

NATIONAL PARKS



*Conservation
Magazine*

The Environmental Journal

February 1974



THE OIL SHORTAGE

The energy crisis confronts the American people with a need to correct the gross mismanagement of the economy which has been rampant for much too long.

The mismanagement centers at the moment in the liquid-fuels and motor-transportation segment of the economy, but is not confined to that segment.

The structured portion of the economy, consisting of the large corporations and the symbiotic government agencies, is planned and controlled in the manner of oligopoly by corporate management. The difficulty does not lie in the lack of industrywide planning nor even of inter-industry coordination, bad as that has been, but in the values which govern the planning.

The goals of industrial planning have been growth, power, and money (not necessarily profit for stockholders, but executive salaries and bonuses). It should now be apparent that growth as a value must yield to a differential stabilization. While profitability is a necessary value (even in most public enterprises in the long run, but depending on how you measure it), the values of ecological security and social relevance must shortly be added, if we are to escape disintegration. There are plenty of ways in a democratic society to compel such reforms.

Consider the record in the oil matter to date. The corporations themselves held up the construction of the Alaskan pipeline for four years by (1) the blundering and irresponsible choice of an unecological route, (2) the acceptance of construction permits in violation of law with respect to the width of the right-of-way and the requirement of adequate environmental impact statements, and (3) their refusal to consider alternative routes.

The environmental movement did *not* oppose the extraction of oil from the Arctic pools, but insisted quite properly that the laws be obeyed and the alternatives be considered. The NPCA, to be specified, recommended immediate action on the MacKenzie River Route.

Nor will the flow of crude oil from the Arctic, when it comes, redress the shortage; the demand and the costs will be too high. And the first big pipeline break and spill, which will certainly ensue from the inevitable earthquake along the Denali fault, or the first supertanker disaster in the stormy waters of the Gulf of Alaska will reopen the whole environmental question.

It is the corporations themselves that have delayed the tapping of the oil pools under the continental shelves. The blame for the Santa Barbara catastrophe and the fires and spills in the Gulf of Mexico does not rest upon the public, but on corporate management. The communities and industries along our coasts will never again tolerate the befouling of their shorelines as a consequence of pollution from drilling or from ships.

For quite a long time the diagrams, whether done by hand or by computer, have been forecasting the exhaustion of domestic petroleum resources. The industry has resisted bigger imports of crude when they could have been obtained easily on the international market, surpluses could have been built up, and domestic reserves could have been conserved.

We are now turning over our military oil reserves to help remedy the deficiency; so much for national security. The answer does not lie in an impossible economic self-sufficiency, but in developing a network of multilateral agreements which will provide us with alternative sources of supply, and which can be obtained by negotiations involving trade-offs beyond petroleum.

Central to the whole problem has been the explosion of private automobile traffic. There is abundant evidence that the American people did not really want the gas-guzzlers, but had a snow-job done on them by the advertisers and by the refusal of the companies to offer alternative models.

There are plenty of cars on the road these days which give 20 miles or more to the gallon. They are easy to make, if the will to do so be present. The change-over in plant, patterns, machine-tools, and processes could be completed in a year, but it seems we must wait another decade.

A revolution in energy policy, then, is required, and the main blessing of the fuel crisis is that we are being forced as a nation to do something. The elements of

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NATIONAL PARKS & CONSERVATION ASSOCIATION ■ 1701 EIGHTEENTH STREET, NW ■ WASHINGTON, D.C. 20009

weathered american chestnut trunk
jack jeffers photograph

NATIONAL PARKS & Conservation Magazine

The Environmental Journal Vol. 48, No. 2, February 1974
NPCA • National Parks & Conservation Association • NPCA

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COVERS *Death Valley National Monument, by Ed Cooper*
Death Valley National Monument is a vast natural museum containing representatives of all the great divisions of geologic time. Contortions, tiltings, intense heat and pressure from changes in the earth's crust, and sculpturing of the landscape by water, wind, and gravity are forces that have created the unique and beautiful Death Valley as we know it today. The striking badland topography at Zabriskie Point (front cover) was caused by torrential rains on lake beds during the Tertiary Period. As the clay surface of the beds eroded from rivulets, deep gullies developed. The more resistant layers of gravel and lava eroded less quickly and now stand out as prominent ridges. Dantes View (back cover) offers a magnificent view of the Panamint Mountains and the valley below. (See page 4.)

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ED COOPER

DEATH VALLEY

desert wilderness in danger

Death Valley National Monument needs stronger protection from invasions of exotic plants and animals, man's vehicles, and mining activities

by HAROLD WM. WOOD, JR.

In February of 1933, President Herbert Hoover signed an Executive Order that created Death Valley National Monument. The area was closed to mining and settlement, and its natural features were to be protected. Four months later Congress passed a law permitting resumption of mining activity within the national monument. Since then the monument has been enlarged several times, but the combined effects of the preceding legislation, soaring visitor use, and other problems have obscured any benefit of enlargement.

Originally established to protect the "unusual features of scenic, scientific, and educational interest therein contained," the monument now suffers from an onslaught of more than 500,000 visitors a year. The dilemma of recreation versus preservation, common to all the national parks and monuments is nowhere better exemplified than in Death Valley. With half a million visitors a year, most of them concentrated into the winter months, management of the area to preserve its wilderness characteristics is extremely difficult. Mass recreation, rather than preservation of natural values, seems to be the byword. Most of the people bring with them campers, trailers, mobile homes, and other mechanized paraphernalia with which they crowd the campgrounds. Many people drive jeeps into the back country or ride motorcycles, dune buggies, mini-bikes, or trail bikes.

Some seven hundred miles of paved and dirt roads are open to vehicles in the monument although most of the roads were constructed not for visitor use, but as access to mining sites long since abandoned. Such roads lead nowhere, but they are kept visible by present explorers. The result is almost permanent scarring, destruction of fragile

desert flora, and disturbance to desert creatures such as the bighorn sheep.

For many years off-road vehicles have been used to reach locations where foot exploration could begin. Hardy "desert rats" and intrepid rockhounds drove into remote areas and came back with tales of isolated canyons and beautiful mountains. Even these reports did not get too many other people interested, until gradually a cult began to form—not around the desert lore, but around the machines themselves. For many people today the use of these vehicles is a sport in itself. They do not seek access to the natural features of an exciting desert landscape; they seek only the thrill of bumps and accelerations.

There is no need for vehicles to drive *off* the roads in Death Valley, for there is hardly a need to drive *on* the multiplicity of dirt roads. Park Service regulations reflect this fact, for it is not only forbidden to drive off the roads, but new regulations require a state highway license even for motor-bikes. Sadly, the old scars are incessantly renewed by travelers wanting only a joyride, and new scars are made by people who ignore the regulations and can only be regarded as vandals.

Off-road vehicles not only damage desert esthetics; they trample many desert plants. The California Native Plant Society has listed eighteen endemic plants in Death Valley as being rare or endangered. Many of these plants are survivors from prehistoric periods when Death Valley was more moist than it is today. These species of plants were isolated by alkali sinks, sandy wastes, and rocky mountain ranges. Most show unique adaptations to the desert environment, but some are confined to habitats that approximate conditions that were more widespread thousands of years ago. A few rare plants may be found isolated high atop the Panamint or Armagosa ranges, and others are found only in wet years in a few Death Valley

Mud cracks in the valley floor at Death Valley National Monument. A steep alluvial plain can be seen in the background.



CECIL W. STOUGHTON, NATIONAL PARK SERVICE

ROBERT SCHOLL



The Beauty of Death Valley's shifting sands and mountainous backdrop is framed by an unusually shaped piece of deadwood, above. At left and below, however, the land contained within the monument shows signs of abuse and scarring. Some of the scars are caused by off-road vehicles that not only mar the landscape but destroy endangered desert plants. Other signs of abuse were caused by mining activities, past and present. The picturesque miner and his burro have been replaced by the bulldozer, helicopter, and other sophisticated mining equipment. With the new technology, remnants of old mines and ghost towns are threatened as well as the natural values of the monument. Although few mines are active today, 47,000 mining claims are scattered throughout Death Valley, posing a potential threat and presenting legal difficulties in managing the monument.



FRED E. MANG, JR., NATIONAL PARK SERVICE



Campers and trailers crowd the campgrounds at Death Valley, particularly in the winter months.

NATIONAL PARK SERVICE



NATIONAL PARK SERVICE



Exotic and introduced species have caused the decline of native flora and fauna in many natural areas. In Death Valley feral burros, offspring of the burros of early miners, trample rare plants and compete with the native bighorn sheep. This competition has resulted in a reduction of the sheep population.

washes. When groups of jeeps or motor bikes go roaring up desert canyons and washes, they threaten to decimate the last of these unique species.

Another cause for destruction of rare native plants is the invasion of species not native to the region. Feral burros, offspring of the burros of the early miners, trample and graze rare Death Valley grasses and flowers. The tamarisk, a native shrub of Africa, has taken over in many of the wet areas, assimilating the scant water supply, and crowding out native plants.

These two exotics, the burro and the tamarisk, threaten more than the native vegetation. The rare desert bighorn sheep is a sensitive creature that has only a few refuges left, one of them being Death Valley. The tamarisks choke the few watering places with growth, sucking up the life-giving water and making it unavailable for the sheep. The feral burros compete with the bighorn sheep and other creatures for palatable, edible plants. Burros also muddy up the water holes and defecate in them. Such pollution does not seem to bother the burros, but bighorn sheep require isolated watering places with clear, clean water.

Every year there are more and more burros and fewer sheep. The Park Service is conducting research to determine how best to manage the burros. The choices seem to be live capture and relocation or direct reduction by Park Service personnel or both. The Park Service also is attempting to eradicate the tamarisk, but this problem, too, is difficult to solve.

The greatest mistake in the history of Death Valley was the reopening of the national monument to mining. The four months that elapsed between creation of the monument and repermitting mining seems a sufficiently short time to arouse suspicions of intense lobbying from the mining industry, but in fact this may not have been entirely an example of greed. In a letter to the Congress, then Director of the National Park Service Horace Albright supported the bill allowing mining. Director Albright said, "In recommending the establishment of this area as a national monument, however, it was not the desire to prevent prospecting and mining within the area, as such activities would in no way interfere with the preservation of the characteristics of the area sought to be preserved. In fact,

the picturesque miner is one of the characteristics which give the area the color of the early pioneer days, and his continuance there would be a very desirable feature of the area under national-monument status." (*Congressional Record*, March 3, 1933, page 5436.)

This romantic vision was enough to get Congress to permit mining in Death Valley, but today the vision is not so romantic. The grizzled miner and his burro searching for gold, silver, and antimony are gone, and in their place are the bulldozer, the helicopter, and million-dollar mining equipment extracting lead, talc, and borax from large open-pit mines. The historical mines and ghost towns of Death Valley do give a flavor of the color and spirit of the Old West. But, ironically, the modern mining practices threaten to destroy the remnants of these picturesque old mines and ghost towns, as well as the natural values of the monument.

Even a few active mines in Death Valley today are an insult to the ideals behind a special reserve such as a national monument, but in fact some 47,000 mining claims are scattered throughout the monument. Death Valley is considered one of the most thoroughly prospected areas in the West. Most of the claims are worthless, but they present legal difficulties in the management of the national monument. Some of the claims are owned by large mining companies, such as U.S. Borax and Tenneco. Although today it is economically unfeasible to extract the minerals found in most of these areas, the price of many minerals is increasing, and mining may become feasible in the future. Among the items produced with minerals extracted from Death Valley are ceramics, glass, steel, enamel, fabrics, and electrical insulation.

The threat is not simply one of development of mining sites. Mining law (primarily, the Mining Law of 1872) allows claim owners to build whatever roads they please to get to their mining claim. Death Valley already bears the scars of too many roads of this type. More can be expected unless something is done to halt further exploitation of mining sites.

In twenty years, Death Valley could become one vast mining district. Roads could be blasted and bulldozed across the landscape to provide access to the mines. Ore would be hauled out, business would boom, and we would pay the price by losing the greatest desert wilderness in North America.

An example of the kind of devastation mining exploration can cause is shown in a back-country spot called "Hole-in-the-Wall." Large areas bear the scars of roads built around and about an undeveloped mining claim. Apparently the mining company did not think that it was enough to build a road merely to their site; they crisscrossed the whole area with bulldozers. One gash leads down into a wash, crosses, and stops. Another gash goes partway up a hillside and stops abruptly. Another winds around in between to finally dead end. After following a maze of false starts and dead ends, a person walking the bull tracks will find a final dead end. Half of the dead end roadways are isolated on the far side of a washout. And where is the claim marker? Up on the hilltop, away from the roads, and spray-painted silver to be easily seen by helicopter. There was no need for *any* road at all inasmuch as the company apparently decided to use a helicopter.

At present, the only recourse for the Park Service is to

acquire the patented mining land. Last year they acquired the Keane Wonder Mine, but funds for such projects are usually limited and there are literally thousands of mining claims to deal with.

A public hearing is upcoming on the suitability of classifying portions of Death Valley in the National Wilderness Preservation System. Under the Wilderness Act of 1964 the Park Service was required to make a study of wilderness suitability and to present a proposal.

But even wilderness designation will not solve the mining problem, for although roads and developments are excluded from designated wilderness areas, the law expressly permits new mining claims to be made until 1984. This mining exception was a compromise included in the Wilderness Act as a price for its passage. Efforts have been made to delete this provision from the Wilderness Act, but thus far they have been unsuccessful.

These facts leave a few major alternatives for saving Death Valley from becoming a mining district. One possibility is that the Death Valley wilderness designation proposal will specifically include a measure to establish a moratorium on new mining activity. Another possibility is that the obsolete Mining Law of 1872 may some day be repealed or updated.

More secure protection for Death Valley could be provided by upgrading its status from a national monument to a national park. A national monument is created by presidential order and it can be abolished in the same way. In the past, several national monuments have been so abolished. National parks, on the other hand, can be designated only by Congress and are ensured of the greatest degree of protection possible. Combined with a substantial wilderness classification, national park status for Death Valley would provide the National Park Service with stronger protective and management authority. Such designation has been recommended by the Park Service's Advisory Board on National Parks and by reports made by the Park Service itself.

The upcoming Park Service hearing on the Death Valley wilderness proposal will give interested citizens an opportunity to express their views on the questions of wilderness classification and national park status for Death Valley. Copies of the Park Service wilderness proposal for Death Valley can be obtained by writing to the National Park Service Western Regional Office, 450 Golden Gate Avenue, San Francisco, California 94102. Citizens can also ask to be notified of the time and location of the Park Service wilderness hearing, and can submit letters stating their views if unable to attend in person.

