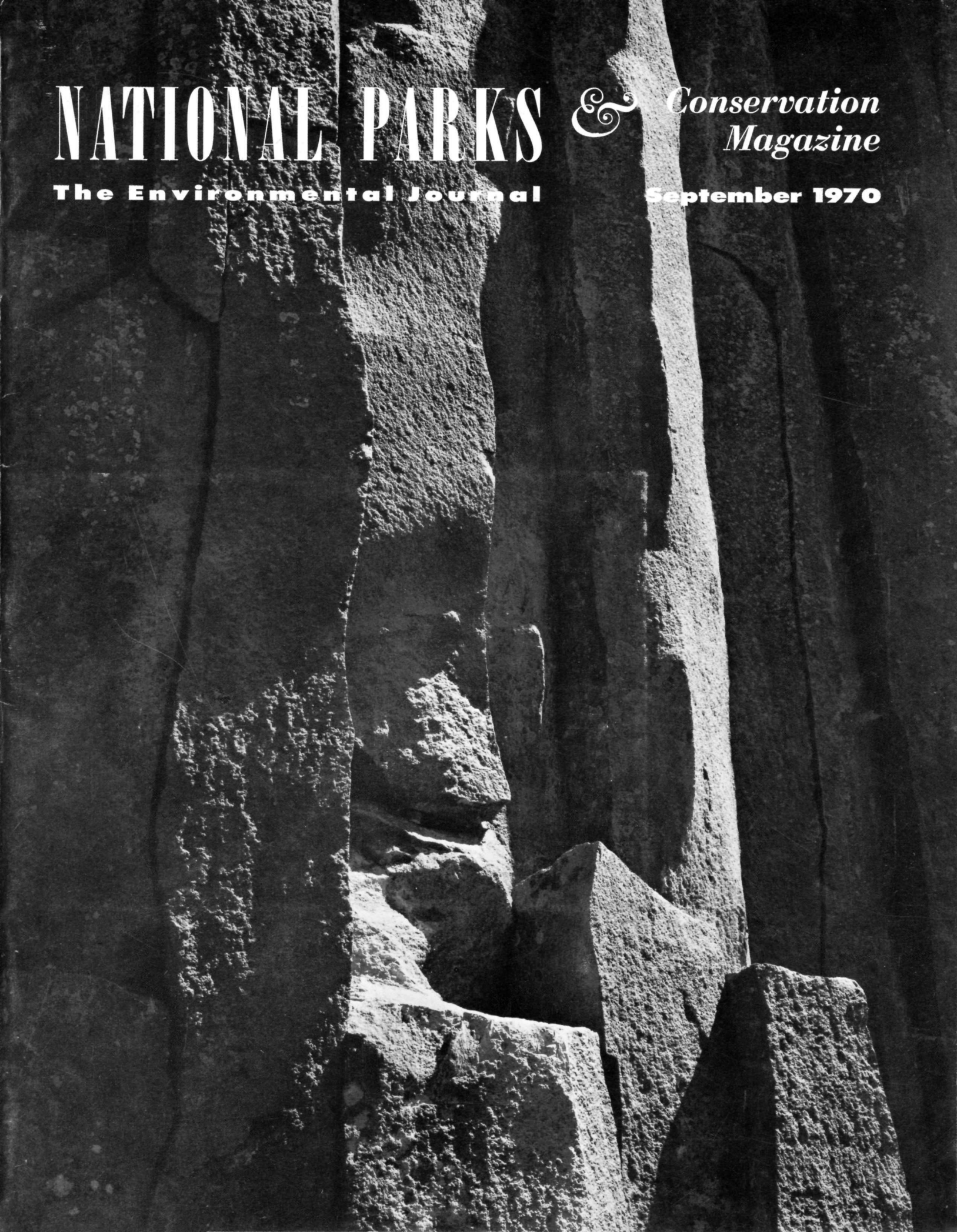
NATIONAL PARKS & Conservation Magazine

The Environmental Journal

September 1970



RIVER IDOLS

For fifty years or more, the industrial countries, including the United States and the Soviet Union, have been busy spreading the faith of river basin development around the world. The production of hydro-electric power would lead to industrialization, hence to prosperity for all. Coupled with big hydro-power, big irrigation would feed everybody. In retrospect, the vision seems childish; for the future, it is a dangerous mirage.

