteen- to twenty-pound specimens on soft-shelled crayfish, but they don't make their living that way. Paddlefish caught this way are usually skinned and passed off as catfish or buffalo.)

Practically nothing was known about the early stage of the life cycle of the paddlefish until 1961, when Charles Purkett of the Missouri Fish and Game Commission became the first person to observe paddlefish spawning. From his and subsequent observations it was learned that there must be a rapid rise in the level of stream waters when the water temperature is 50°F or above before adults are stimulated to run upstream to the spawning shoals. Those shoals are roughly three feet deep and located primarily over gravel bars. The current of these shoals is much too swift to allow secure footing for a would-be fisherman. Nevertheless, fishermen I observed on the Osage were catching spawners right off the riffles, some with the eggs or milt still squirting from their bellies. I also saw two breeders cut nearly in half by the props of outboard motors, unspawned roe and bloated intestines protruding through the bloody gashes.

Two to four males court each female that has attained reproductive readiness. They nose her undersides with their bills, pressing in against her sides with their slippery bodies until she suddenly begins to extrude eggs. They then position themselves beside her and release great clouds of milt over the eggs. Thousands of minnows, sunfish, and sculpins also attend the nuptial activities, feasting on some of the eggs as they are swept downstream by the current.

Freshly spawned eggs are one-tenth of an inch in diameter and a pale yellowish-white. They are not adhesive, but moments after being fertilized they swell somewhat, become opaque, and adhere to stones on the stream bottom. This stage of the egg's development necessitates a constant supply of strong current; without it silt would smother the eggs before development could proceed to the hatching stage. On rivers where impoundments occur in tandem, two adverse effects are produced: Dams prevent the rapid rise of water level required to stimulate the spawning runs, and they facilitate heavy sedimentation of the spawning grounds.

Spawned eggs that survive hatch after seven to ten days. Freshly hatched paddlefish are grotesque in appearance—pug-nosed little creatures that do not resemble their parents at all. They are never restful, but swim constantly in wide, random circles searching for the microscopic crustaceans that constitute their food. Young *Polyodon* start to look like paddlefish near the end of their first month, when they are approximately two inches long. They grow rapidly until two years of age, sometimes attaining three feet in seventeen months.

After that initial growth spurt, their growth rate

slows considerably. From the ages of four to thirteen years they grow approximately two inches a year; and after fourteen years of age they grow only two-tenths of an inch per year. The reason for this slow growth is understandable. The average run-of-the-mill paddlefish must pump between an estimated 12,000 to 36,000 gallons of water across its gill rakers in order to concentrate enough plankton for one day's grub.

The reader now knows as much about the general biology of paddlefish as any scientist. Little research has been done on the life cycle of this massive, unusual fish; and if steps are not soon taken to protect the species, there will not be enough paddlefish left to study.

The factors that have led to the endangerment of the species are many and varied. A conversation I had in Missouri with an old fisherman named Chad Muller illuminated one cause of the fish's decline.

"Well, you'n only take two a day," he said. "Four in possession. Hardly worth it anymore. I can remember my daddy and Uncle Sil bringing them in by th' wagon-load. We fed 'em to th' hogs," he added with a sad shake of his head. "Them and spring suckers. Giggled 'em on th' riffles at night." When queried about the size of these specimens, Chad hinted at seven-footers that weighed over two hundred pounds.

All of those lunkers must be gone, however, for the largest one I saw barely tipped the scales at eighty-four pounds. Chad and his cronies took over one hundred tons a year between 1958 and 1961 during the two-month snagging season that runs from March 15 to May 15. Those paddlefish averaged around thirty-eight pounds and were eleven to thirty years old.

As we talked, a game commission airplane made a couple of passes over the snagging site. "State fellers," Chad said, glancing upward. "Spoons ain't doin' no good, an' they're tryin' to figger out why."

It became obvious that Chad and his father and hundreds more like them had unwittingly contributed to the paddlefish's decline when they fed the fish to their hogs fifty to sixty years ago. The populations could not stand that kind of pressure—not when it takes thirty years to attain eighty-four pounds.

Although using paddlefish for hog feed definitely hurt the species, the largest reduction in population occurred during the latter part of the nineteenth and early years of the twentieth centuries from the activities of roe hunters for caviar manufacturers. A large female *Polyodon* produces between ten to fifteen pounds of eggs, or up to five percent of her body weight. An average female produces between 82,000 and 270,000 eggs; and sixty- to seventy-pound specimens produce an estimated 600,000 eggs or more. Now, any wildlife population expert will testify that if half the males in a species are killed, the population of that species will continue to grow. But if only one egg-laden female is killed, the reproductive potential of the species is reduced by that much. That is why game departments around the world protect female game animals from hunting pressure. And neglect of population dynamics is part of the sad story of the paddlefish as well as that of the American river sturgeon and the bowfin, the nearest living relatives of the paddlefish.

These species are in the same danger as the bald eagle and they are becoming just as rare, although this fact is not yet officially acknowledged.