Death Valley is a great scenic, historic, and scientific treasure. Man must not be allowed to destroy it by his misguided activities. ■

Harold Wood holds a degree in renewable natural resources from the University of California at Davis. He has served as a consultant in environmental education and is currently employed by the California Department of Parks and Recreation.



ED COOPER

The Hawaiian Hoary Bat

Daredevil of the Volcanoes



by P. QUENTIN TOMICH

If Hawaii's native hoary bat is to survive
it must be assured of adequate living space

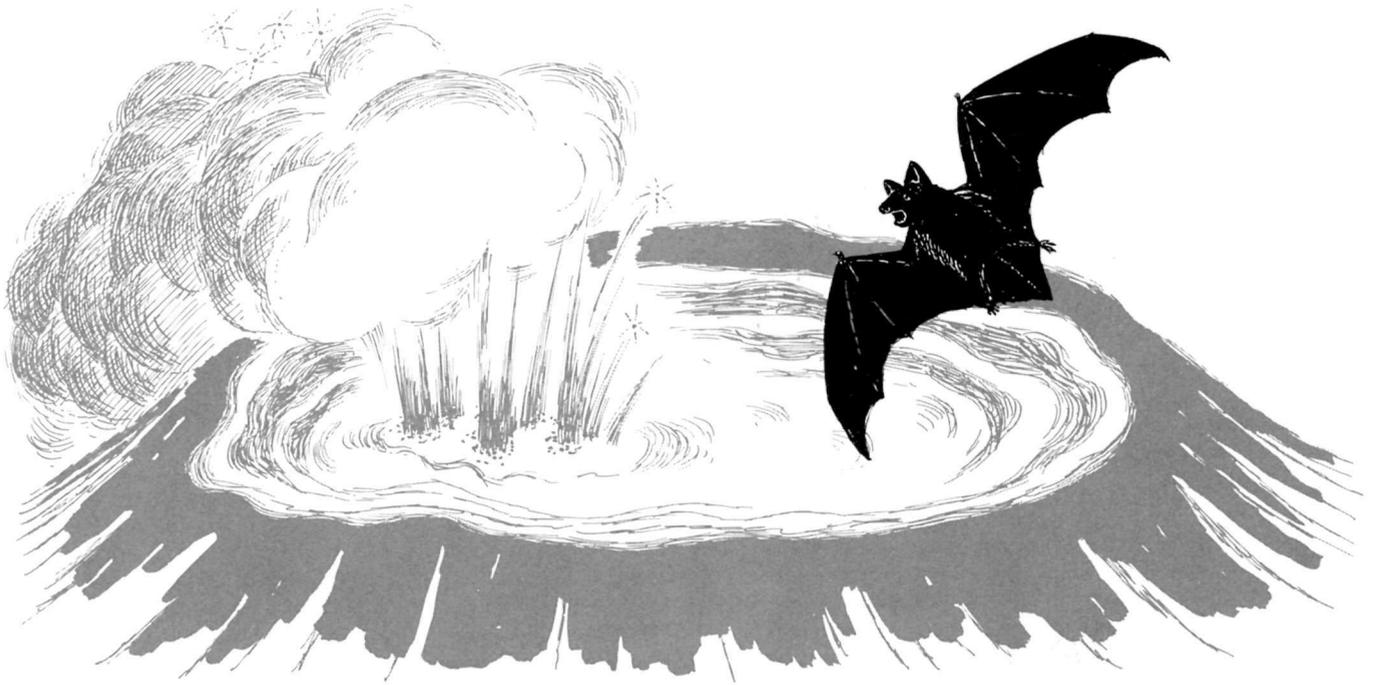
The only known native mammals that preceded man to Hawaii were a species of monk seal and a form of the hoary bat, *Lasiurus cinereus*. Birds are actually the ancient colonizers of the islands: A large and varied assemblage representing a total of eleven families descended from only a few immigrant stocks. This treasure of bird life was at one time distributed widely among the many environmental niches provided by the interaction of the mild climate, varied topography, and luxuriant vegetation of the island chain. Sadly, only a relatively few of these species of birds still survive, and nearly all of the species that remain are listed among the endangered wildlife of the United States. Although the birds of Hawaii have fared badly, the early mammal species can claim a 100 percent survival rate.

The colonization of Hawaii by the hoary bat (*Lasiurus cinereus semotus*) occurred relatively recently, possibly only tens of thousands of years ago. This population is one of three related subspecies all of which are found in the Western Hemisphere. The other two are *Lasiurus cinereus cinereus* of North America and *Lasiurus cinereus villosissimus* of South America. On the basis of a similar smaller size reddish coloration, the Hawaiian form seems to be

more closely related to the South American population than it is to the North American population.

The North American population is strongly migratory, and in recent years several vagrant individuals have reached the southwestern coast of Iceland during fall migration and in periods of favorable wind patterns. Others have been found in the Bermudas, and the Farallon Islands off San Francisco are probably a regular stopping place. The South American form also migrates overland for long distances, although some local populations migrate only by moving from one elevation to another in the Andean cordillera.

The hoary bat's arrival in Hawaii has been described as a result of "the most remarkable mammalian flight of all time." The bat must have crossed open seas for a distance of at least 2,500 miles. Scientists hypothesize that a group of bats or possibly even a single pregnant female of the southern population overflowed a usual migration route, was caught up in a tropical storm and was finally deposited somewhere in Hawaii. However, we can only speculate as to where the pioneer stock originated, how it was aided in its travels, and how many colonizations might have occurred. What is especially remarkable about the establishment



of the hoary bat in Hawaii is not its ability to get there in the first place, but its ability to remain once it had arrived. An immediate suppression of migratory instincts must have occurred because any bat that would have headed out to sea, obeying an urge to return to the ancestral homeland, almost certainly would have been lost.

The Hawaiian hoary bat exhibits seasonal movement and local loose aggregation while foraging; it is uncertain whether regular migration occurs from one island to another. Slight seasonal temperature variations are evident in Hawaii, but the minimum temperature at sea level will only rarely drop as low as 55° F, and in the mid-elevation forests temperatures as low as 40° F are uncommon. The bat responds to cooling weather by acquiring deposits of fat in late summer. These deposits account for 20 to 25 percent of a bat's body weight, which suggests the possibility of a dormant period. One function of this fat reserve might be to carry the bat through the period of shorter days and cooler weather when the food source of small flying insects is scant. The usual mechanism for reduction of metabolic rates as a means of conserving energy is unquestionably an attribute of the Hawaiian subspecies. It easily explains the normal sluggishness of

any bat at rest. Even though the bat forages daily, there could be times of inadequate nutrient intake. Very rarely an individual hoary bat is found on the ground, unable to fly and its energy reserves depleted. Because the bat has no natural enemies a usual means of death may be just such physiological attrition combined with old age.

The Hawaiian hoary bat is typically a solitary, tree-roosting animal. Occasional specimens are found singly in rock crevices or even in buildings. Thus, the population is widely scattered. This dispersal lessens the risk of mass mortality that is faced by cave bats, which are forced by their narrow physiological tolerances to congregate in large numbers at a few optimal sites. Although the bat may remain overnight in the barren mountains where it is sometimes seen, this is unlikely. There, even in summer, nightly frosts are the rule.

The Hawaiian hoary bat has been recorded on the islands of Kauai, Oahu, Maui, and Hawaii. The major populations occupy Kauai and Hawaii, but only on Hawaii has any extended effort been made to assess their abundance and distribution. Available data suggest stable numbers of bats on the island of Hawaii at least since the 1940s, given expected fluctuations that may be related to



STEVE POTRAS

The Hawaiian hoary bat is typically a solitary, tree-roosting animal. In spite of the bat's adaptability, it is dependent on secluded forest areas. These refuges are disappearing.

climatic cycles. The total number of bats is probably in the range of a few thousand. At selected locations on the big island of Hawaii, up to three bats can be seen foraging between sundown and dusk. As many as twelve bats have been observed at one time over Hilo Bay on the eastern side of the island and as many as seven over Kailua Bay on the western side. In November 1840, Titian Peale of the U.S. Exploring Expedition observed Hawaiian hoary bats only a few miles south of Kailua Bay, at Kealakekua Bay and declared the species to be "quite common" there. I have observed as many as twenty-two bats foraging in and

near the cove at Honokaa Landing on the northeast Hamakua Coast. Concentrations of bats are more readily observed from September to December. There seems to be a mixing of the populations from the different areas of the island in this season and it may well be the time of breeding. The twin young produced by each female are born between May and July, according to preliminary data. Males apparently are fecund the year around.

In upland regions the bat forages as an individual and often selects its hunting grounds in either a small clearing in a wooded area, a glade provided by a cemetery or park in or near a town, or open land at the edge of a forest. These sites are used habitually, so it is easy to observe bats once their regular feeding places are found. If one bat is disturbed by another in the near vicinity while foraging, it will usually display aggressive behavior and will attempt to drive the intruder away. Some bats are attracted to insects that come to street lights and will forage at these favorable places for many minutes at a time. Bats sometimes feed high in the air in the open, over pastures or sugarcane fields, especially if the air is still.

This utilization of a variety of habitats, some radically altered from a pristine condition by agriculture and urbanization, demonstrates the bat's adaptability. This attribute may explain in part the survival of the bat in situations where the native birds have succumbed. In spite of the bat's adaptability, it seems obvious that the availability of natural forest areas is essential to the survival of the species. For example, on the island of Oahu, lowland forests have been either totally removed or replaced by exotic tree species. A few upland forests survive only as modified remnants. As a result, the hoary bat is rarely seen on this urbanized island. However, the situation was much different in 1816 when forests of leeward Oahu were only in the early stages of disruption. On the eighth of December of that year Adelbert von Chamisso, the German poet who was naturalist of Kotzebue's Russian-American Expedition, encountered bats in the late afternoon while on an overland trip between Honolulu and the "Pearl River." He recorded that "the air was filled with a small species of bat differing from ours." Notes describing the progress of the journey disclose that Chamisso probably encountered the bats near the mouth of Moanalua Valley at some 250 feet above sea level. This is the earliest known report of a bat in Hawaii and it suggests that Oahu formerly had local concentrations as great or greater than those currently found at favorable sites on the island of Hawaii. I know of only one authentic sighting of a bat on Oahu in the past fifteen years. There are a few records of sightings for Kauai and none for Maui during this period. However, none of these three islands has been searched for bats in any systematic fashion. Rainy, forested valleys and adjacent coasts of the islands of Kauai, Oahu, and Maui should be examined for an assessment of the status of their hoary bat populations.

Little official attention has been paid to the bat from the standpoint of management, protection, economics, or public health. Rabies does not occur in Hawaii and no other disease that can be transmitted to humans is known to be harbored by bats.

Until recently, the state of Hawaii had no provision for protection of *Lasiurus cinereus semotus*. Lately, however, environmental concern in Hawaii has grown, and in 1972

the state legislature adopted a strongly set piece of legislation entitled Act 49, designed to protect endangered species of native birds, mammals, and fish. Under this law the hoary bat receives full protection against disturbances of any kind. Penalties for violations of the act include imprisonment for not more than thirty days, or a fine not to exceed \$100, or both. The act allows the Department of Land and Natural Resources to permit collection or netting of the bat for legitimate research purposes. However, no program relating to the bat has been implemented to carry out the intentions of Act 49 beyond the act's official protection and designation of the hoary bat as an endangered species.

Another action of the state government established a Natural Areas Reserve System Commission. The duty of the commission is to designate unspoiled natural areas of varying size for various levels of protection and management as examples of the wide range of vegetation and ecosystems formerly extensive in Hawaii. Certain of



P. QUENTIN TOMICH

HELP THE HAWAIIAN HOARY BAT

Readers concerned about the survival of the Hawaiian hoary bat can write the Office of Endangered Species urging them to cooperate with the state of Hawaii and other interested parties in studying the needs of the hoary bat. Specifically, such studies should be aimed at identifying and preserving sufficient natural habitat to ensure its survival.

Mr. Keith M. Schreiner
Office of Endangered Species
Bureau of Sport Fisheries and Wildlife
Department of the Interior
Washington, D.C. 20240

the larger NARS lands and waters will enhance the hoary bat's chance for survival by preserving native forest habitat necessary to its existence. Preservation of even small tracts of native forest of a hundred acres or so at strategically located sites could provide enough support to maintain small local populations of the bat.

The Hawaiian hoary bat receives no protection under federal law at present. It is included in the Department of Interior's official list of endangered native fish and wildlife, along with four forms of bats of the coterminous United States. Such listing under the Endangered Species Conservation Act of 1969 provides no protection and no benefits for native endangered species other than publicizing their plight and possibly eliciting research funds. At the federal level further ecological studies of the bat have been recommended. A strong state-federal program is now in order to establish final baseline data with regard to habitat preservation and other possible management procedures that would help assure the survival of Hawaii's only flying mammal.

The Hawaiian hoary bat ranges only sparingly throughout the expansive Hawaii Volcanoes National Park and its vicinity, but in a remarkable pattern from sea level to the summit crater of Mauna Loa at nearly 13,500 feet. Paul H. Baldwin recorded eleven sightings of bats in the park from 1938 to 1949, and a similar scattering has been more recently recorded. During the spectacular Kilauea Iki volcanic eruption of 1959, a ranger observed a bat in flight silhouetted against the fiery glow of a lava fountain. In the prolonged eruptive series of 1969-73 that produced the Mauna Ulu shield volcano and its crater, a mummified bat was collected on newly formed lava at the crater rim. This bat was a probable victim of one of the many eruptions in the 1969-73 sequence. During a daytime observation of a resurgent violent eruption following some days of quiet, a party of geologists and rangers watched with surprise as a bat rose slowly from the crater among the clouds of sulfurous fumes. Suddenly the bat faltered and plunged spiraling into the boiling lava caldron. The bat most likely had selected a roost in a crevice of the quiescent crater wall and was disturbed by rock falls associated with reactivation of the volcano, but it was too late to make its escape.

Does the Hawaiian hoary bat have a fatal fascination for volcanoes, or did the three bats recorded at active sites just happen to be there because of other attractions? Bats and volcanoes have survived together in Hawaii for a long time. The volcanoes will likely remain in spite of man. We must assure that the bat does not disappear because of man. ■

Dr. P. Quentin Tomich, animal ecologist with the Hawaii Department of Health, has lived in the islands for fourteen years, where he has studied populations of small mammals, including the hoary bat. He is author of *Mammals in Hawaii* (Bishop Museum Press, 1969) and is a participant in the Island Ecosystems Project of the International Biological Program. He is past president of Hawaii Chapter, The Wildlife Society, and has actively supported the protection of Hawaii's rare and endangered species through citizen programs for management and preservation of critical habitats.