The huge Aswan Dam in Egypt is an ominous case in point. Aided by the new four-crop or perennial irrigation, made possible by stable water supplies, the lowly snail has multiplied enormously, and schistosomiasis, carrying misery, debility, and death, is spreading with explosive violence throughout Egypt.

The sardine fisheries of the eastern Mediterranean, a major food resource, have apparently been destroyed by changes in salinity resulting from the interruption of the flow of the Nile to the Sea. Whether new fisheries in the Aswan Reservoir will compensate is an open question.

The human population of Egypt has been growing at a rate which will nullify rapidly all the agricultural benefits the dam was intended to provide.

Had the funds being sunk in the Aswan project been devoted to the immediate improvement of the lot of human beings in Egypt, they could have gone a long way toward solving the major national problems of disease, ignorance, and poverty.

The first need, primary in all the industrial and agricultural countries alike, was and is the stabilization and reduction of population. This means clinics, supplies, technicians, and teachers wise in the ways of the sub-cultures. It requires social security systems to relieve parents of dependence on children. The target is reduction of the rate of population growth to zero and below.

The second requirement was to lift agricultural production sharply. The components of the agricultural revolution in the West have been mechanization, fertilizers, insecticides, herbicides, and better seeds and livestock. The base has been land ownership and management patterns which made modern techniques possible.

The heavy fertilization has ended in eutrophication, and must be curtailed. The abuse of insecticides and herbicides threatens the world with ecological death, and must be terminated. But better seeds and breeding still offer hope; and machines, rightly used, can still free men from toil.

Radical land reforms will be essential for both economic and humanitarian reasons. Greater production, combined with basic social reforms, should enable farmers to remain on the land and in the villages, where life in a natural setting could still be enjoyed within a context of prosperity.

Population reduction, coupled with an ecological and sociological green revolution, with a determined public health and sanitation program (both death and birth must be controlled), and with massive investments in education, might have solved a number of Egypt's major problems, as they could still solve many grave problems of men around the world.

But the River Idols decreed otherwise. Regardless of ecological, demographic, and sociological considerations, huge capital funds are going into the conventional dual-purpose project, and on such a gigantic scale as to render the consequences irretrievable.

Elsewhere in Africa, other structures much like Aswan, though not always so formidable, are arising. In some cases their ecological and environmental consequences may well be disastrous; their economic and social merits are doubtful. And a consortium of nations has plans for the Mekong River Basin in Southeast Asia; if peace ever comes to that tragic region, the march of so-called progress will resume the destruction. In the United States, the resistance to the dam-building proclivities of the Army Engineers, dealt with elsewhere in this issue, continues interminably.

The River Idols are the Super-dams for electric power, irrigation, flood control, water supply, navigation, pollution abatement, and, more recently and absurdly, motorboat recreation.

Among their ugly progeny are the uprooting of human communities, the destruction of good farm and forest lands, the extinction of wildlife, the scarring of the earth with hideous drawdown margins, the wreckage of ecosystems, the general ruination of the environment, and the misappropriation of resources and funds which ought to go into meritorious ventures.

Hydro-power can lead to industrialization, with good or evil consequences; but the project must be subjected to severe ecological, economic, and sociological analysis. In the industrial countries, hydro-power cannot touch demand. The large irrigation schemes too often saturate the land with alkali or salt. Flood damage can best be prevented by zoning, insurance, relocation, and headwaters management. Storage for pollution abatement is archaic; pollution must be stopped at source. Closed cooling towers will be used for the cooling of industrial plant and equipment. Small impoundments, recycling, and distillation will furnish good water supplies.

For the patrons of the big projects, the major industrial powers, sponsorship generates great influence, builds empires, capitalist or communist. For the presidents and dictators of the client countries the projects build prestige and power, create monopolies of electric energy, build giant industries and super-cities, all highly centralized, fertile soil for tyranny. For the powers and principalities alike, the projects build military strength.

New values are needed for the governance of river basin planning throughout the world, not least in America. The preservation of river basins and stream valleys as the life-environment of men, plants, and animals, should be the first governing criterion.

The stabilization and reduction of human populations to levels compatible with economic prosperity, ecological security, and environmental preservation must be accepted as preconditions of rational management.