Reduction of *Polyodon* has also been caused by man-made dams—structures that impede upstream migrations, cause ensiltation of spawning grounds, or back water over the shoals. Yet another cause of population reduction is the intensification of water pollution in the fish's habitat brought on by an ever-growing human population.

Instead of allowing a snagging season, then, all states should protect the paddlefish and its cousins the sturgeon and the bowfin. Some states have made cursory attempts in this direction. The Missouri Game and Fish Commission is attempting to stabilize and protect known populations, but that work may go for naught because the U.S. Army Corps of Engineers plans to build dams above several of the known spawning sites. In 1965, Montana placed the paddlefish on its game-fish list in an attempt to protect it.

But these are only Bandaid measures; no protection can be effective when applied in a piecemeal manner. To be effective, comprehensive, uniform measures must be applied throughout the entire range. First, snagging must be prohibited at all times, especially in Montana and South Dakota, where numbers of fish have been especially greatly reduced. Secondly, all known paddlefish spawning grounds must be placed off limits during the

height of spawning, a time that can be easily predetermined by simply keeping track of the rise in a river's water level as the water temperature approaches 50° F. All U.S. Army Corps of Engineers dams planned for streams in the distributional range of the paddlefish should be carefully scrutinized to determine possible impact on the fish's population, and no action should be taken that directly or indirectly would harm the paddlefish's chances for survival. Finally, pollutants that do not kill fish directly should be thoroughly investigated to determine how they affect plankton. Water standards that allow disruption of basic food chains are sorely deficient. Moreover, the paddlefish must be federally protected. It must be placed on the Interior Department's list of rare and endangered species. Although under present laws, simply listing the fish as endangered will offer no protection, it would help publicize the plight of the fish and arouse public concern for it.

Drastic measures must be taken to ensure the survival of this valuable native fish. It is a pity that preventative steps were not taken long ago; but they were not, and the cure must be harsh. If we are to save our endangered wildlife, measures that should have been taken yesterday must be applied today. Tomorrow may be too late. ■

Branley Allan Branson is a professor at Eastern Kentucky University, Richmond, Kentucky. He holds a Ph.D. in Ichthyology and Fisheries Management. He has published numerous articles relating to aquatic organisms and is a member of the American Fisheries Society and the American Society of Ichthyologists and Herpetologists.

The funnel-like mouthparts of the paddlefish are used to concentrate the plankton food.



HELP SAVE THE AMERICAN PADDLEFISH

Members who feel strongly about the plight of the American paddlefish can write the states of Montana and South Dakota indicating that all spawning grounds should be placed off limits during spawning season and that snagging should be prohibited at all times:

Mr. Don L. Brown, Director
Montana Fish & Game Department
Helena, Montana 59601

Mr. Robert A. Hodgins, Director
South Dakota Department of Game,
Fish & Parks
State Office Building
Pierre, South Dakota 57501

You may also wish to write to the Army Corps of Engineers to urge them to take no action that would directly or indirectly harm the fish's chances for survival:

Major-General J. W. Morris
Director of Civil Works
Army Corps of Engineers
Office of the Chief of Engineers
Forrestal Building
Washington, D.C. 20314

NPCA at work

Polar bear treaty An international convention to conclude a treaty to protect polar bears in international waters was convened in Oslo, Norway, in November 1973. The five countries with polar bear populations were in attendance—Canada, Denmark, Norway, Russia, and the United States. In a preparatory meeting to the conference at the Department of the Interior, the U.S. position on the treaty was discussed. At issue were the questions of whether the treaty should be merely an agreement or a treaty, whether it should be interim or permanent, and whether it should cover only the bears on the high seas (Arctic Icecap) or also those within the boundaries of the signatory nations.

NPCA urged that we conclude a viable permanent treaty covering the bear within national boundaries as well as on the high seas. Although Canada allows hunting, Denmark and the U.S. allow only Arctic natives to take polar bears, Norway has a five-year moratorium on hunting, and Russia—strongest of all—has not allowed hunting since 1956. NPCA prefers no sport hunting of polar bears at present but urged, if a nation wants to allow hunting within its own limits, that the treaty contain provisions for establishing hunting seasons with limits within national territory as well as a ban on trading hides and using mechanized aids such as snowmobiles and aircraft. NPCA also urged setting up sanctuaries both within national boundaries and throughout the Arctic Ocean.

As of this writing the convention is in progress; results will be reported in a future issue.

Grand Canyon enlargement When Senator Barry Goldwater's controversial bill to enlarge the size of the Grand Canyon National Park by nearly double its present size passed the Senate, the House Committee on Interior and Insular Affairs invited NPCA to testify.

NPCA opposed any provision in the bill that would allow the Secretary of the Interior to authorize dams or other reclamation projects in the enlarged park. Both the House and the Senate have been under intense lobby pressures from the Arizona Power Authority and the Hualapai Indian Nation to reopen the old Brige Canyon (now Hualapai) Dam issue. This dam was proposed for the Colorado River in the Lake Mead Recreation Area downstream from the Grand Canyon National Park; and if it were built, it would back up water and create a reservoir in the park. Due to this rekindled interest in the dam, NPCA and other conservation groups specifically asked that such language that would allow the construction of the dam be deleted from the bill. This park was established as a preserve; to violate the original intent with provisions to allow dams or other reclamation projects at some undetermined future time would be totally irresponsible.