Whither Weather?

by ISABELLE LYNN

Cloud seeding is a controversial government activity with unpredictable and possibly disastrous long-range consequences

Most inhabitants of the civilized world are at least dimly aware of the debt we owe our mother, the sea. That is, they understand that our common ancestor pulled itself out of the sea to evolve, over painful millions of years and through random natural processes, into what we fondly suppose to be the highest form of animal life possible.

By way of gratitude we have for hundreds of years ignored, despoiled, misused, and all but destroyed the waters of the earth. A great many of us, assessing the damage, feel the cost of undoing our folly is too high, but one can scarcely credit that there should be a monetary limit on cleaning up the only place we have to live.

People are often surprised to learn that there is no such thing as "more water." The amount of water available to the Planet Earth is fixed, neither more nor less at any given time. There are an estimated 359×10^{18} gallons of water—a veritable googolplex of a gallonage—on, in, and around the planet. Simplified, the natural cycle of much of this water is rainfall; use by organisms, including man; return to soil or sea for storage; evaporation into the atmosphere; and subsequent return as rain, sleet, snow, or hail to endlessly repeat the cycle. No matter whether the hydrological cycle takes twenty-four hours or a million years to complete, the total amount of water in its various forms in the system is, for the layman's purposes at least, always the same.

The Bureau of Reclamation in the Department of the Interior has in recent years begun a raindance that is commonly called "weather modification," which means putting rain or snow where the Bureau wants it to fall, not where planetary winds, low and high pressure systems, jet flow, and, if you like, chance would have it fall.

Rainmaking as an idea is hardly new; but it is relatively new to the Bureau of Reclamation. As the Center for the

Study of Responsive Law neatly puts it in *Damming the West*, "Like much else in the West, the attempt to stimulate precipitation by some artificial means has been taken over from the Indians by the Bureau of Reclamation." One would not need to worry if the Bureau confined itself to dancing, singing, sacrificing sheep, or shooting arrows into stratocumulus clouds. Alas. It is not the arrow but silver iodide and salt that are used in cloud seeding, sown from planes or shot from the ground by a propane generator.

For more than a year I have been delving into materials relating to weather modification. Some incredible statements have come to light. For example, an article in *The Smithsonian*, October 1972, notes that a study sponsored in the San Joaquin Valley by the Bureau adduced that opposition to rainmaking ran heaviest "among low education groups with little or no grasp of rainmaking technology and among individuals with strong religious convictions." I don't know about the latter, but the Bureau itself would seem to qualify as lacking in technology. The fact is that today nobody knows enough about weather modification to pursue it as an action program or on any but the most carefully controlled and purely experimental basis.

The rainmakers talk of a "science." If weather modification is a science, it is an inexact one. Meteorologists know a great deal about "weather"; they can look out the window at a manifestation of weather and tell you with certitude what brought it into being. But they have not mastered prediction of its behavior in any real sense. It would be splendid if they had. Then we would know how much fuel to lay in each winter, when to plan vacations and where, when to cut hay, when to plant potatoes, and how much to budget for snow removal. "Modifying"

something so unpredictable as weather can scarcely be done with precision when meteorologists cannot say what would have happened without the use of technology.

The annual snowfall at Paradise Valley on Mount Rainier in the winter of 1971-72 broke all previous snowfall records at more than 1,100 inches, or twice the normal average. The previous alltime record that was broken was for the winter of 1970-71. Cloud seeding has been taking place near Rainier, which is west of Cascade Range, as a part of the Bureau's Project Skywater. The idea, at least, was to have more snowfall on the east, or dry side, of the Cascades. The loudest outcry came from residents of eastside Cle Elum, who blamed cloudseeding activities for breaking the back of their budget for snow removal. They were told by the University of Washington meteorologists, who are conducting the project on the Bureau of Reclamation's payroll, that the cloud seeding was not responsible for the heavy snowfall. Thus the technologists denied achieving what they set out to do, although it was achieved.

Why should all the previously set snowfall records for this area suddenly be broken? And why in 1972-73 was snowfall in the Cascades only 80 percent of normal? The Bureau doesn't know. But the fact provides an interesting avenue for exploration.

One may well ask why, of all agencies, the Bureau of Reclamation got in on this particular act. The reason is simple and had nothing to do with expertise or lack of it. This is what happened, according to *Damming the West*:

In 1961 Floyd Dominy, then Commissioner of Reclamation, had lunch with the late Senator Francis Case of South Dakota. The Senator happened to mention some private rainmaking efforts that were going on in his home state—and not by the Sioux, either. The senator was ex-



PHOTOGRAPH BY HELEN HORSTMAN

tremely interested in the possibilities of such projects. In Dominy's own words: "I'm not a stupid guy. Here was a senator interested in something, so why shouldn't I encourage him a little?" Why not, indeed? As it turned out, Congress rewarded Dominy that same year with some funds, and the appropriations for the little project went from \$100,000 in fiscal year 1962 to nearly \$7 million in fiscal year 1971.

A demonstration of the Bureau's priorities is provided by the 1968 contract awarded to two scientists at the University of Michigan's School of Natural Resources to analyze potential impact on areas subjected to weather modification. The Bureau allotted the sum of \$31,625 to this end, which can be compared with the total of nearly \$18 million for actual attempts at modifying weather that



had been budgeted through fiscal 1968. The resulting report adduced no new knowledge, and its findings were not based on experiments or investigations in the field. It did remind the Bureau that "there has so far not been a single biological field study completed and reported in the literature specifically designed to identify any aspect of the ecological effects of weather modification."

The Bureau had done its duty. It paid for a report that added nothing, but at least it issued a warning, obviously unheeded by the Bureau itself. The emphasis is on continuing development of weather modification technology as rapidly as possible, "consistent with sound engineering practices." Environmental quality comes in a poor second to the Bureau's action programs.

In 1966 the National Science Foundation warned: "Anything that has a general and significant effect upon plants and animals, making some more abundant, others less so, is of primary concern to mankind, for it strikes at the very basis of human existence. Changes in weather and climate may be expected to have such effects." Moreover, in its 1973 report on *Weather and Climate Modification* published by the National Academy of Sciences/National Research Council, the Committee on Atmospheric Sciences said, "In considering the prospect of controlled weather modification, we are acutely aware that just

because science and technology may develop the capability to modify weather there is no reason to assume that society should automatically use that capability."

Although it is not widely publicized, citizens are protesting many of the Bureau's experiments. Their clamor is valid, if only because the weather modification technologists do not really know whether they are achieving their goals of additional rain or snowfall. In any case, there never is more rainfall or snowfall; precipitation may be moved from where it would have fallen to somewhere it would not. But there is no way at present to ascertain whether seeding actually might lessen the amount that would have fallen. There is another side to the coin: Too much silver iodide can cause rain not to fall at all.

Only a few seem to have seriously considered the legal, social, and most importantly the ecological implications of weather modification. The National Science Foundation, which in 1966 warned of virtually cosmic consequences of this activity by 1972, took a rather more blasé attitude in 1971 toward the Bureau's San Juan (Colorado) project—five years of attempted weather modification, which will end in 1975. According to the National Science Foundation, the San Juan project will result in "few, if any, sudden or catastrophic ecological changes." One wonders how the National Science Foundation was able to make such a dramatic turnabout in a mere six years. Further reading elicits the information that "the changes will be reflected in cumulative year-to-year changes in abundance of species, and slight shifts in rates of reproduction, growth and production. In other cases where a species is unable to survive or migrate, it may become less numerous or even extinct."

The report, "The Impacts of Snow Enhancement," prepared for the National Science Foundation by the Stanford Research Institute and released in late 1972 speaks, among other things, of undesirable "side effects" of weather modification. In fact, the so-called side effects of cloud seeding are direct, expected, anticipated results. And there may be quite a few effects that are unwanted.

Let us consider some of the things the National Science Foundation has to say about the winter orographic snowpack augmentation in the Upper Colorado Basin, or WOSA, as planners call it: "It is estimated that in the average year WOSA will generate 2.3 million acre feet (maf) of augmented runoff within the Basin. . . and 1.2 maf outside the Basin." Five pages later in the report it is mentioned that 2 maf of augmented water annually can be expected to produce an annual suspended sediment increase of 12.5 million tons, most of which will be trapped in Lake Powell and other Colorado River storage reservoirs, thus reducing their storage capacity and useful life. We already have made a disaster area of Glen Canyon. Augmenting the suspended sediment in the river by generating more runoff would make Lake Powell an obscenity—insofar as it is not one already.

The increased flow from the Upper Colorado Basin will result in the addition of 700,000 tons of dissolved minerals to the river annually. According to the National Science Foundation report, WOSA would reduce the average dissolved salt concentration in the river. But this very small water quality improvement will depend on the uses

to which the water increment is applied. "The serious water quality problem of the Colorado River will not be significantly improved by WOSA and may be made much worse if it is used to bring additional lands under irrigation or for industrial development." The argument that the dilution in salinity would enable us to honor our treaty with Mexico regarding Colorado River water use rights is something of a bill of goods. The National Science Foundation report says, "The water produced will probably not be sufficient on the average to accommodate the Mexican Water Treaty obligations if evaporation losses are considered." Because obviously evaporation losses exist, the whole statement seems fatuous.

Among other side effects of the Upper Colorado Project is the increase in the probability of avalanches and floods—unless control measures are taken. These control measures are not spelled out for the excellent reason that as yet no one knows what they would be.

"The possibility of additional snowfall in downwind areas, such as Denver and Boulder, cannot be completely eliminated. Damages in these areas in some years might be as great as, or greater than, those in the mountainous areas because of the much larger populations that would be affected. However with careful control [in this case presumably resisting the urge to seed storms in the downwind areas, although there can be no control over the possibility of a wind shift] the probability of these events will be small." Residents of Denver and Boulder can take what comfort they will from that statement.

Perhaps one of the saddest things about this whole business is the confession at the end of the National Science Foundation report: "In general the assessment was severely limited by the time available (six months for the basic research). This did not allow sufficient time for conducting subordinate research tasks in a logical sequence nor did it allow for adequate iteration of the assessment process." Six months for a planned climatological change that could affect us for centuries! There is no evident reason to be in such a tearing hurry.

Surely no one can question that man has been tampering with climate. The rise in temperatures in urban areas, resulting in part from the release of carbon dioxide into the atmosphere and thermal pollution, and the increase in cloud cover in urban areas (for example, Washington, D.C., and Davos, Switzerland, where it has been closely checked, according to Gordon J. F. MacDonald, Vice Chancellor for Research, University of California at Santa Barbara) are but two measured instances of the results of our inadvertence. Now we are faced with specific, deliberate tamperings whose ultimate effects are unknown.

Any alleged benefits from the augmentation of precipitation should be considered in the light of this revealing remark from a Bureau of Reclamation pamphlet on Skywater: "... the prospects of being able to manipulate a tenth of that precipitation are exciting." Yes, they are exciting, and eventually they could prove to be so, well beyond the Bureau's wildest dreams.

As if the situation described here were not bad enough, the Bureau of Reclamation is not alone in its weather modification efforts. Multiply the situation by other federal agencies involved in similar projects—National



Oceanic and Atmospheric Administration, Department of Transportation, the U.S. Forest Service, the Federal Aviation Agency, and the military agencies.

It seems obvious that now is the time to apply the cautionary brakes in order to find answers to the important questions raised by the National Science Foundation study. As the President's National Water Commission said in its report released in November 1972, "... insufficient information is known at present to develop a comprehensive national policy with respect to this technology [precipitation augmentation]."

Unfortunately the Bureau of Reclamation, like the Corps of Engineers, loses interest rapidly in such an unchallenging field as cleaning up our polluted waters, an area in which the expertise they do have would be valuable. Moreover, cleaning up will be considerably less dangerous than cloud seeding until science has a much firmer grasp on weather modification and its long-term effects on all inhabitants of the earth, animal and plant alike. ■

Active in conservation work for some fifteen years, Isabelle Lynn is a trustee of National Parks & Conservation Association.



GOATS of GUNSIGHT PASS

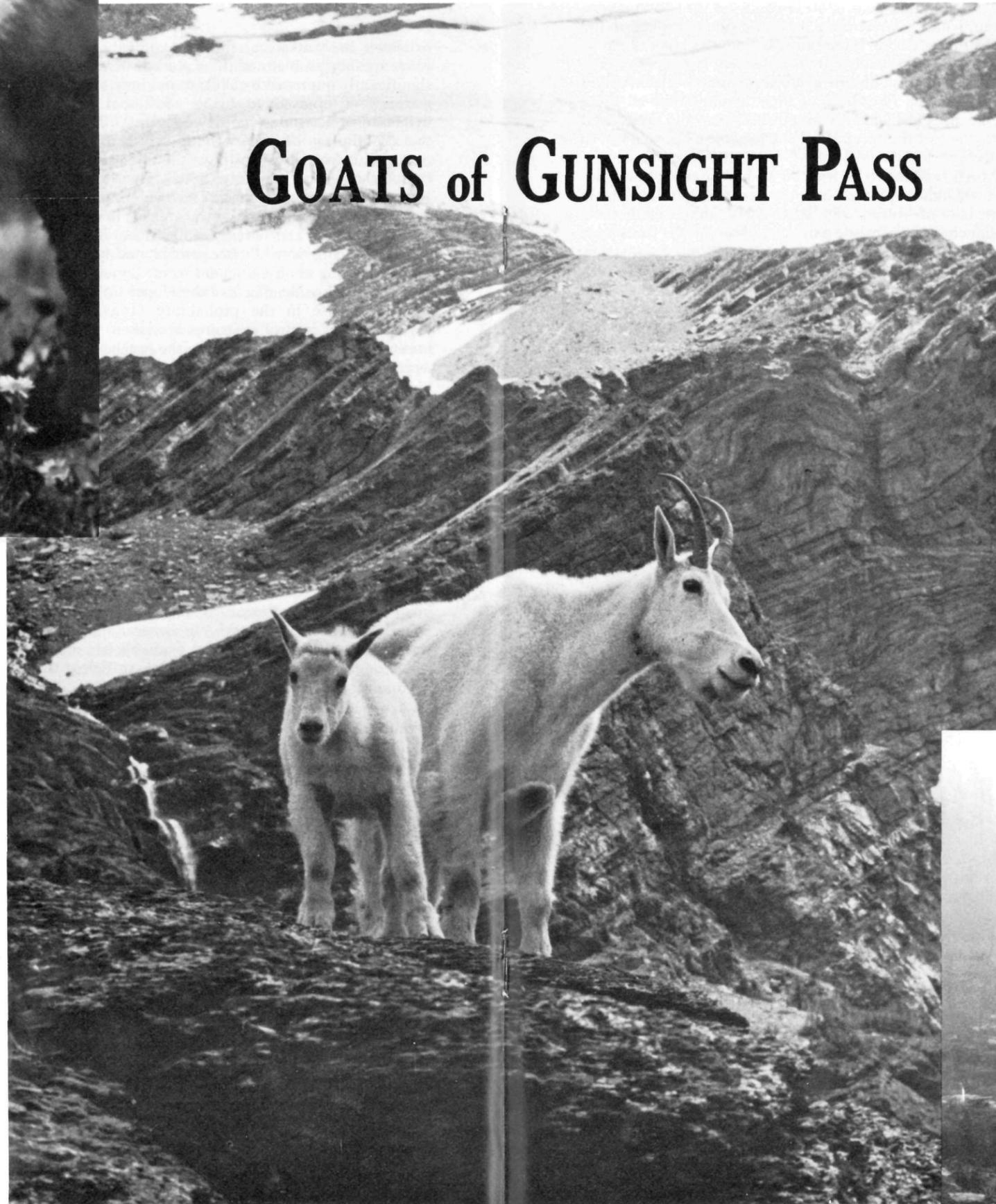
article & photographs by
CHESTER B. RIDEOUT

A graduate student and his wife spend the summer living on the Continental Divide and studying the behavior of mountain goats in Glacier National Park

The sun's first rays gleamed down past the snowy slopes of Mount Jackson as we heated our breakfast over the tiny stove. The wind, whistling over the pass, pushed ripples across the lake far below. A white-crowned sparrow sang its lonely song, adding variety to the steady drumming of cascading waterfalls. Only thirty feet away, on a boulder-strewn slope, four male mountain goats had gathered around an artificial salt lick.