The developing countries have too often been inclined to bow down to the River Idols. They should reject them and overthrow them. The great human struggles against poverty, deprivation, and starvation call first of all for population control, land reform, social justice, and agricultural modernization.

This is not a question of the niceties of life, as it could and ought to be enjoyed in the so-called advanced countries. It is a question of the preservation of the ecosphere within which mankind must survive, if it is to survive. And it is a question of social objectives which might foster a will to live, not a desire to die, among all men everywhere.

—*A. W. S.*

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NATIONAL PARKS & *Conservation Magazine*

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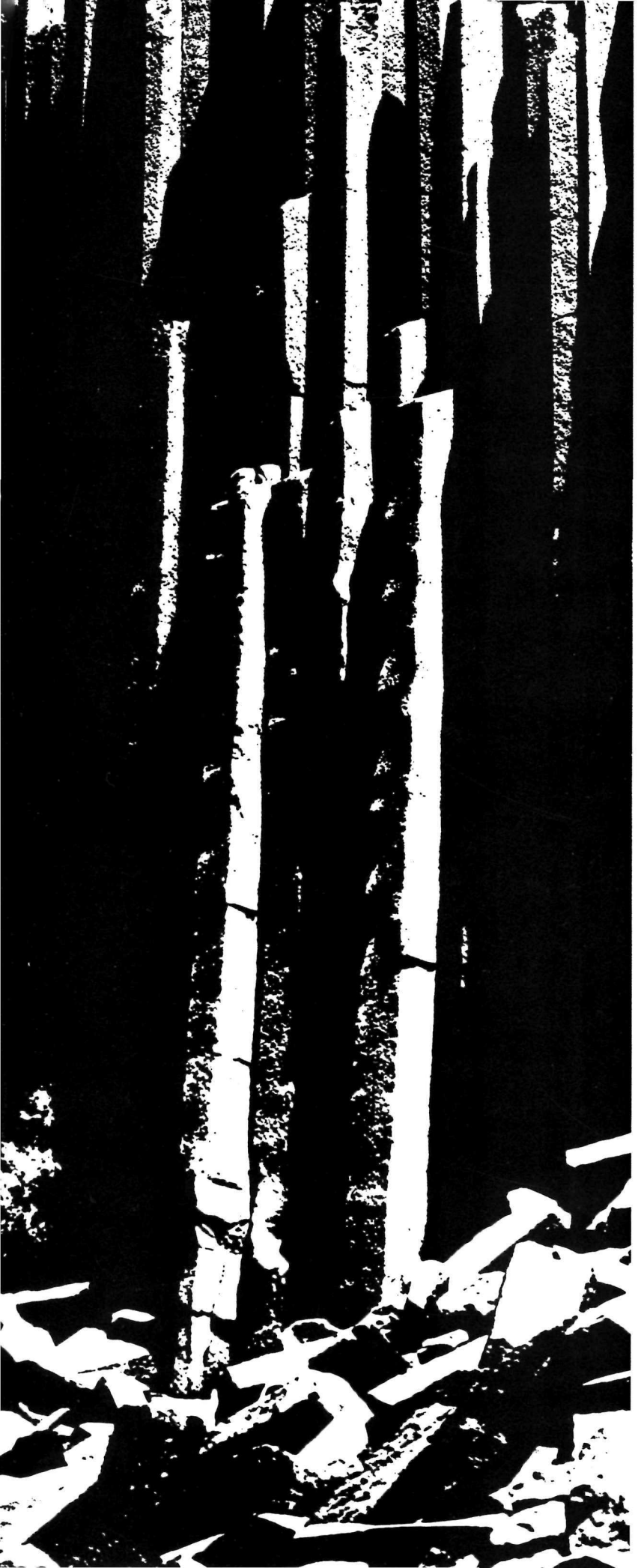
COVER *"Lava Columns" by Ansel Adams*

The artistry of the eye behind the camera captures the essence of Devils Postpile National Monument in a nearly abstract composition of texture, light, and shadow. This photograph by artist-photographer Ansel Adams is available as a 28 × 42-inch National Park Service poster from Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. The cost of the poster is 40¢.