NPCA also specifically requested a wilderness study for the Grand Canyon, and recommended termination of timber leases on the Canyon's rim, which are due to mature in 1980.

The Association commended the proposed legislation for "providing an expanded interpretation and public education program concerning the Canyon, both inside and outside the National Park."

Oil tankers and pollution The Maritime Subsidy Board of the Maritime Administration, Department of Commerce, issued its final order and opinion relating to the environmental review of its tanker subsidy program, required by the settlement of litigation brought by NPCA with the Environmental Defense Fund and the Natural Resources Defense Council. The litigation was intended to ensure maximum protection of the environment through review of the environmental impacts of tank-

ers and possible incorporation in such ships of safety features for the purpose of avoiding so far as possible massive oil spills in case of collision or grounding.

The order, issued August 30, represents the Board's decision based upon the final environmental impact statement and economic viability analysis with respect to future administration of the tanker construction subsidy program. The Board's order announced its intention to take several actions, including:

(1) A commitment to consider financial assistance for reconstruction or reconditioning of tankers to incorporate antipollution features;

(2) A commitment to require all subsidized vessels to comply with international and domestic pollution abatement design regulations;

(3) A commitment to supplement international and domestic pollution abatement requirements when the Board finds that a particular requirement will be effective in preventing pollution and will not adversely affect the commercial competitive ability of the subsidized vessel;

(4) A decision to require all subsidized tankers contracted for since June 30, 1972, to incorporate pollution abatement features and collision avoidance radar systems as set forth in the Board's specifications. These specifications were previously only advisory and not mandatory;

(5) A decision to require all tankers exceeding 100,000 dead weight tons to employ inert gas systems which will assist in preventing fire and explosion;

(6) A decision to permit the public to petition the Board for revisions in pollution abatement regulations and to require all staff recommendations to be noticed in the Federal Register, providing for a 30-day comment period and Board consideration of all comments in making its final determinations with respect to recommended changes.

The Board determined that the environmental impact statement was adequate and that the projected mix of subsidized tankers, with the features just listed, represented "an environmentally sound

composition of vessels for the U.S. tanker fleet," through 1980. Approximately 26 percent of all subsidized vessels under this projection will be oil tankers, of which about 50 percent will be "supertankers."

Although the Board's final decision left much to be desired with respect to remedying the problem of tanker-caused marine pollution, the final environmental impact statement is an extremely useful document that provides crucial information about the inadequacy of present technology to clean up oil spills and potential damages resulting from supertankers. It also discusses the environmental benefits associated with vessel design alternatives.

The ultimate value of the documents and actions resulting from the settlement of the lawsuit will depend largely upon the extent to which the public makes use of the information and procedures for participation. To this end, NPCA and the other plaintiffs in the lawsuit have responded to the Board's public notice of intent to modify its specifications so as to require oily water content meters and separators capable of detecting and achieving 50 parts per million rather than the 10 parts per million standard presently in force, based upon the Board's staff recommendation that the 50 parts per million standard "reflects the best technology currently available and will provide significant control of the operational pollution from tankers to protect the marine environment." NPCA objected to the proposed relaxation of the standard as unwarranted in comments which included a report on currently available technology.

Tiger Haven Wildlife Trust NPCA's President A. W. Smith recently agreed to serve as a trustee of the nonprofit Tiger Haven Wildlife Trust in India. The Wildlife Trust was established in September 1973 to develop and maintain the Dudhwa Sanctuary (Tiger Haven) in northern Uttar Pradesh near India's border with Nepal, and to provide there, in the ideal habitat of the terai forest, a sanctuary for endangered species, notably the tiger, the

leopard, and the swampdeer, or barasingha.

The Trust was established under the patronage of Mrs. Indira Gandhi, Prime Minister of India, and of the Chief Minister of the State of Uttar Pradesh and will be administered by a board of trustees. The Chief Trustee and resident manager will be Arjan Singh, the noted Indian conservationist and naturalist, who has worked in the Dudhwa area since 1959. The remarkable story of his work there is told in his fascinating book, *Tiger Haven*, recently published in New York by Harper & Row, and in London by Macmillan London, Ltd. (See page 30 for a review of this book.)

Wildlife in India is threatened by indiscriminate shooting in the past, by present-day poaching, by the destruction of the forest by timber cutting, and by the decrease in numbers of prey species. Dudhwa Sanctuary is one of the few places in India where there is still hope of preserving endangered species in their natural habitat, and now through the work of Arjan Singh and the Tiger Haven Wildlife Trust, perhaps this aim can be achieved.