Suddenly one of the billies made his bid for the salt. With stiffened legs and a jutting jaw, he approached the lick, challenging the male who had held monopoly over it. I reached for my camera. The 200-pound beasts tossed their heads up and down and circled each other majestically.

It was early July. My wife and I were encamped on Gunsight Pass, a remote spot along the Continental Divide in Glacier National Park, Montana. Glacier-carved between two mountains, Gunsight is a magnificent rock ridge separating two trout-filled lakes. We picked this location



because a herd of twenty goats occupy the vicinity of the pass and we were interested in observing their movements and behavior as part of my work toward a master of science in teaching degree. Throughout much of the summer I lived in a nylon alpine tent with my wife Lynn; all of our equipment had to be backpacked in.

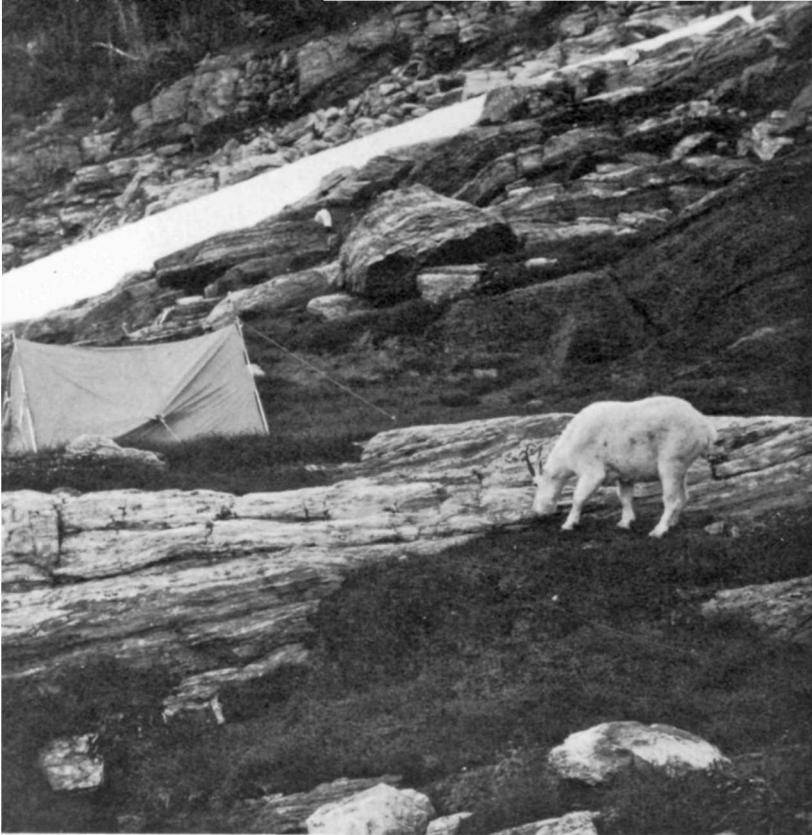
The trail that leads to the pass is well maintained, but snowbanks limit access before mid-July and make horse travel difficult. The windy and often cold pass has changeable weather; thunderstorms come on with amazing suddenness. Modern, lightweight camping gear and freeze-dried food are essentials, and a portable stove is necessary because of the lack of wood.

Most visitors to Glacier Park don't see mountain goats from close range, but must strain for glimpses of these white balancing artists. High on cliffs the goats move slowly and deliberately, finding footholds for their nonskid hooves on what seem to be smooth rock faces. They seem to defy nature, remaining on steep cliffs even throughout the severe mountain winters. Although they have few natural predators, their life is filled with the dangers mountain climbers face—as many as forty percent of the new kids fail to survive their first winter season.

Mountain goats are not really goats, their closest relatives being the goat-antelopes of Europe and Asia: the chamois, the serow, the Japanese serow, and the goral. They occur naturally in three states of the lower forty-eight, including Washington, Idaho, and Montana. Introductions have extended their range to include mountainous areas in Oregon, Colorado, and South Dakota. They are also found in the high country of British Columbia, the Yukon, and Alaska.

The spunky mountain goat of the Continental Divide seems to defy nature by making its home on the sheer glacier-carved cliffs even through the bitter mountain winters.



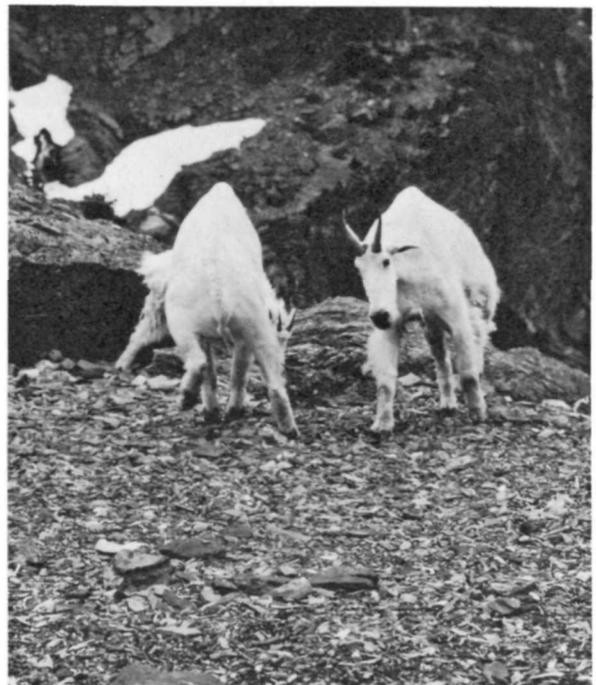


The goats frequented the author's campsite after discovering an artificial salt lick. They are fond of this delicacy, often battling for a taste.



The mountain goat is often confused with the bighorn sheep, which is more often seen and photographed in the parks of the Rocky Mountains. Unlike the bighorn rams, whose huge spiral horns are far different from those of the females, male mountain goats have simple black spikes that are much like those of their mates. Their all-white wool coat is also easily distinguished from the brown and tan pelage of the sheep. Indian tribes have been known to collect the newly shed wool off bushes to weave blankets.

Much remains to be learned about the mountain goat, even though it is prized as a big game species. The rigors of its habitat—biting cold, sheer cliffs, and unpredictable avalanches—have made extended observations from close range difficult. Its existence was thought to be a myth by many as recently as 1880. Early reports of mountain men indicated that the goat would land on its horns when falling from precipices, rebounding without injury!



The goats of Gunsight Pass show little fear of people, and during the summer they often approached to examine us more closely. They sometimes surrounded our tent at dawn, and once a kid tripped over the guylines, causing the tent to collapse. Many hunters consider goat hunting to be tremendous sport because of the animal's inaccessibility, but some have been reluctant to shoot a curious goat when they happen to meet face to face. In areas where goats are hunted they may be quite wary, however, and a close approach by a mountain goat makes headline news in Montana.

The daily activities of the Gunsight herd in the summer consist mainly of feeding and resting, and they also show an interest in salt. During the morning they gradually climb in altitude while feeding. At midday most are resting on the higher slopes. They often take dust baths in wallows they have carved in the thin alpine sod, tossing

clouds of dust over their backs with a foreleg. Their food includes some of the prettiest wildflowers in the park—showy asters, arrowleaf groundsel, yellowdot saxifrage, buttercups, and mountain heath. Much of the rest of their diet consists of grasses, sedges, and the growing tips of shrubs and subalpine fir.

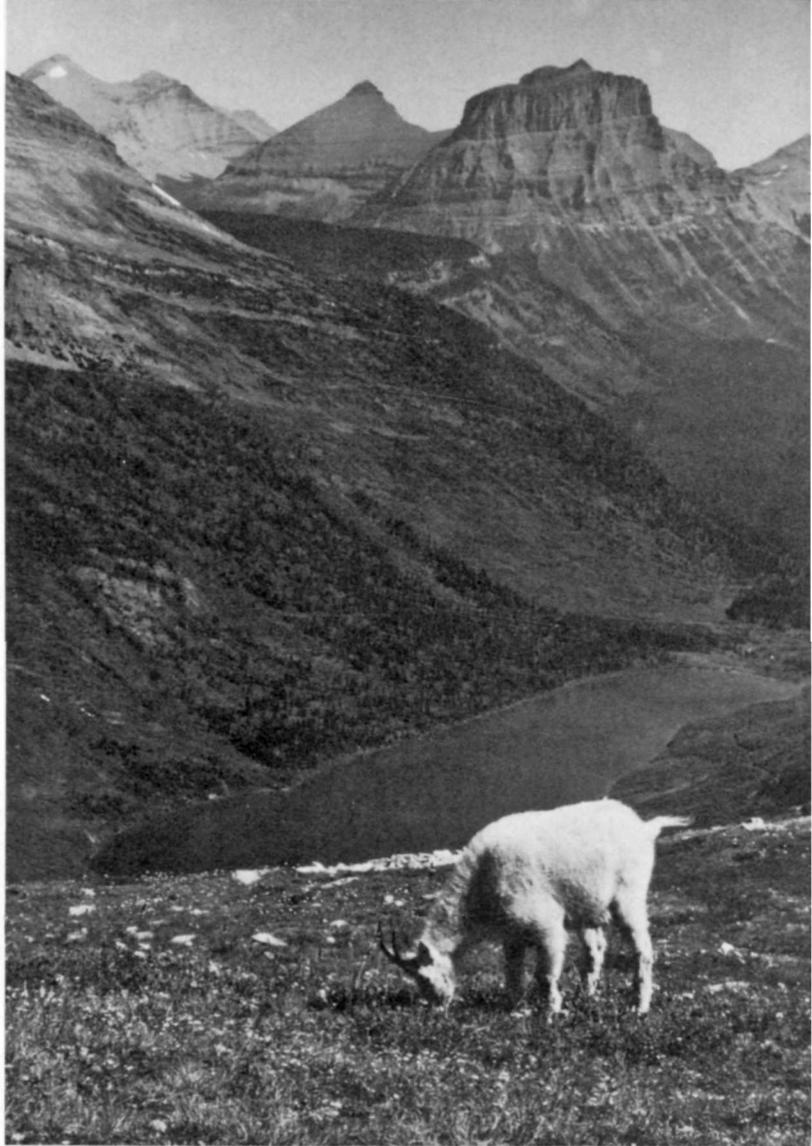
The most striking aspect of the mountain goats' activities, however, is their fighting behavior near salt licks. They quickly locate any artificial source of salt on the pass, and it is an excellent opportunity to watch their movements as they interact. Although a goat seldom responds to others in the herd while feeding or bedding down, it will often approach another at a salt lick, trying to take it over for itself. When billies come together on these occasions, a chorus of grunts, snorts, and humming sounds fills the air. Previous studies were made from so far away that adults had been thought to be practically mute.

One week after we first saw an aggressive encounter between adults, we watched two young mountain goat kids carry out circling movements similar to those of their elders. They went a step farther than the adults in their actions, however, actually butting each other under the abdomen. Because their horns hadn't formed yet, their blows were harmless, but at an older age they could be lethal. The adults were not observed to attack each other, but one male displayed an injured eye, another a large black swelling on his side, and a third a fresh gash on his rump, indicating that attacks with the horns are not uncommon.

The aggressive behavior of animals is often misinterpreted. Many feel, for example, that the antlers of elk serve primarily to allow them to fight off predators or to wound other males during the breeding season. Studies indicate, however, that these antlers actually provide a wide base for contact between males of the same species, allowing a pushing match to take place. Tests of strength of this sort determine the victor without bloodshed, the weaker animal eventually giving way. Because winners get their choice of females and of important substances in short supply, such as salt, they tend to be more successful and father more young.

The establishment of a "pecking order" is another means of resolving conflicts. In this case each animal knows, from previous experience, its status in the herd. If it has been defeated previously by an opponent, it will not compete again, but will avoid a fight. The pecking order that exists in the Gunsight herd is determined by the size, sex, and age of contestants. Males are dominant to females and older goats dominate younger goats.