National Parks & Conservation Association, established in 1919 by Stephen Mather, the first Director of the National Park Service, is an independent, private, nonprofit, public-service organization, educational and scientific in character. Its responsibilities relate primarily to protecting the national parks and monuments of America, in which it endeavors to cooperate with the National Park Service while functioning as a constructive critic, and to protecting and restoring the whole environment. Life memberships are $500. Annual membership dues, including subscription to National Parks & Conservation Magazine, are: $80 sustaining, $40 supporting, $12 contributing, and $8 associate. Student memberships are $6.50. Single copies are 75¢. Contributions and bequests are needed to carry on our work. Dues in excess of $8 and contributions are deductible from federal taxable income, and gifts and bequests are deductible for federal gift and estate tax purposes. Mail membership dues, correspondence concerning subscriptions or changes of address, and postmaster notices or undeliverable copies to Association headquarters in Washington. When changing address, please allow six weeks' advance notice and include old address (send address label from latest issue) along with new address. Advertising rates and circulation data are available on request from the Advertising Manager in Washington.



DEVILS POSTPILE NATIONAL MONUMENT

LEON B. SZYMANSKY

"Once liquid basalt flowed in a molten torrent from a nearby crater, plunged over a precipice, split into prisms, and hardened in mid-air." That is how one of the first newspaper articles explained this geological oddity—Devils Postpile. It took several years of careful scientific study of the area to develop a more logical explanation of the how and whys of the formation of these columns.

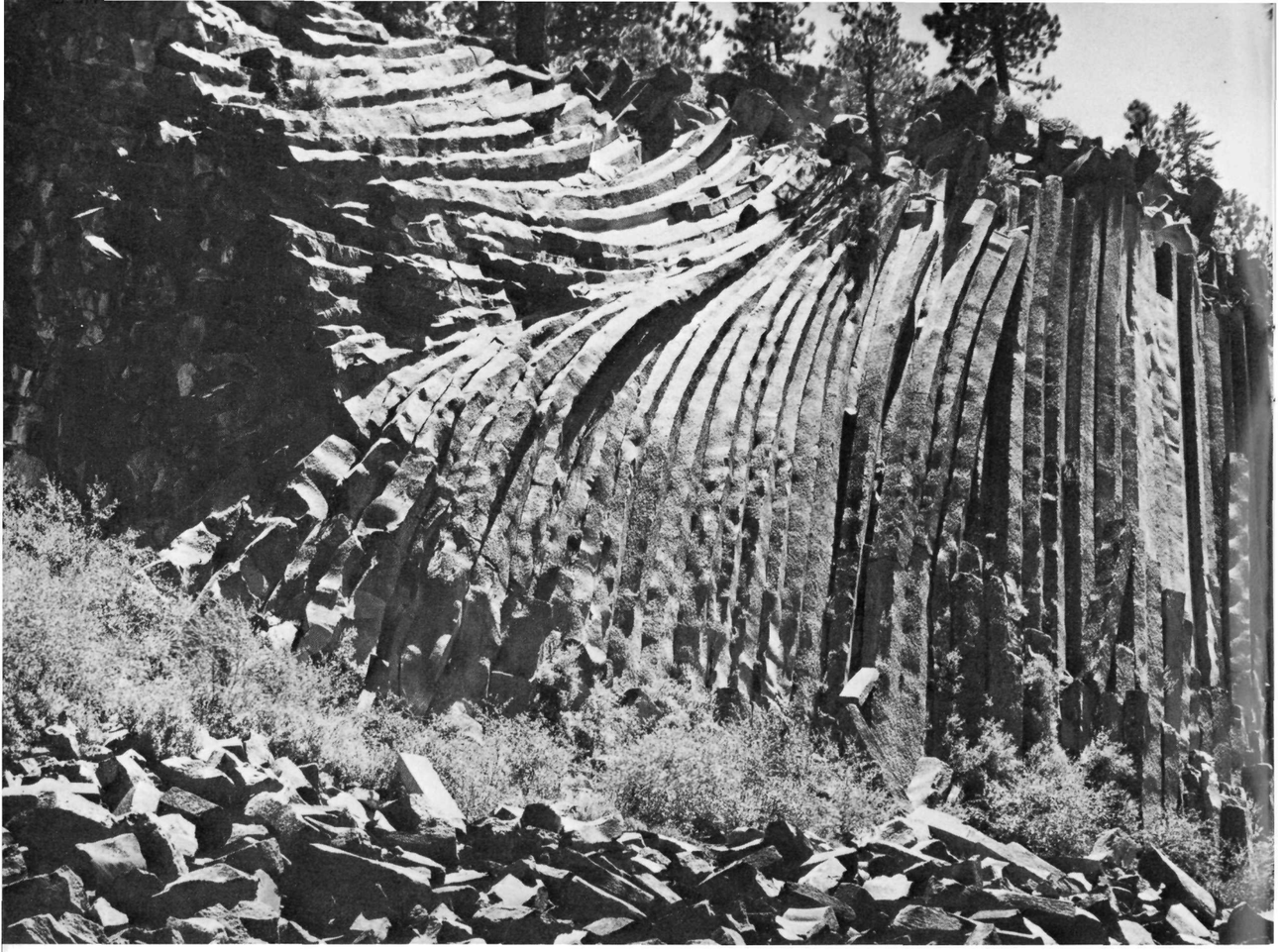
The story of the Postpile starts with the formation of the Sierra Nevadas themselves. As the Sierra Nevada block rose and tilted, a fault zone along the eastern face was produced. This fault zone gave rise to volcanic action such as the Mono Craters and, closer to the Postpile, Mammoth Mountain. About 900,000 years ago lava poured from vents in the Mammoth system to form a river that flowed into the valley of the Middle Fork of the San Joaquin River for some 6 miles. When this flow stopped, the valley was filled from side to side and from below Rainbow Falls on the south to Pumice Flats on the north with a layer of lava from 100 to 700 feet deep.