Although official recognition and a long-term lease of Dudhwa Sanctuary have been granted to Arjan Singh for the purposes of wildlife study and preservation, the Trust has no financial support other than a patrol vehicle provided by the World Wildlife Fund and the anticipated earnings from the book. To provide the protection necessary, the Trust needs money for additional patrol staff to prevent poaching and illicit grazing in the Sanctuary, for more patrol vehicles, for facilities for breeding and rehabilitation of endangered species, and for additional accommodations at Tiger Haven farm for visiting conservationists and scientists. Earnings from the book will form the basis of the Trust Fund, and it is anticipated that in due course limited numbers of tourists can be accommodated at Tiger Haven and income from that source paid into the Trust.

Meanwhile, NPCA has agreed to serve as custodian for funds donated in the United States on behalf of the Tiger Haven Wildlife Trust. Whereas Americans were once the



most conspicuous big game hunters in India, perhaps now we can contribute our moral and financial support toward saving the remnant populations of Indian wildlife while there is still time. Readers who wish to help the Tiger Haven project can order this book through NPCA (see order blank, page 27), and/or send contributions to NPCA, marked for that purpose.

Prescribed Burning in Sequoia Forests Concerned by the fact that inadequate funding has limited the prescribed burning program in Sequoia forests, NPCA recently sent the following letter to Ronald H. Walker, Director, National Park Service:

"The National Parks & Conservation Association has learned that because of inadequate funding the prescribed burning program at Sequoia and Kings Canyon national parks has been inoperative for the past several years. If the major objective of custodial management at Sequoia and Kings Canyon is, in fact, to provide for the protection, survival, and perpetuation of giant sequoia redwoods as a species for the appreciation and enjoyment of future generations of the American people, we feel it imperative that sufficient budget priority be given over to prescribed burning to insure that the program can and will be given full and proper attention by the Congress of the United States.

"Although a number of ecologists have investigated the role of fire in the sequoia-mixed conifer forest biome, the former research biologist at Sequoia and Kings Canyon national parks, Dr. Bruce Kilgore, has conducted the most comprehensive studies. Kilgore points out the importance of fire in the dynamics of the sequoia ecosystem



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in the Spring 1972 issue of *Naturalist* magazine: 'Fire appears to be essential to the life cycle of the giant sequoias, and as such, to the whole ecosystem. . . . In all probability, the giant sequoia survives today because of the role fire plays in the ecosystem operation. Fire must be restored, as nearly as possible, to that natural role if we are to continue to have sequoias through the next many milleniums.'

"Studies show that fire occurs naturally in the sequoia-mixed conifer forest at about ten- to eighteen-year intervals. However, due largely to a fire-suppression policy that had prevailed at Sequoia and Kings Canyon for well over fifty years, a deep ground litter accumulated and a well-advanced understory developed. One serious consequence has been that successional advancement of understory species, especially white fir (*Abies concolor*), now poses a considerable and increasing risk of crown fire. A second consequence has been that sequoia seedlings are not able to become established in mineral soil. Other natural processes or functions of fire that had effectively been deterred by the fire-suppression policy have been summarized by Kilgore. He states: 'Fire in this forest (1) prepares a seedbed; (2) cycles nutrients; (3) sets back succession in certain relatively small areas; (4) provides for conditions which favor wildlife; (5) provides a mosaic of age classes and vegetative types; (6) reduces numbers of trees susceptible to attacks by insects and disease; and (7) reduces fire hazards.'

"Recent NPCA field investigations bear out these findings. However, before fire can be restored to its natural role in the ecology of the sequoia-mixed conifer forest, prescribed burning must first be done. It might well be that certain minimal and careful removal of large white fir trees from the understory also be carried out if there is a proven need for such action, and if no commercial utilization is made of removed trees.

"It is NPCA's understanding that since 1968 about 250 acres of Sequoia and Kings Canyon park lands have undergone prescribed burning,

and that at least another 1,100 acres need immediate treatment. Funds, however, were not made available to complete this work. And as former Park Superintendent John S. McLaughlin said at the 1972 Tall Timbers Fire Ecology Conference, 'Proper budgetary support is required if this program is to remain meaningful and productive in the national parks.' We estimate that about

\$55,000 would be required to implement the program for FY 1974-75.

"NPCA is fully aware that successful prescribed burning demands favorable weather conditions and extreme care by highly skilled personnel. Because of the past success of prescribed burning at Sequoia and Kings Canyon, we are confident that this cultural treatment can and will be carried out both carefully

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and skillfully. The public educational and information program at the parks has also been sufficiently successful in enhancing public understanding and acceptance of prescribed burning, and NPCA will continue to do its part to help achieve this same end."

Mr. Howard H. Chapman, National Park Service Western Regional Director, expressed his appreciation of NPCA's interest in the prescribed burning program and described the program's current status as follows:

"The fire management program at Sequoia and Kings Canyon has been moving steadily ahead for the past several years. This includes allowing natural fires to run their courses as well as prescription burning. After a modest beginning a few years ago at Kings Canyon in allowing natural fires to run their courses, approximately 75 percent of both parks is included in what we call the 'let burn zone.' The sequoia groves are not included within this zone. During the same period we have carried forward our prescribed burns, prin-

cipally in the Redwood Mountain Grove. Here, we have conducted burns under varying conditions and using various techniques for the purpose of determining the most appropriate procedures to be employed under varying conditions of slope, weather, fuel, etc.