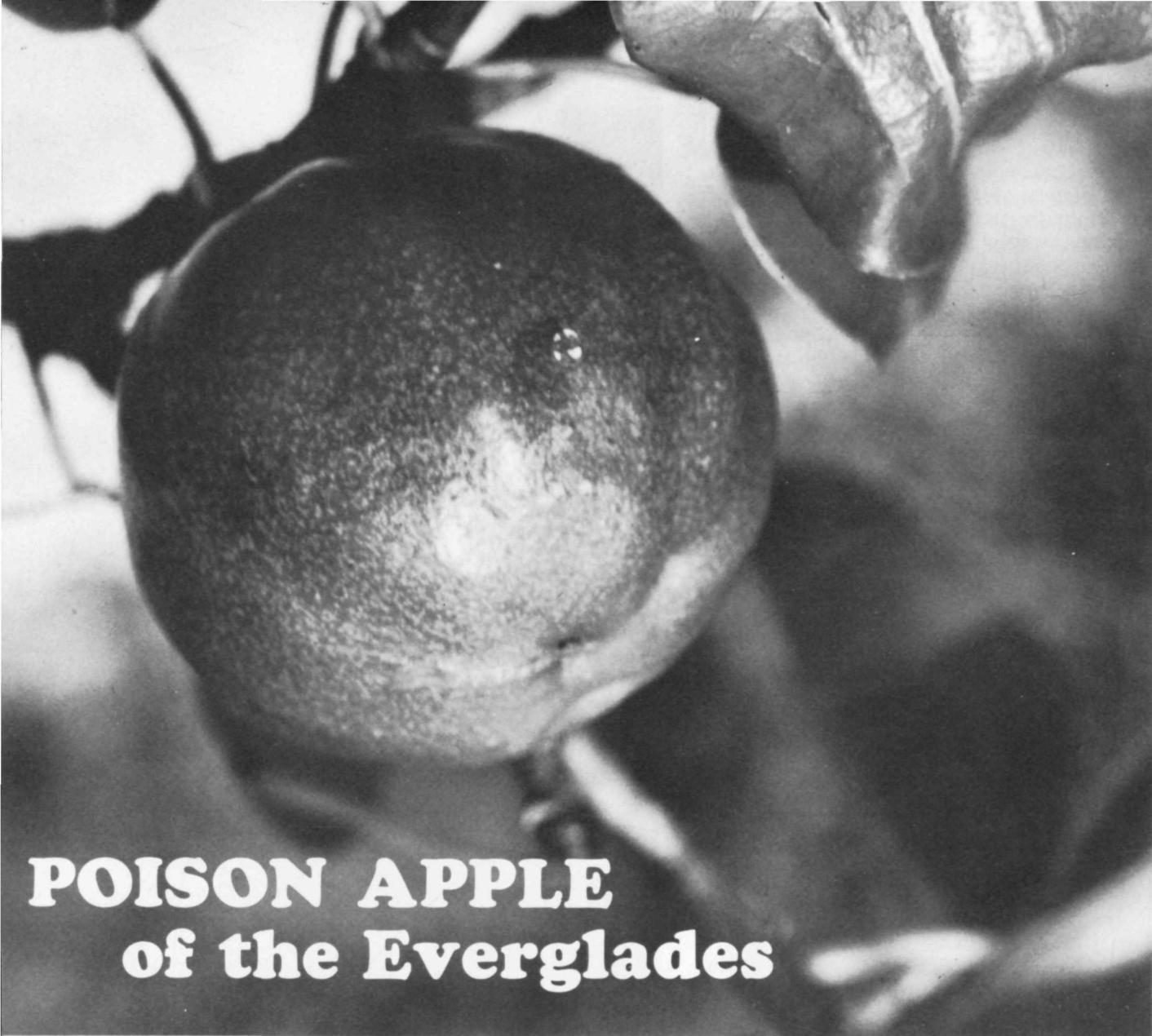
The fighting behavior of mountain goats is quite different from most hooved mammals, however, because they don't push against one another. Their horns are not modified for attacks from the front, and contests are not determined by measuring the opponent's strength physically. Their circling behavior is a display which advertises their size. One of the contestants usually gives in before they come to blows. The serious injuries they receive while fighting are still not suffered as commonly by other ungulates, however, many of which follow elaborate rules and thereby avoid being stabbed by sharp horns. These differences indicate that the mountain goat has an extremely primitive fighting behavior, one that is not shared by any of the other hooved mammals of this continent.



The goats feed on asters, buttercups, mountain heath, and other wildflowers, as well as the grasses and shrubs of the mountain ridges.

In August we left the pass for the summer. The wind that made our packframes whistle drove the thin waterfalls across the barren cliffs. New clouds formed downwind from Mount Jackson's peak. Above us a lone white goat paused, looking down from its mountain stronghold. As we directed our footsteps along the winding trail, I hoped that we could return again to the world of the mountain goat, to continue our study of the unique fighting behavior of this magnificent mammal. ■

Chester B. Rideout studied the goats in Glacier National Park during the summer of 1969, when he was working on his master of science in teaching degree at the University of Montana Biology Station at Flathead Lake. Since that time he has been working at the University of Kansas on his Ph.D., which involves a radio-tracking study of mountain goat movements and ecology. He has taught at the high school level and plans to teach in the fields of ecology and animal behavior when he completes his graduate work.



POISON APPLE of the Everglades

The beautiful manchineel tree of southern Florida and the Caribbean has been the subject of fearsome reports about its deadly properties for four centuries

by JOAN BROWDER

A prairie warbler rests a moment on an obliging branch of the shapely tree, before springing off and dipping into the tropical hammock. The tree's deep green leaves, heavy with dew, glisten in the sunlight, as a golden web spider, spinning her net behind her, drops from one leaf to another.

Basking in the fresh, new, morning sunshine, the handsome manchineel, with its broad bower of greenery, seems to hold a promise of life and all good things; but the manchineel is a poison tree, and its promise can be a deadly deception to the unwary.

In appearance, the manchineel closely resembles an apple tree. With its shiny, often heart-shaped leaves and small, green applelike fruits, it presents a tempting picture to one seeking food or shelter.

But the manchineel does not belong to the apple family. It is a member of the spurge family, known for its many

poisonous plants. Scientists have labeled the manchineel the most toxic tree in the western hemisphere. Merely brushing against this tree can cause a severe skin irritation. Water dripping from its foliage can cause blisters or, if it gets in the eyes, temporary blindness. Eating its tasty, bittersweet apples can be fatal.

A native of tropical America, the manchineel grows in sandy seaside forests of south Florida, the Bahamas, the West Indies, the Isthmus of Panama, Mexico, and throughout the coastal regions of the Caribbean. Spanish explorers, on discovering it, named this pretty tree "el manzanillo" or "little apple," but soon learned to call it by another name—*el arbol de la muerte*, "the tree of death."

Because of its bad reputation, the manchineel leads a precarious existence in many portions of its range. Complete forests on Martinique have been burned to rid the island of manchineel. In the Virgin Islands, where they are considered a threat to the thriving tourist trade, these toxic trees are rapidly being extirpated.

Florida's chary pioneers burned them up, chopped them down or pulled them out wherever they encountered them, leaving the manchineels, like the Indians, a last refuge only in remote, inaccessible regions. In the state today, these trees exist only on a few islands of the Florida Keys—and in the Cape Sable and Crocodile Point areas of Everglades National Park, where they grow under the protection of the National Park Service.

At least one scientist believes that manchineels are so dangerous the park should try to eradicate them, rather than protect them. Dr. Werner M. Lauter, professor of pharmaceutical chemistry at the University of Florida, collected leaves, fruit, and wood from park trees and made a laboratory investigation of their toxic principles. While conducting his experiments, Dr. Lauter was injured by the poison tree several times. As he collected material in the park, a drop of dew from one of the trees fell onto his ear and raised a blister. Later, examining a manchineel apple, Dr. Lauter got some of its toxic juice on his hand. His entire arm was ulcerated and paralyzed for many days.

Not everyone is equally susceptible to the poisonous properties that are present in all parts of this plant. Dr. Walter M. Buswell, late curator of the University of Miami's Herbarium, once climbed a large manchineel on No Name Key. Though he broke branches and leaves and felt sap from the tree dripping onto his face and hands, he was not affected by it.

Almost every botanist who has ever examined this strange tree has a story of his own to relate about it. Tales pertaining to the deadly nature of the manchineel date back to the early sixteenth century, when Queen Isabella's court geographer, Peter Martyr, mentioned it in his book, *De Orbe Novo*, published in 1509.

"Upon the same banks there grows a tree whose fruits are sure poison, and yet they are sweet. When the fruits fall into the water, they are eaten by fish. People who afterwards eat those fish are attacked by divers strange maladies. The Friar Tomas Ortis declared that he has tasted, but not eaten, these fruits; their taste is bitter-sweet. He was afterwards slightly indisposed. The antidote to this poison is to swallow oil. Even the shade of this fruit tree affects the head and hurts the eyes. Dogs, cats, and other animals which eat of it die."

A few years later, Gonzalo Fernandez de Oviedo

described the manchineel in his book, *Natural History of the West Indies*.

"I have been told by Indians that the poison they use to tip their arrows is made from sweet-smelling apples and certain large ants, and the venom of vipers, scorpions, and other poisonous ingredients which they mix.

"The manchineel apples from which the Carib Indians make their poison are borne on very bushy trees with many thick limbs and branches and very green leaves. In some places the fruits are spotted red and have a very pleasant odor. These trees usually grow on the coast near the sea, and every man who sees them wants to eat many of the manchineel apples. Out of every fifty Christians wounded by this poison, not three escape.

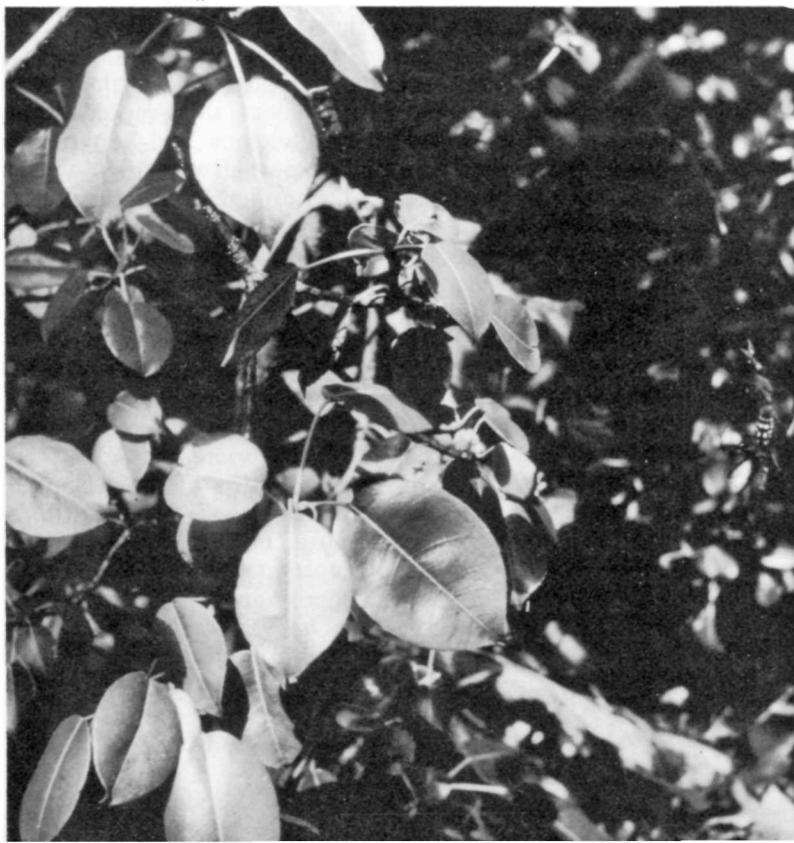
"So that you may better comprehend the power of the poison of this tree, I say that if a man lies down to sleep for only an hour in the shade of one of these manchineel trees, he awakes with his head and eyes swollen, his eyebrows level with his cheeks. If by chance a drop of dew falls from this tree into a man's eyes, his eyes will burst, or at least the man will go blind. It would be very difficult to describe the pestiferous properties of these trees. When the wood of the tree is burned one cannot bear it, because instantly it gives one a splitting headache."

One would never know, just from looking at the manchineel, that the tree could inspire such tales of affliction and death. The manchineel stands out as one of the handsomest trees of the tropical forest. It is especially appealing—and dangerous—during fall and early winter months, when the small, green fruits hang invitingly from its thick, drooping limbs.

Manchineels grow fairly tall, occasionally reaching 65 feet in height, and are often as wide as they are tall, with trunks up to three feet in diameter. They are fairly common, even dominant, in the narrow strip of coastal land

Eating the tempting fruit of the manchineel tree can be fatal. Even dew dripping from the glossy leaves can cause irritating blisters on human skin.

PHOTOS BY JOE BROWDER



where they occur. There is a place, in Watson Hammock on the northwest coast of Big Pine Key, where these poison trees grow in orchardlike profusion.

The manchineel is a deciduous tree. Trees in the park lose their leaves in January and stand totally bare for about a month, before putting forth new growth. Small, inconspicuous flowers are borne in early summer. The fruit is about one inch in diameter.

From these apples, Dr. Lauter and his assistants at the university isolated a toxic substance called *physostigmine*, an indole alkaloid. *Physostigmine* is a well-known drug and poison found in the seeds of *Physostigma venenosum*, a leguminous woody vine native to western Africa. These seeds, when eaten, act as a powerful sedative on the spinal cord, resulting in paralysis of the lower limbs and death by asphyxiation. In large doses, they cause paralysis of the heart. Taken from pods called calabar beans, the seeds have been used by Africans in ordeals for their trials by witchcraft. *Physostigmine* is used in medicine to contract the pupil of the eye and for treating diseases of the eye. It is also used as a sedative to the spinal cord for the treatment of tetanus and as an antidote for strychnine poisoning.

Manchineel apples have themselves been used in medicine. In Cuba, they have been used as a treatment for tetanus; in Jamaica, to treat dropsy and venereal disease. Their stones, as well as bark from the trees, have been employed as vermifuges.

Marked variations in the fruits' taste and toxicity, combined with a wide range of individual reaction to the manchineel, have led to conflicting opinions about the tree's poisonous properties. Mr. Richard M. Bond, officer in charge of U.S. Department of Agriculture Research in the Virgin Islands, says that in the past fifteen years of his duty in the islands, a fair number of tourists have tasted manchineel apples; and, though several have been sick, none have died, nor come anywhere near dying from it. The tourists with whom he has spoken say the juice burns so badly their instant reaction is to spit it out. Clearly, Mr. Bond feels that, since part of the danger of the apples lies in the deception of their supposedly delicious taste, it would be most unlikely that anyone in the Virgin Islands could ever die from eating them.

But 54 German seamen, on landing at Curacao in 1885, were poisoned by manchineel apples. Five of these men died. Again, in 1940, British sailors, shipwrecked on an uninhabited beach at St. Bartholomew, fed hungrily on the poison fruit. Fortunately, these men were discovered in time to receive treatment at a hospital in Gustava, where they all recovered. At St. Thomas in 1954, prompt action with induced vomiting and a stomach pump enabled two persons poisoned by the manchineel to live through their experience.