"Funding for carrying out the total silviculture program, including prescribed burning, has been inadequate to provide the scope of work we would like to accomplish on an annual basis. Work to date has been accomplished with regularly programmed funds, which means that something else does not get done. This fiscal year we have allotted \$15,000 specifically for work in the sequoia groves. We recognize this as being woefully inadequate; however, we are hopeful that funding of this important activity will grow so that we will be able to carry out a long range program of silvicultural management including prescription burning."

NPCA was pleased to learn that the Park Service is continuing to follow its program of prescribed burn-

ing at Sequoia and Kings Canyon national parks, but the Association hopes that more adequate funding will be provided in the future so that fire can be restored safely to its natural role in the sequoia-mixed conifer forest biome.

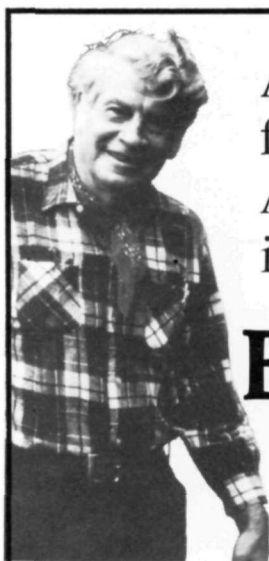
Report to members Last month we reported our forthcoming survey questionnaire. These questionnaires are currently at the printers. We plan to start using them with the January renewal mailings. Your help is requested in filling them out and returning them to us in the envelopes provided. Your answers will enable us to respond to the desires and needs of the members more effectively.

You have probably noticed that your December issue was received without that old familiar kraft cover we have used for so many years. In the interests of conserving paper and with the ever-increasing prices of paper, we felt the elimination of the kraft cover would be in the best interest of the Association and our members.

We are pleased to announce the appointment of two new staff members: Toby Cooper, our new Administrative Assistant for Parks, and Pam Smith, Assistant Editor of the Magazine. Mr. Cooper, a graduate of the University of Michigan, has been active in environmental activities for several years. Mrs. Smith, a graduate of the University of Connecticut, brings to us considerable experience from several Washington area organizations.

IMCO Convention On November 2, at the conclusion of the four-week International Conference on Marine Pollution held in London under the auspices of the International Maritime Consultative Organization, 79 nations signed an International Convention for the Prevention of Pollution from Ships. This Convention, if it enters into force, would establish a comprehensive scheme for the regulation of all forms of ship-generated pollution, including oil, chemicals, sewage, and garbage.

With respect to oil pollution, the most serious problem dealt with in the Convention, two provisions are



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NEW 1974

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Richard G. Durnin, The City College of the City University of New York (from a prepublication review)

Feb., 1974, paperbound, est. 360 pp.

EDUCATIONAL PSYCHOLOGY:

Focus on the Learner

Lita Linzer Schwartz, The Pennsylvania State University Innovative topics, such as educational accountability and the British approach to primary education, are presented along with traditional topics. Stressing the application of theoretical principles, the author illustrates ideas in a practical context. 1972, 7½ x 9¼, 604 pp.

Holbrook Press, Inc.

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of particular environmental significance. First, the Convention adopts a uniform discharge standard for all types of oil, thereby ending the anomaly created under the 1954 Oil Pollution Convention that left light refined products unregulated. Second, the Convention requires that all oil tankers in excess of 70,000 tons constructed for after 1976 have segregated ballast capacity. The provision of segregated ballast capacity on these tankers—essentially future crude carriers—will help to eliminate the serious problem of operational ballast discharges.

On the negative side, the Convention failed to establish discharge standards significantly more rigorous than those adopted in 1969 amendments to the 1954 Convention; failed to adopt a double-bottom requirement for oil tankers; and failed to create a scheme that would allow for "port" state enforcement of violations of the discharge standards. Broad inspection rights for coastal states were also not approved in the Convention.

NPCA, as well as other United States environmental groups, were represented in London by Eldon Greenberg, an attorney with the Center for Law and Social Policy, a Washington-based public-interest law firm. NPCA's participation in this delegation, as well as in the Law of the Sea delegation last summer, marked the first time that environmental representatives have been invited to sit on the United States delegations in international conferences.

Paddlefish NPCA was distressed recently to learn of the impending threats to the survival of the paddlefish, *Polyodon spatula*, in the Mississippi and Missouri river systems. The Association wrote to the Army Corps of Engineers urging them, before undertaking any planned water resources development projects, such as dams, in these river systems, to consider carefully the effects such projects would have on the paddlefish, and to take no action that might disturb the fish's life cycle by impeding upstream migration or by destroying breeding shoals.

news notes

BOOK REVIEW: TIGER HAVEN, by Arjan Singh. Harper & Row, New York, 1973. 238 pages, illustrated, \$8.95.

For want of space we carry notes on books only rarely, but occasionally a publishing event has momentous news value, as happens with *Tiger Haven*. This book is written by an extraordinary man, who, living in an isolated area in the foothills of the Himalayas, is fighting a determined and almost single-handed battle to save the once abundant wildlife of India. Singh's charm and wit, patient and perceptive observations of wildlife, and ardent conservationist philosophy are evident throughout the book.

Tiger Haven recounts the remarkable story of Singh's struggles. From his passion for hunting as a youth grew an affinity for wild creatures. Gradually he awakened to the fact that the day might soon come when there would be no more wildlife. He exchanged his gun for the camera.

Singh dedicated his farm, Tiger Haven, five miles from the Nepal border, as a wildlife preserve. He

also managed to persuade officials to declare 82 square miles of forest around Tiger Haven as the Dudhwa wildlife sanctuary, in which live the tiger, leopard, swampdeer, sloth bear, and the marsh crocodile—all once common to the forests of India but now driven to the brink of extinction. Singh gives fascinating accounts of the natural histories and behavior of these animals, which are illustrated by some of the finest photographs of wild animals we have ever seen—many of them by the author, who confronted the creatures with his camera at close range. He regales us with tales of individual personalities who live in the sanctuary—two semi-wild monkeys, a little leopard cub, the "black" tiger, the "red" tiger, and the "lame" tiger.

Tiger Haven is not only a well-written, informative, and fascinating book; it is a moving plea for the future of India's wildlife—must reading for those who love animals.

See news item, *Tiger Haven Wildlife Trust*, page 25, for information on ordering the book from NPCA.

Friend of conservation lost Representative John Phillips Saylor of Pennsylvania, a leading conservationist and ranking minority mem-



American Motors conservation awards A. W. Smith, NPCA President, left, looks on as Ed Zern, Director of the American Motors Corporation Conservation Awards Committee, presents two of the twenty 1973 conservation awards to Mr. Jerry T. Verkler, second from left, and Dr. Spencer M. Smith, Jr. Mr. Verkler is staff director of the Committee on Interior and Insular Affairs, United States Senate. Dr. Smith is secretary of the Citizens Committee on Natural Resources and chairman of the NPCA board.

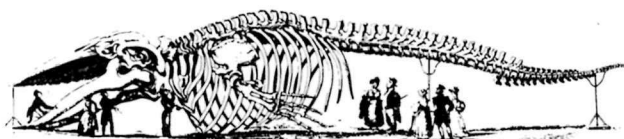


Imagine that you are a whale

You are huge. You weigh more than three thousand people, but the water makes you light and cradles you. Thick fat warms you. You sing whale songs over hundreds of miles. You live in big, friendly families. (Whale babies grow on mother's milk; and whales breathe air.) You easily swim thousands of miles to follow your food. You are so big that you have no real enemies except one: people.



A long time ago, people saw you as a devil fish.



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Worst of all, they began to see you only as a product.

You grew lonely. Your parents, brothers, sisters, and friends were gone. You swam, calling your songs over long distances.

Whales have lived in the oceans for millions of years. But in the time it took for your grandparents to grow up and grow older, people have killed two million whales.

Russia and Japan kill most of the whales today. Russian people kill sperm whales for rocket oil and animal feed. Japanese people have eaten whale meat for hundreds of years, but if they kill off the whales, there will be no more to eat. Many kinds of whales are almost extinct. Extinct means that there are no more and can never be any more. Extinct is forever.

Please help save the whales before they are all gone. Thousands of children all over the world are helping. Write a letter, draw a picture, make a poem or story that tells how you feel. Address it to Mr. Tanaka of Japan and Mr. Kosygin of Russia. Next spring a few children from around the world will take your messages to Japan's and Russia's leaders and plead for the whales. Send your messages to Save the Whales, Project JONAH, Box 476, Bolinas, California 94924.

An hour's worth of your time can mean a lifetime for the whales!

National Parks and Conservation Association
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If you wish a special school teaching kit on whales and dolphins, write to Project JONAH, Box 476, Bolinas, California 94924.

IMPORTANT NPCA PUBLICATIONS

ECOLOGICAL FORESTRY FOR THE COAST REDWOODS

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ber of the House Interior and Insular Affairs Committee, died at sixty-five years of age on October 28, 1973, of a heart attack in Houston, Texas. Congressman Saylor, who had served in the House since 1949, co-authored bills such as statehood for Alaska and Hawaii, the Wilderness Act, and the Land and Water Conservation Act. He received many awards for his unceasing efforts in the field of conservation. NPCA and the conservation movement have lost a good friend and spokesman.

Volunteers in the Parks We have had several queries from members about the National Park Service's Volunteers in the Parks program. A number of jobs are available for people who wish to donate some of their time and talents to a national park. Among them are (1) guides for interpreting the natural and human history of the area; (2) historical guides who dress in period costume and interpret for visitors life styles of other eras; (3) craftsmen who

demonstrate a skill, such as glassblowing or weaving, or who work with children on an arts and crafts program; (4) assistants to Park Service personnel in historical, archeological, or scientific research projects; and (5) assistants to park rangers to help with the duties of resource management.