Symptoms of internal poisoning from manchineel apples include serious nausea and diarrhea, often followed by shock and muscular weakness. Antidotes include ephedrine and atropine. In Cuba, the uncooked rhizome of a native arrowroot, *Maranta orundinaceae*, is considered an antidote. In Mexico, parts of three plants—the pink tabebuia, *Tabebuia pentaphylla*; cats claw, *Bignonia unguis-cati*; and a gourd, *Fevillea cordifolia*—are said to be effective antidotal agents.

In the leaves of the manchineel, university chemists discovered a second compound, *brevifolin*. This compound, though nontoxic when extracted from the leaves, may exist

within them in the form of a powerful glycoside, and may be highly toxic before extraction. *Brevifolin* has been found in nature only once before—in *Artemesia brevifolin*, a poisonous tree native to Madagascar. Any contact, direct or indirect, with manchineel leaves can result in a painful skin eruption. Water dripping from the leaves carries particles of poison in solution or suspension that account for the poison-dew phenomenon.

A third toxic substance is present in the manchineel. Scientists found it in the wood of the tree, but have been unable to isolate or identify it. They did, however, determine that this unknown toxin is even more virulent than *physostigmine* or *brevifolin*.

The unidentified toxic principle in manchineel wood is extremely volatile, despite its potency, and it oxidizes rapidly, once it is exposed to air. Within ten to twenty days after a tree is cut, the poisonous properties of its wood have completely disappeared. In the Caribbean islands, this wood is often used for staves in sugar barrels. It once was prized in Florida and the West Indies for cabinet and furniture making.

Sloane, in his account of plants of Jamaica, says: "Large boards were sown from the trunk of this tree, not only for wainscot and cabinets, but even for the largest tables, this wood being much coveted by all people for its polish, durability, and delicate and various colours."

The wood resembles walnut, being finely textured, of medium weight and hardness. It is yellow-brown, variegated with brown and black, and can be polished to a glossy sheen.

Manchineel trees were burned before they were cut. Woodsmen, careful to avoid the noxious headache-producing smoke, built a ring of fire around the trunk of a tree, before taking the ax to it. Once the tree was downed and its trunk exposed to air for almost a month, it could be lumbered and tooled in the conventional manner.

Should such a potent tree continue to endure man's enmity and destruction? Naturalists who study wild Florida do not think so. Dr. Carl Campbell of the Subtropical Experiment Station, a botanist and student of native plants, says he would as soon exterminate the rattlesnake. He indicates that manchineels, like poisonous snakes, are forms of life to be understood and appreciated.

And the manchineel, like the rattlesnake whose venom is used in treatment of disease, may someday prove beneficial to mankind. The manchineel is a complex tree that has not yet given up all its secrets. It remains an intriguing mystery to be explored, a challenge to students of both chemistry and the natural sciences.

So long as proper controls are exercised, this handsome tropical tree must be allowed to keep its place in life's community. The manchineel is another curious loop in the Gordian knot of life on Earth, about which so little is known. We cannot today presume, as Alexander did with his Gordian knot, to lop off that which we do not understand simply because it presents some inconvenience. ■

Joan Browder is working toward a Ph.D. in environmental engineering at the University of Florida, where her project is to design and simulate a model of energy flow in the wetlands of southwest Florida, including the Big Cypress Swamp and the western flatlands.

NPCA at work

Glacier National Park In November NPCA sent letters to William J. Briggie, Superintendent of Glacier National Park, concerning the master plan and wilderness proposal for that park. Glacier National Park includes one of the outstanding natural areas in the United States. The Park Service seems to recognize this and proposed to include almost 90 percent of the park in the new wilderness area. However, NPCA felt there was ample room for improvement in both the master plan and the wilderness proposal.

NPCA proposed adding four major areas to the existing wilderness proposal. These areas are Camas Creek Roadless Area, 13,500 acres slated for intensive campground development; Bowman Lake, excluded from the wilderness proposal to allow the continued use of motorboats on the lake; Grinnel Glacier, degraded by heavy tourist traffic; and private holdings scattered throughout the park.

Besides the four additions of acreage, NPCA specifically urged the Park Service to eliminate buffer zones or management zones along the Park Service roads in the park, thereby bringing the wilderness boundary to the roads' right-of-way. Also, we asked the Park Service to abandon plans to build two high-country huts in areas where a concentration of recreational activities would damage the fragile tundra habitat.

NPCA recommended further background research and attention to alternatives to automobile facilities in the master plan for Glacier National Park. The effects of snowmobile use, sewage disposal, and back-country developments, all of which can be damaging in remote areas, were treated lightly in the master plan. NPCA cited highway improvements and one-way motor nature trail developments proposed in the master plan as examples of the overdependence on automobile transportation fostered by the National Park Service.

NPCA stated that two projects outside the park boundaries mentioned in the master plan are dangerous to the park environment. These are a proposed road to Waterton Lakes National Park in Canada, skirting

Glacier's boundaries but resulting in a complete circumferential road system around the park, and a proposed airport just two miles from the southeast corner of the park.

NPCA commended the Park Service for planning a mass transit system for Going-to-the-Sun Road and for suggesting low levels of development for four areas within the park.

Goats in Hawaiian parks NPCA is pleased to learn that the National Park Service is making progress toward eliminating feral goats from the national parks in Hawaii.

Among many exotic plants and animals introduced into the Hawaiian islands that have proved destructive to the natural ecosystems, the feral domestic goat has been one of the worst, wreaking havoc with the native vegetation on which many native birds and other animals depend. After the establishment of Hawaii Volcanoes National Park and Haleakala National Park, the Park Service began a long series of programs to eradicate these destructive creatures from the parks.

However, several years ago, when the end was in sight, control rather than elimination became the Park Service goal. This reversal of policy was in response to pressure from organized sport hunters in Hawaii who were accustomed to hunting the goats as deputized rangers. If all goats had been killed off, the sport hunters would have had nothing left to hunt.

NPCA vigorously protested this new policy as setting a bad precedent of hunting in national parks and insisted that the Park Service return to its original goal of complete eradication.

Now the Park Service has fenced off two management units in one of the parks and has virtually eliminated the goats there. Additional units are being

fenced off, and goats will be eliminated there, too.

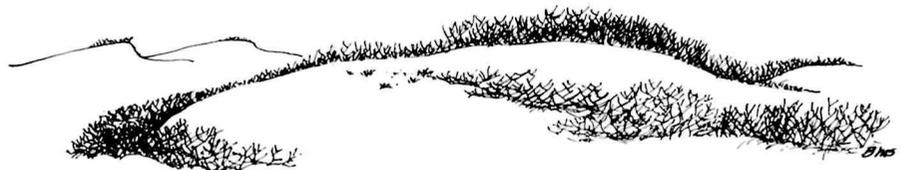
NPCA commends the Park Service on its successful program of fencing areas of the park to exclude the goats. This program can only work to the great benefit of these parks and the native Hawaiian flora and fauna.

Protection for national forest system

NPCA was invited to testify before the Senate Subcommittee on Environment, Soil Conservation and Forestry on an amendment in the nature of a substitute to S 2296, the Forest and Rangeland Environmental Management Act of 1973. The hearings were conducted by Sen. Hubert H. Humphrey, who introduced the legislation, and by Sen. Walter Huddleston, one of the bill's sixteen cosponsors.

The proposed legislation provides for the "protection, development, and enhancement" of the 187-million-acre national forest system administered by the U.S. Forest Service. According to Sen. Humphrey, "The Executive Branch has totally failed to organize or plan for the protection of our forest resources and for meeting our forest products and service needs." The substance of S 2296 deals with measures to help resolve problems of natural resources administration, and particularly calls for changes in planning and fiscal policy to improve the effectiveness of the Forest Service in managing the national forests.

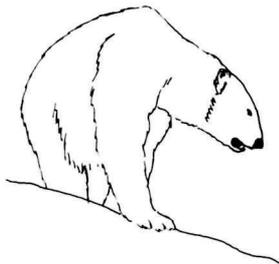
If enacted, S 2296 will prohibit the President from impounding funds that have been appropriated by Congress as long as such appropriations are consistent with earlier stated program goals. Furthermore, if the Chief Executive fails to request funds to meet these established goals or policies for the national forests, he would be required to set forth the reasons for requesting the Congress to approve a lesser sum. These adjustments in the federal budget process would do much to improve such on-the-ground programs as outdoor recreation and reforestation that have been inadequately funded in the past. There



exists, in fact, a backlog of about five million acres of forest lands currently in need of reforestation.

The provisions of S 2296 also require the Forest Service to make a comprehensive and detailed assessment of timber, forage, wildlife, water, and related renewable resources in the nation's forests by 1975 and periodically thereafter. Humphrey claims that "This assessment would pull together in one place, for the first time in history, all of the facts needed to determine the condition of our nation's forest lands."

NPCA's statement on the Forest and Rangeland Environmental Management Act supported those provisions for the nation's forest lands as well as those that would equip the Forest Service with the necessary funds and manpower needed to translate planning goals into action programs. The Senate subcommittee was informed, however, that NPCA supports S 2296 only to the degree the bill will allow for the attainment of good ecological forestry practices at the level of the forest resource base itself.



Polar bear treaty As reported in the January issue, representatives of Denmark, Norway, Russia, Canada, and the United States met in Oslo, Norway, on November 13, 14, and 15 to conclude a treaty to protect polar bears in international waters. NPCA took part in a meeting with United States delegates prior to the convention to discuss our country's position on various aspects of the proposed treaty. NPCA favored a permanent treaty that would apply within the territorial boundaries of the signatory nations as well as in international waters. Basically we supported the establishment of sanctuaries. We also favored some sort of restrictions against the use of snowmobiles and aircraft in hunting where such hunting was to be allowed, the taking of polar

bears in denning areas, and the taking of mothers with cubs. We strongly suggested that the Arctic Ocean be made a sanctuary for polar bears.

The treaty that emerged from the convention created a de facto arctic polar bear sanctuary by restricting the means of transportation of hunters into the ice-covered Arctic Ocean. They may travel one day's journey "by the sole use of means which are or have become traditional for them," i.e., by dog sled, or in the case of Canadian natives, snowmobile. However, when guiding sport hunters, Canadian natives may use only dog sleds. Aircraft and ships are specifically prohibited from use in hunting in the arctic region and national jurisdictions. Only polar bear skins taken by natives by traditional means and for traditional uses and those taken by sport hunters can be utilized in the hide trade.

Specific boundaries of the sanctuary were not established due to the debate over the extent of the territorial waters, but an effective sanctuary was nevertheless established.

All treaty signatories have agreed to take appropriate action to protect the ecosystem surrounding the polar bear in international waters and in areas under their national jurisdiction. Special attention will be given to habitat components such as denning areas, feeding sites, and migratory routes. Also, all signatory nations are required to manage polar bears in accordance with sound conservation practices based on the best scientific data available. Signatory nations are required to take all necessary and appropriate measures to prevent their own nationals and visiting foreigners from violating the treaty.

Department of the Interior officials generally agree that this treaty and its inherent cooperation has laid the groundwork for future agreements on other problems of mutual interest in the Arctic Ocean. (Note: The United States, Russia, Greenland, and Norway either have already prohibited hunting or allow only hunting by natives. Hence, the treaty will affect only international areas and Canada, and fortunately a large reduction in polar bear kills should occur.)

Most of the provisions that NPCA wanted were adopted mainly because of the good efforts of the U.S. Department of the Interior. NPCA commends the U.S. government and the Depart-

ment of the Interior for their efforts during the negotiations that substantially strengthened the draft treaty.

Treaties testimony During this past summer NPCA testified on invitation before the Senate Foreign Relations Committee's Subcommittee on Oceans and International Environment concerning the proposed ratification of the Endangered Species Treaty and the World Heritage Trust Treaty for the protection of significant natural and cultural world areas.

NPCA urged ratification of both treaties, noting the need to move quickly because of the increasingly rapid destruction of important plant, wildlife, and natural resources. The Association also urged that the Senate strongly endorse sufficient funding to ensure adequate implementation of both treaties.

Since the hearing, the Senate has ratified both treaties, approving the Endangered Species Treaty on August 3, 1973, and the World Heritage Trust Treaty on October 30, 1973. Among other provisions, the Endangered Species Treaty strives to protect individual species by prohibiting international trade in endangered species or products derived from them. The World Heritage Trust Treaty provides international recognition of and some protection for cultural and natural features and areas that have been determined to have international significance. The Trust also provides the mechanism for compiling lists of qualified areas throughout the world, including areas that may be threatened by destruction or development and provides some funds for the protection and preservation of such qualified areas.

Canyonlands National Park A draft environmental impact statement on the Squaw Flat-Confluence Overlook Road proposal, prepared by the Park Service, was heavily criticized by NPCA and other environmental interests. When a final statement was prepared, it made no substantial changes, concluding that the project was desirable. The Park Service carefully outlined arguments against every environmental criticism of the draft statement, and the final statement seemed to be a justification for a decision that had already been made.

After being notified of the deadline for hearing statements by long-stand-

ing NPCA member, Robert Coshland, the Association urged the Park Service to abandon plans for this road in a strong statement to Robert I. Kerr, Superintendent of Canyonlands National Park. NPCA pointed out that the current national energy crisis and projected increases in energy costs should discourage any plan to construct new automobile-centered facilities. NPCA also protested that the road would permanently disqualify 2,500 acres of the park from wilderness designation. Finally, the presence of this road would provide the stimulus for more roads or bridges in the future, thus further degrading the Canyonlands National Park.

Members may send letters concerning this proposal to either Ronald Walker, Director, National Park Service, Department of the Interior, Washington, D.C. 20240, or J. Leonard Volz, Regional Director Midwest Region, National Park Service, 1709 Jackson St., Omaha, Nebraska, 68102.

NPCA demands halt to hunting grizzly bears in Yellowstone ecosystem

Grizzly bears range in Yellowstone National Park and in adjoining national forests in Wyoming, Idaho, and Montana on about 5,000,000 acres known as the Yellowstone ecosystem. Distressed by the uncertain future of the grizzly bear in the Yellowstone ecosystem, NPCA joined with other conservation organizations in sending a letter to John R. McGuire, Chief of the U.S. Forest Service, citing the current situation and asking that the Forest Service move to halt the hunting of grizzly bears in the national forests there.

On one hand, Park Service biologists argue, with supporting data, that the grizzly bear management program is progressing satisfactorily and that the grizzly is not endangered. On the other hand, two independent biologists, Drs. John and Frank Craighead, offer the opinion, also with supporting data, that the number of grizzlies is in a precipitous decline in the ecosystem and thus the population is in danger of extinction.