Volunteers serve without pay, although a person may be reimbursed for incidental expenses such as uniforms, local transportation, and meals. People of all ages and occupations are urged to apply. Volunteers must be in good health and in general must meet the qualifications, except for education, that apply to seasonal employees of the Park Service. Volunteers may serve on a part-time basis, such as an hour a week, several days a week, or on special occasions.

People interested in this program should contact the superintendent of the National Park Service area where they wish to work. Requirements for and use of volunteers vary among the individual Park Service



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areas, and applications are processed at the different areas rather than in Washington, D.C. Applications should be made on the short Standard Form 170, available at most federal personnel offices and post offices. Applicants should specify special interests and skills. Applicants under age 18 should attach a written parental consent to the form.

A thoughtful remembrance NPCA extends its condolences to Mr. and Mrs. John H. Isbell of Naugatuck, Connecticut, upon the death of their son Stuart on October 28, 1973. The Association wishes to thank them for their thoughtful gesture of suggesting that, in lieu of flowers, contributions be sent to NPCA in memory of their son; and we thank their many friends who contributed. Inasmuch as Stuart was by vocation a forester, it seemed fitting that these remembrances be allocated to our forestry program.

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conservation docket

Although the first session of the 93rd Congress has recently ended, a number of major environmental issues have not been resolved. Among these unresolved issues are some that have been under consideration for several years including land-use planning, strip mining regulation, wilderness areas in the East, deepwater ports, and protection for specific natural areas such as the Big Cypress swamp of Florida, the Big Thicket area of East Texas, and the Tallgrass Prairie area of Kansas. Despite laudable efforts by some committees and individuals in both House and Senate to bring final action on these and other bills of environmental significance, they must carry over into the second session.

Other bills, some newly introduced and others that were not included in committee schedules during the first session, should see some action in 1974.

Recent action on bills of interest to NPCA members has included:

Big Thicket: The House Parks and Recreation Subcommittee approved HR 9562 amended, for full Interior Committee action. The bill authorizes acquisition of 84,000 acres by a legislative declaration in taking, and provides for up to \$63.6 million for acquisition.

Colorado Wildernesses: The Senate passed S 1864, establishing the Eagles Nest Wilderness, Arapaho and White River National Forests, Colorado; and S 702 designating the Flat Tops Wilderness, Routt and White River National Forests, Colorado.

Oil Pollution Casualties: The Senate passed S 1070 to implement the International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties. This Convention permits a coastal nation to take necessary measures to prevent the pollution by oil of its waters or shore by damaged vessels outside its normal jurisdiction.

Alaskan Pipeline: Both the House and Senate have voted to approve the Conference report on the Alaskan pipeline bill, S 1081, despite

considerable pressure from the Office of Management and Budget, which wanted the bill recommitted to conference to remove several amendments that restrict OMB powers. Although OMB has recommended a veto to the President, it is unlikely in view of the pipeline's wide support in the Congress and the Administration and with the crude oil shortage already exerting significant influence in many areas.

CEQ: Former Delaware Governor Russell W. Peterson was recently confirmed by the Senate to serve as the new Chairman of the President's Council on Environmental Quality. Chairman Peterson is considered by many to be a strong environmental advocate.

DDT: The House Forests Subcommittee recently approved HR 10796, to authorize the Agriculture Secretary to permit the use of DDT, for full committee action. The bill pertains primarily to attempts to control the tussock moth in Northwest

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forests but apparently could be applied to other insects in other areas.

Eastern Wilderness: The Eastern Wilderness bill, S 316, now in the Senate Interior Committee, has recently been sent to the Senate Agriculture and Forestry Committee for their review and comment. After a specific review period, the bill is scheduled to return to the Interior Committee for final approval before being reported to the full Senate for action. New eastern wilderness bills, S 2487 and HR 10469, have recently been introduced in the Senate and House by request of the Administration. These identical Administration bills provide 16 areas for immediate inclusion in the National Wilderness Preservation System, and 37 areas for study for possible future inclusion.

Predator Control: The House Subcommittee on Fisheries, Wildlife Conservation and the Environment recently reported an amended version of HR 4759 to the full Committee. As amended, the bill presently allows the use of the M-44 cyanide gun in control of coyotes. The bill prohibits use of chemical substances which have a secondary killing effect and requires that the means of control used kill quickly and painlessly. The livestock and poultry industries lobbied intensely for use of the M-44 devices and also gained control of the overall predator program for the states subject to federal standards. Up to \$3 million per year (FY 1974-78) is authorized to assist the states with research on the management and conservation of predatory animals. Many environmentalists are opposed to the use of the M-44 cyanide devices because of their inability to distinguish between "target and nontarget" species.

Solar Energy: The House Energy Subcommittee of the Science and Astronautics Committee, chaired by Representative Mike McCormack, is working on legislation (HR 10952) that would establish a high-priority program to encourage the widespread use of solar energy to heat and cool residences and businesses. The immediate use of the sun's energy is both technically feasible and economically practical, according to Chairman McCormack. The bill directs the Administrator of

NASA to develop performance criteria for both the solar equipment and the dwellings themselves, with up to 2,000 demonstration models for monitoring purposes to be installed within three years. Complementary legislation is also being prepared to encourage development and use of solar technology through various tax and mortgage incentives for manufacturers and home owners.

Newly introduced legislation not yet acted on has included:

Alpine Lakes: S 2607 and HR 11059, to establish the Alpine Lakes National Recreation Area and within it the Alpine Lakes Wilder-

ness Area in the Cascade Mountains of Washington. Referred to respective Interior Committees.

Sequoia: HR 10944, to enlarge the Sequoia National Park in California. Referred to House Interior Committee.

Open Beaches: S 2621, to declare a national policy that the beaches of the U.S. are of national interest and the public shall have free and unrestricted right to use them consistent with such property rights of littoral landowners as may be protected by the Constitution, and to provide for the national open beaches program to be administered by the Interior Secretary.

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Continued from page 2

which will have to be internalized. Or, where the return journey is long enough for separation, facilities will have to be provided at the loading port to receive the ballast water. This will mean that ballast cannot be taken on and released during the journey to adjust for weather.

ON THE CREDIT side, the Convention controls noxious liquids other than oil. The discharge of certain chemicals of major hazard is prohibited. The annexes dealing with oil and chemicals are mandatory.

The Convention also regulates the discharge of sewage and garbage from ships. The dumping of plastics is prohibited; this includes synthetic ropes, fishing nets, and garbage bags. Adherence to the sewage and garbage annexes, however, is optional.

Of great importance was the question whether coastal states could impose higher standards within their own jurisdictions with respect to matters covered by the Convention. No agreement was reached on this score, and the result is to permit unilateral supplemental action. The Water Pollution Control and Ports and Waterways Safety Acts of the United States will not be impaired.

THE enforcement procedures established by the Convention are very weak. Enforcement of discharge violations on the high seas is left entirely to the "flag" states. Moreover, the Conference rejected the proposition that visible traces of oil in water in the wake of the ship establish a presumption of discharge in violation of the Convention. Port and coastal states, however, can apply their own standards of discharge, design, and construction within their jurisdictions.

The compulsory settlement of disputes was agreed upon. When one party requests arbitration, the other must acquiesce. Much more than arbitration has been hoped for in the negotiations looking toward the United Nations Conference on the Law of the Sea. Whether disputes arising under the Pollution Convention can be related to the Tribunal to be established by the later Conference remains to be seen.

Nothing adequate was done at the London Conference about pollution resulting from groundings or collisions. The memory of the Torrey Canyon disaster assuredly remains with us all. Double bottoms might have been of some help, similarly the requirement of bow-thrusters and more advanced navigational aids. A top limit should have been

placed on the size of ships. These issues should be taken up in the Conference on the Law of the Sea.

OR THEY and the other deficiencies of the Convention may be dealt with by amendment. The International Maritime Consultative Organization (IMCO), which managed the Conference, is empowered by the Convention to establish a special body to process amendments. These procedures could eliminate, in some measure, the cumbersome ratification requirements which have made it difficult to improve previous pollution conventions. It seems probable that the IMCO Assembly, which is meeting as of press time, will implement these provisions of the Convention. But the amendment procedures will be complex and difficult, and a coalition of a few of the conservative so-called maritime states, which include the United Kingdom, West Germany, Japan, Norway, Netherlands, Greece, and Liberia, could prevent any change.

The international groupings at the Conference were interesting and significant. The United States, the Soviet Union, Canada, and Australia were the leaders in urging strong antipollution measures. They were supported by the Arab states, with their obvious interest in the protection of the waters in the Middle East, and by many coastal states. Opposition centered in the conservative maritime states.

THE WORLD was grappling in these meetings with a major question of survival. Clearly because short-sighted and selfish interests prevailed all too well, it did not grapple effectively enough. A Conference which might have solved the problem of the pollution of the oceans from the intentional discharge of oils and chemicals, and might have initiated precautions against accidents and catastrophes, becomes merely the first step in a long effort.

The first measure must be to supplement the Pollution Convention by action at the United Nations Conference on the Law of the Sea next year. Pollution from ships will be only one element in an enormously complex pattern at that Conference. But if given a high enough priority in the general settlement, the issue might be dealt with effectively there.

Short of such action, the amendment process provided for by the Pollution Convention will have to be used. The diplomatic and economic power of the United States should be brought to bear for this purpose on the conservative combination of states which have the power to block progress.

—Anthony Wayne Smith



National Parks and Conservation Association has worked for the protection and enlargement of the national parks system for over 53 years. In addition, NPCA has been vitally involved in other serious environmental problems such as endangered species, good water planning, good forestry practices. In these days of renewed attacks on the environmental movement coupled with ever rising costs,

we need the continued support of NPCA members and their friends.

Your early renewal can help immeasurably. And, if you would send the names of friends who believe in our aims, this too would help. With your help we can build and maintain a more effective Association serving your needs and the needs of our environment.

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