Although it is difficult to determine the validity of these conflicting claims, NPCA feels that it is clearly the responsibility of the Forest Service to assure preservation of the grizzly when the bears range on land within their jurisdiction. NPCA believes that the Forest Service should take a pes-

simistic view on the status of the bear and therefore should take appropriate measures to reduce the grizzly bear mortality.

The easiest and quickest way to reduce grizzly bear mortality and ensure the bears' survival in the Yellowstone ecosystem is to close the hunting season in the areas in which such hunting is still allowed. These areas are primarily within the Gallatin National Forest, Montana, and the Shoshone and Teton national forests, Wyoming, which are the responsibility of the Forest Service. In its letter to Mr. McGuire, NPCA suggested that the Forest Service begin immediate discussions with the states involved to identify those areas of the Yellowstone ecosystem under their jurisdictions in which hunting seasons on grizzly bears should be closed. Failing agreement with the states, NPCA and other organizations noted that the Forest Service has both the power and the duty to close the hunting season in the three national forests. If desirable and justified, the hunting season could be reopened after sufficient data are collected and the survival of the grizzlies in the ecosystem is assured.

Members interested in seeing the grizzly bear preserved in the Yellowstone ecosystem should write to John R. McGuire, Chief, U.S. Forest Service, Washington, D.C. 20250, urging him to effect a closing on the hunting season on grizzlies as soon as possible.



BLM Recently, the NPCA along with other groups participated in a meeting with the new director of the Bureau of Land Management, Curt Berklund. Called at Director Berklund's request, the meeting was designed to open channels of communication between conservation and environmental groups and the public lands management officials of the BLM.

A central theme of the discussion emphasized by Director Berklund was the urgent need for a BLM Organic Act to provide uniform management and enforcement authority for the Bureau over the vast public lands under its control. Although the need for such authority was understood by most of those present, the specific form and content of the proposal remains a point of serious contention.

One of the most important areas of concern to environmentalists is the Bureau's opposition to provisions authorizing the inclusion of BLM lands in the National Wilderness Preservation System. Because the Wilderness Act of 1964 failed to make provision for the establishment of wilderness areas on BLM lands, environmentalists are now supporting the inclusion of such authority in the BLM Organic Act proposals.

Other subjects of discussion included grazing and range management practices, funding and personnel for the BLM, off-road vehicle use, and the Bureau's wildlife program.

NPCA raised the question of the BLM's recently announced off-road vehicle plan for the California desert. Conflicting reports on the Bureau's decisions regarding desert management had differed as to whether the plan dealt only with ORVs on the desert or included all desert uses. The BLM spokesman confirmed that the recently enacted measures constituted a final interim plan dealing only with ORV use on the desert. A comprehensive, long-range desert management plan is currently underway and could take several years to complete. The current plan closes a small portion of the desert to all recreational ORVs, opens another section to free ORV use, and restricts recreational ORVs to existing roads and trails on the major portion of the desert. The Bureau indicated that no environmental impact statement was proposed on the ORV plan, but that they expected to prepare one on the later, more comprehensive study.

One distressing comment of the BLM should be mentioned. The BLM spokesman, responding to a question concerning the BLM management of the wild horses and burros on the public lands, indicated that the wild horses and burros were generally just domestic livestock released to graze on public lands and constituted more of a nuisance and unnecessary

expense than was justified—presumably because the horses and burros provide no recreation or sport benefits to balance the cost/benefit scheme of management. This statement is distressing inasmuch as wild horses and burros are protected by law, and BLM has so far failed to fully implement the spirit of that law. Mr. Berklund's comments would seem to indicate a continuation of that policy. Director Berklund indicated that the BLM was undertaking some sort of branding program for these animals but did not elaborate on specific practices to be carried out.



NWR sport hunting NPCA and two other conservation groups have written to the Department of the Interior in response to a September Federal Register notice that announced that the Lewis and Clark and the Columbian White-tailed Deer wildlife refuges in Oregon would be opened to sport hunting of migratory birds.

The letter pointed out that an adequate period of time for public comment had not been provided, and it requested an extension of that period. The letter also said that environmental impact statements had not been filed for either proposal. Therefore, the three conservation groups called for impact statements that would include a discussion of the numbers of migratory birds that might be killed as reflected in species resources, the direct effect of allowing the use of lead shot, and the impact of untrained hunters in the area.

NPCA does not oppose adequately regulated and well-managed sport hunting, but we feel that the National Environmental Policy Act of 1969 should be precisely followed before major federal actions are taken. Complete impact statements on the conversion of these two refuges from the list of refuges closed to sport hunting to the list of refuges open for hunting would present an excellent opportunity to review and reevaluate many of the issues facing other wildlife refuges as well as the two under discussion.

New Park Service policy NPCA has learned that Ronald Walker, National Park Service Director, has been under pressure to extend private concessioner contracts after having implemented a new policy of phasing out unnecessary concessioner-operated lodging in Zion and Bryce Canyon national parks and Cedar Breaks National Monument.

NPCA wrote Mr. Walker in early November to indicate that thousands of citizens were indeed satisfied with the new Park Service policy, and that this policy should be adhered to at all costs. The Association commended the Park Service for challenging the wisdom of proposed private developments in our parks, seeking instead renegotiation based on proper environmental impact statement review.

NPCA is following the progress of another decision concerning commercial lodging contracts, this time at Crater Lake, and hopes that the outcome of this decision will be as favorable as the results in Bryce and Zion.

Minnesota refuges The U.S. Department of the Interior is considering the designation as wilderness areas of 1,400 acres and three islands out of a possible 18,065 acres of the Mille Lacs and Rice Lake national wildlife refuges in Mille Lacs and Aitken counties, Minnesota. This action is in compliance with the Wilderness Act of 1964, which requires the Secretary of the Interior to review every roadless area of 5,000 or more acres and every roadless island, regardless of size, within the National Wildlife Refuge System for suitability for preservation as a wilderness area before September 3, 1974. These two refuges that are under consideration play an important role in benefiting the waterfowl of the Mississippi flyway, in supporting the largest concentration of ring-necked ducks in the state of Minnesota, and in protecting and harboring several endangered species of birds.

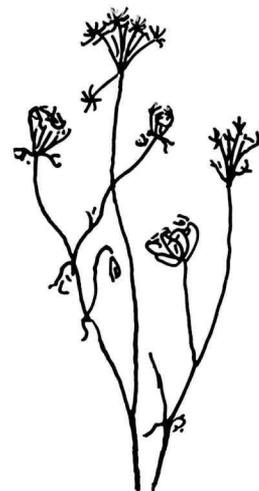
After careful review of the Mille Lacs and Rice Lake national wildlife refuge study, NPCA endorsed the proposed wilderness classification of designated areas in the refuges in comments at a public hearing held on October 29, 1973, in Minnesota.

The Association questioned, however, the necessity of the Bureau of Sport Fisheries and Wildlife policy of seemingly never-ending intensive

management and development, such as impoundments and nesting structures for waterfowl. Such development makes the remaining 16,665 acres of the two refuges ineligible for consideration as wilderness according to the official guidelines for establishing wilderness areas. NPCA concurred with the desire for increased waterfowl but suggested reconsideration of the necessity for such a large number of impoundments and nesting structures. If the number of man-made structures were reduced, the area designated wilderness could be enlarged. If these suggestions were adopted, larger portions of these and other wildlife refuges such as Brigantine National Wildlife Refuge (see June 1973 Magazine, page 31) could be considered for wilderness designation.

Olympic Wilderness NPCA submitted reactions to the proposed Olympic Wilderness, Olympic National Park, directly to the National Park Service in early November. The proposed Olympic Wilderness places 834,890 acres, or approximately 92 percent of the existing Olympic National Park, in the National Wilderness Preservation System. However, NPCA and at least twelve other conservation organizations recommended that approximately 27,000 more acres of wilderness-quality land be added to the proposed Olympic Wilderness. All of these lands are within the existing national park.

The Association prepared a statement for the hearing record on the wilderness proposal. Besides recommending an increase in wilderness area, NPCA stressed that no new roads or even one-way loop roads should be built in the park, that a proposal for an





aerial tramway should be abandoned as unacceptable, and that plans to build and supply two back-country hostels with the help of helicopters would be incompatible with wilderness values.

In general the Association praised the National Park Service plans. "The Park Service is to be commended," the statement read, "for promoting wilderness preservation, environmental concepts, and ecological concerns in planning these guidelines."

Garrison Diversion Unit The Garrison Diversion Unit is a Bureau of Reclamation project for an 1,800-mile network of major canals and laterals in North Dakota. It is designed to divert Missouri River water from the reservoir behind Garrison Dam for irrigation. Funding has been authorized and construction started on the canal system.

NPCA and other conservation organizations have opposed this project for years because it would destroy important wetlands and would threaten several existing wildlife refuges. Many small farmers have been driven from their land by direct land loss to the project; others may be forced to leave by the prohibitive cost of the sprinkler equipment needed to utilize the canals.

It is likely that return flows of irrigation water to North Dakota rivers will carry a heavy load of salt, which will cause a concentration of salt above recommended levels in the Souris River that flows into Canada. A recent letter to the Secretary of State from the Canadian government on this subject has resulted in renewed efforts to stop the project.

These and other consequences are resulting from the diversion of water to lands that are untested for irrigation at a public cost of almost \$1,500 per "improved" acre. In November NPCA wrote to Rogers Morton, Secretary of the Interior, Urging an immediate

moratorium on the Garrison Diversion project until the serious problems are reassessed and resolved.

Development in Grand Canyon National Park In a letter to the National Park Service, NPCA has expressed strong opposition to National Park Service plans to allow a \$5,000,000 development and construction program on the South Rim of the Grand Canyon. NPCA expressed alarm at a thirty-year contract for developments at Grand Canyon that would include construction of several employee residence halls, cafeterias, gift shops, a cocktail lounge, and a trailer camp in various parts of the South Rim. NPCA also noted that both the concessioner contract and site selection contract were signed prior to publication of either a master plan or a development concept plan, with associated environmental impact statements, which are required by the National Environmental Policy Act for all major actions concerning developments on federally owned lands. NPCA noted that the master plan and development concept plan for Grand Canyon National Park are being prepared concurrently, indicating that a decision to allow the planned developments have already been made. According to the guidelines for compliance with NEPA, published by the President's Council on Environmental Quality, decisions on developments should follow an environmental impact statement's review, not precede it. Thus, the Park Service seems to be in violation of C.E.Q. regulations. We will report on further steps that are being taken to prevent development in Grand Canyon in future issues of this Magazine.

news notes

Monongahela ruling In November at Elkins, West Virginia, U.S. District Judge Robert Maxwell handed down a ruling that essentially barred the controversial timber management practice of clearcutting in the Monongahela National Forest in West Virginia. A civil action brought before the federal court by several conservation organizations, citing violations in the Forest Service Organic Act of 1897, resulted in this ruling.

In the Court's opinion the language of the Organic Act constituted "a clear directive from Congress, to the persons charged with the administration of the national forests, that trees can be cut and sold only if they are dead, matured or large growth and then may be sold only when the sale serves the purpose of preserving and promoting the younger growth of timber on the national forests." The ruling requires Forest Service personnel to mark individual physiologically mature trees for cutting within designated areas of the Monongahela before they are harvested. Also, the Court does not sanction under the law the leaving behind of cut, unmarketable immature trees on the forest floor.

Judge Maxwell's landmark decision comes at a time when the U.S. Forest Service is under intense pressure from industrial timber interests and, allegedly, from the Office of Management and Budget in the Executive Office of the President to substantially increase the annual harvest rate of national forest timber. In light of current trends, such pressure would call for increased clearcutting, especially on the national forests in the western United States. However, if Judge Maxwell's ruling on the Monongahela case is upheld, it might well set the precedent for similar rulings affecting the controversial practice of clearcutting throughout the entire national forest system.

ORV regulations The U. S. Forest Service has announced that it is beginning to establish controls regulating the use of dune buggies, amphibious four-wheel drive, and similar all-terrain or off-road vehicles on all 187 million acres of national forests, grasslands, and other lands administered by the agency.

Supervisors of the 155 national forests will have until December 31, 1976, to establish places where off-road vehicle use will be allowed, partially restricted, or prohibited. Such vehicles are banned from the 14.5 million acres of wilderness and primitive areas. Before a final decision is made, the public will be given an opportunity to participate in the designation or revision of designation of areas where restrictions or closures will occur.

Forest Service Chief John R. McGuire says the closure actions that

have already taken place in the national forest system over the years are the result of the explosive increase in off-road vehicle use. The program of designation for full, limited, or no use by off-road vehicles is an outgrowth of a 1972 executive order to set up a system for controls that would minimize damage to natural resources, protect public safety, and reduce conflicts among users on public lands.

New wilderness study areas U.S. Forest Service Chief John R. McGuire has announced the selection of areas to be given further study for possible inclusion in the National Wilderness Preservation System. The 274 new study areas that were chosen comprise 12.3 million acres of roadless and undeveloped national forest lands. The list includes thirty-nine areas that were added to a previously announced list in response to the large number of public comments received by the Forest Service.

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According to Paul A. Vander Myde, U.S. Department of Agriculture Deputy Assistant for Conservation, Research, and Education, in a statement to members of the House Committee on Agriculture and Forestry, "The 274 areas will be protected to preserve their present wilderness characteristics until wilderness studies are completed and a determination is reached as to whether they should be classified as wilderness or for other purposes." Though there is no guarantee that Congress will finally designate the new study areas as wilderness, the chances are good. Most candidate wilderness areas are in the West. States with over a million acres of candidate wilderness are Montana, Wyoming, Idaho, Colorado, and Washington. The greatest study acreage in any one state is the 2.5 million acres in Alaska, which presently has no designated wilderness. Only three of the new wilderness study areas are in the East: Puerto Rico's El Cacicque National Forest, Florida's Bradwell Bay National Forest, and North Carolina's Joyce Kilmer-Slickrock National Forest.

Attention now focuses on the more than 1,100 roadless areas not scheduled for further study by the Forest Service. "Although the 56 million acres of roadless and underdeveloped areas may have wilderness values," said Vander Myde, "they also have other resource values for which there are competing needs and planned outputs."

Conservationists had originally urged that all of the 1,449 inventoried roadless areas be selected as new wilderness study areas. Forest Service budgetary and manpower restrictions, however, prohibited the carrying out of the alternative measure. Also, since new study area classification requires a moratorium on timber harvest operations, selection of all 1,449 roadless areas for further study would have required an immediate but temporary reduction of about 17 percent

in the present annual allowable cut of 13.63 billion board feet of national forest timber. As a result of defining the potential harvest of timber on the 274 new study areas, this volume will be reduced by approximately 2 percent. It therefore appears that areas of high timber volume have been excluded from the list of new study areas.

The fate of the remaining 1,175 inventoried roadless areas, however, has still not been completely decided. The Forest Service has agreed to file an environmental impact statement for each area before authorizing timber sales or other actions that would impair its wilderness suitability. In addition, some active citizen conservationists are bypassing the executive branch altogether and are filing directly to Congress with their respective wilderness proposals. In fact, recent legislation to create fifteen wilderness areas in the eastern United States that were not included on the Forest Service list of 274 was unanimously approved by the Senate Interior Committee.

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New natural landmarks designated

The Interior Department has announced the designation of a number of natural areas as natural landmarks. Named were thirteen New England wetland areas, which include bogs, swamps, streams, and ponds. They are, in Maine: Colby-Marston Preserve and Penney Pond and Joe Pond complex, Kennebec County; Crystal Bog, Aroostock County; Orono Bog and Passadumkeag Marsh and Boglands, Penobscot County; and Maddybemps Heath, Washington County. In Vermont they are: Franklin Bog, Franklin County; Molly Bog, Lamoille County; Barton River Marsh, Orleans County; and Little Otter Creek Marsh, Addison County. In Connecticut they are: Chester Cedar Swamp, Middlesex County; Pachuaug Great Meadow Swamp, New London; and Bingham Pond Bog, Litchfield County.

New natural landmarks in New York include Bear Swamp, Albany County; Big Reed Pond, Suffolk County; Dexter Marsh, Lakeview Marsh and Barrier Beach, Jefferson County; McLean Bogs, Tompkins County; Montezuma Marshes, Seneca County; Moss Lake, Allegany County; Oak Orchard Creek Marsh, Genesee and Orleans counties; Round Lake, Onondaga County; Thompson Pond, Dutchess County; and Zurick Bog, Wayne County.

Of the six newly designated natural landmarks in California and Nevada four illustrate past volcanic phenomena, one is a fossil area, and the other is an outstanding coastal estuary. They are, in California: Amboy Crater, Cinder Cone Natural Area, and Turtle Mountains Natural Area, San Bernardino County; and Tijuana River Estuary, San Diego County. In Nevada they are: Ichthyosaur Site and Lunar Crater, Nye County.

Conserving energy The present fuel shortage is dramatizing the need for conserving gas, coal, oil, and electricity. We would like to bring the reader's attention to two brochures published by the U.S. Government Printing Office. They are "Seven Ways to Reduce Fuel Consumption in House Heating Through Energy Conservation" and "Eleven Ways to Reduce Energy Consumption and Increase Comfort in Household Cooling." These brochures explain how to heat

or cool your house at a lower cost while at the same time helping to conserve our natural resources. These brochures are available for 25¢ each from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Pennsylvania land The Western Pennsylvania Conservancy has announced plans to convey 9,300 forested acres of mountain land on Laurel Ridge in Westmoreland County to the Commonwealth of Pennsylvania. Known as Mountain Streams, the land borders Laurel Ridge State Park and significantly adds to the public recreational lands already established along scenic Laurel Ridge. The acquisition was made possible by a major grant from the Allegheny Foundation of Pittsburgh.

The Conservancy will convey the land to the Commonwealth on the basis of one-half donated value and one-half purchased value. The Commonwealth will utilize the donated value as its share of the conveyance cost. The donated value will be matched by a federal grant.

This project points up the benefit to the public of "land banking" by a conservation organization like the Conservancy in partnership with a private foundation such as the Allegheny Foundation. By acquiring strategically located lands when available, holding these lands until needed by a public agency, and then selling them to the agency at cost, the Conservancy has been able to assist in preserving public lands at considerable savings.

The Mountain Streams Project is also an example of how wild lands can be recreated in the East. If left alone for a period of years, an eastern forest will reestablish itself as primitive wilderness, much the same as that encountered by the early pioneers when they first crossed the Allegheny Mountains.

Tussock moth research In the December 1973 issue of this Magazine we reported on the outbreak of the tussock moth in northeastern Oregon and southeastern Washington during 1972 and 1973. Besides destroying much Douglas-fir timber this moth has touched off a controversy as to the best method of eliminating it. The Forest Service requested an exemption from the Environmental Protection

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conservation docket

Agency to use DDT to control the moth but so far has not been granted this permission. However, the controversy continues to rage as congressmen from Oregon have introduced several bills that would allow the use of DDT on the tussock moth and transfer the exemption authority from EPA to the Secretary of Agriculture. Environmentalists are concerned that allowing the use of DDT in this situation might set a dangerous precedent in the relaxation of controls of the use of this dangerous pesticide.

Recently a research grant was awarded to the Oregon Graduate Center in Beaverton, Oregon, to identify and synthesize the sex attractant of the female tussock moth. The money for this grant was obtained from Washington State and Oregon's Forest and Range Experiment Station. In addition, some funds have been pledged by the timber industry. Recent progress in research indicates that the famel tussock has a pheromone that attracts male moths. The research challenge will be to isolate the attractant from other compounds present in the moths, identify its chemical components, and then synthesize it in the laboratory. If an attractant can be developed, it will be used as an early warning device to help foresters detect tussock moth outbreaks before they reach epidemic proportions in the future. In light of the DDT controversy and the destruction wrought upon forests by these moths this research is particularly critical.

During the closing days of the first session of the 93rd Congress amidst the flurry of activity to pass energy-related legislation to alleviate the current shortage and avoid future ones, the two houses of Congress also acted on a surprising number of major and minor bills affecting the environment that should be of interest to NPCA members.

Legislation acted on by either House or Senate has included:

UNEP: The Senate on November 29 and the House on December 3 agreed to the conference report on HR 6768 to provide for U.S. participation in the United Nations Environment Program, thus clearing the measure for the White House.

NPS land acquisition: The Senate passed S 1039 to authorize appropriations for additional costs of land acquisition for the National Park System. The bill provides funds to pay moving costs, relocation benefits, and other expenses incurred in connection with the acquisition of certain lands for addition to the National Park System. This bill also includes the provision that property owners who elect to retain use and occupancy rights to lands acquired for the park system will be considered to have waived their rights to the relocation expenses normally provided for such displaced per-

sons. This provision should help to avoid the establishment of inholdings in units of the park system.

Chatooga River: The House passed HR 9492 designating the Chatooga River in North and South Carolina and Georgia as a component of the National Wild and Scenic Rivers System. The river section authorized is 57 miles long, encompassing 15,432 acres of which nearly 87 percent is controlled by the U.S. Forest Service.

Wild and scenic rivers: The House passed HR 4864, to amend the Wild and Scenic Rivers Act of 1968, to extend the time for study for inclusion of other rivers in the system from five to ten years and to increase the authorization for acquisition costs from \$17 million to \$37.6 million. The time extension also extends the moratorium on water resources development projects on river segments being studied.

Springfield armory: The Senate passed S 979, to authorize establishment of the Springfield Armory National Historic Site in Massachusetts.

Supplemental appropriations: The House passed HR 11576 making supplemental appropriations for the fiscal year ending June 30, 1974. The bill included an amendment that prohibits the Environmental Protection Agency from using any appropriated funds to administer any program to tax, limit, or regulate parking facilities. EPA had previously proposed various transportation control schemes to control air pollution, including several plans to restrict or regulate inner-city parking. This amendment to HR 11576 would prevent EPA from controlling air pollution through parking limitations.

Independence Park: The Senate passed S 417 to provide for the addition of property to the Independence National Historical Park in Philadelphia, Pennsylvania.

Knife River Indian Village: The Senate passed S 1468 authorizing establishment of the Knife River Indian Villages National Historic Site in North Dakota.

Tuskegee Institute: The Senate passed S 262 to provide for establishment of the Tuskegee Institute National Historical Site in Alabama.

Boston Park: The Senate passed S 210 to authorize the establishment of the Boston National Historical Park in Massachusetts. The bill authorizes \$8

A CITIZEN'S VOICE IN GOVERNMENT

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

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

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

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

million for the preservation of major Revolutionary War sites in Boston including Faneuil Hall, Paul Revere House, Old State House, Bunker Hill, and Old South Meeting House. Other property will be studied for future inclusion by cooperative agreement, donation, or acquisition with appropriated funds.

Indiana Dunes: The Senate passed S 584, to amend the act establishing the Indiana Dunes National Lakeshore by providing nearly \$3 million in additional funds for acquisition and to remove the relocation assistance provision for those landowners who elect or retain the right of use and occupancy of land acquired for the national lakeshore. This latter provision had caused a number of problems in continuing land additions to the park unit.

Flood protection: The Senate passed HR 8449, previously passed by the House, to increase coverage and to require known flood-prone communities to participate in the national flood insurance program. Any community lying in the 100-year flood plain would be required to participate in the flood insurance program or no federal funds would be available to that community for any project located in the flood plain, including funds from federally backed banks, savings and loan associations, and other lending institutions. The bill, which now goes to joint conference, has been viewed as the first important step toward establishing a wise policy for land-use planning and zoning in flood plains.

Alaska Pipeline: The House by 361 to 14 on November 12 and the Senate

by 80 to 5 on November 13 agreed to the conference report on S 1081 to facilitate construction of the Alaskan oil pipeline. The President on November 16 signed the act into law as Public Law 93-153.

Big Thicket: The House on December 3 passed HR 11546 to establish the Big Thicket National Preserve in Texas authorizing 84,500 acres for acquisition, to be administered by the National Park Service. The measure now goes to the Senate where no hearings have been scheduled, but early action is expected.

Indian Nations Trail: The Senate on November 30 passed S 1976 proposing study of Indian Nations Trail, extending from the Red River in Oklahoma to the Oklahoma-Kansas boundary line, for inclusion in the national trails system.

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Continued from page 2

the solution include among other things the following:

(1) a rapid shift to solar energy to pick up a substantial part, not all, of the load;

(2) a substantial return to coal for the time being, and temporarily to natural gas, but subject to severe environmental and mine-safety restrictions, and the ultimate need to reduce chemical combustion in terms of carbon dioxide;

(3) the imposition of severe environmental standards on the automobile and oil industries, so that production and distribution can be carried on without grave ecological damage;

(4) the phasing out of the private car from the congested areas of the big cities, and the substitution of clean, comfortable, spacious, and reasonably speedy public transit;

(5) the revision of national transportation policy to favor a much enlarged and publicly managed railroad network, with reduced emphasis on high-energy modes, air and highway transportation;

(6) the inversion of utility rate schedules to impose increasing costs on the larger consumers, with lower prices for the smaller customers;

(7) a shift to land irrigation systems as contrasted with high-energy chemical methods, for the tertiary treatment of municipal waste water;

(8) a no-nonsense, solid-waste recycling program to conserve production energy and raw materials and cut down on the rubbish;

(9) a shift from plastics and synthetics, which use petroleum as a raw material with high production energy demands and much pollution, to products made from natural substances;

(10) a changeover from chemical pesticides, with high fossil-fuel materials requirements, to organic and integrated pest control as rapidly as possible for both ecological and economic reasons;

(11) composting of sewage sludge, using garbage for the production of organic fertilizer, as contrasted with high-energy incineration accompanied by atmospheric pollution, bringing about a reduction in fossil-fuel-based, high-production-energy, high-pollution chemical fertilizers;

(12) the progressive elimination of those other energy guzzlers, the centrally overheated, overcooled, hermetically air-conditioned office and apartment buildings, with their artificially lighted and ventilated underground parking facilities;

(13) the development of land-use and industrial plant-size and location policies adapted to the reduction of daily and weekend commuting in favor of stable communities;

(14) reorganization of the federal-industrial budget, reducing expenditures on big roads, big dams, and, as international agreement permits, armaments, and on misdirected research and development, in favor of socially and ecologically sound public-private investment; and

(15) in all probability a fundamental revision of the mass-production, mass-distribution industrial structure to reduce the one-way dumping of containers and the cross-hauling of raw materials and products.

The alternative sources of energy other than sun-power are not promising. Nuclear fission, breeders or nonbreeders, will bring a low-level but pervasive radio-

active pollution from stacks and outfalls, constant workplace perils, grave danger of meltdowns, and an intolerable burden of long-lived radioactive wastes. We are well down the nuclear road without having faced these perils; it is time to slow down and back away. Nuclear fusion eludes us, and if harnessed may bring unacceptable regional thermal pollution.

Combustion plants generally, whether oil, coal, gas, or whatever, increase the carbon dioxide content of the atmosphere and could raise temperatures on the planet, disturb the global ecosystem unpredictably, and eventually precipitate the melting of the polar icecaps. The extraction of oil from shale will be enormously costly in both ecological and economic terms. Geothermal, tidal, and wind energy may be useful, but hardly conclusive.

Oviously, the conservation of energy is imperative. The rationing of gasoline or a sharp increase in prices, or both, to meet a situation which will not be temporary, but will be permanent, in respect to oil, coupled with the strict enforcement of air pollution controls, will reduce private automobile traffic drastically and rapidly. Among the favorable consequences will be a decline in highway fatalities, in expenditures on highways, in air pollution, in hospital admissions resulting from smog, in death and incapacity from respiratory ills, including emphysema and lung cancer, and in urban sprawl. Attention can be focused again on the rebuilding of the deserted central cities within patterns of residential and workplace proximity, perhaps even of neighborhood coherence. At least as the population explosion slows down, there may be space for gracious living in the cities.

Our troubles with the Mideast about oil are indicative, not episodic. We have used up our low-cost iron ore to make autos and cans which now lie rusting in the midden heaps of the big cities or scattered over the countryside. We have stripped our old-growth forests and are placing impossible burdens on the young forests and the life they shelter. We have been drawing on the wealth of the entire globe for raw materials far out of proportion to our population. Resistance to this exploitation will take the form of raw materials embargoes and skyrocketing prices.

We shall be paying the bill for the present in greatly expanded food exports, with grave repercussions on domestic soil conservation; in water pollution from excess fertilizers, herbicides, and pesticides; and in timber exports while our paper and construction industries remain in short supply.

It may well be that the young people of America have set the best example and offer the basic solution for everyone: voluntary population stabilization. This trend must be encouraged worldwide.

But in any case, a new competence and sense of responsibility must be brought to bear swiftly on the management of our economic affairs. The public measures and institutions necessary for this purpose must now be created by the vigorous use of our democratic governmental processes. The economy must be fitted to the needs of the people.

—Anthony Wayne Smith



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

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

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