Solidification was a very even process from the surface toward the center. As this mass cooled, shrinkage produced a tension pattern, which, like drying mud, was relieved by cracking. These cracks extended toward the center as cooling progressed, imparting the peculiar columnar pattern.

In the last ice age, 100,000 years ago, glaciers flowed down the Middle Fork of the San Joaquin River Valley. These huge ice rivers (some of them as much as 1,000 feet thick) ground and tore away most of the lava deposits. The Postpile is the largest and most spectacular of the lava remnants left scattered about the area. It is about 200 feet high and 900 feet long.

The glacier quarried away one side of the Postpile, exposing a wall of columns 40 to 60 feet high. The polygonal columns have three to seven sides, about 55 percent of them having six sides, with an average diameter of 2 feet. The columns diverge from the vertical, and some are curved as if they had been bent by shifting after cooling.

Eons ago volcanic action and glaciers formed the strange polygonal columns now preserved in Devils Postpile National Monument.



Some columns apparently shifted after cooling. The ends of the columns form a giant mosaiclike pattern.

Geologists say, however, that under ideal conditions of uniform composition, thickness, and cooling rate the lava theoretically would produce uniform columns. Irregularities in any of these variables would produce columns that could be tilted or bent or would have variously numbered sides.

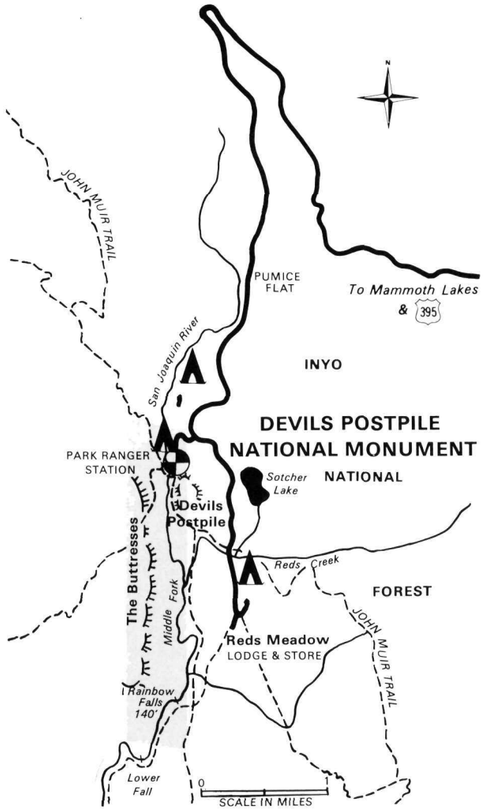
A giant mosaiclike pattern is visible on the top of the Postpile. Here the polygonal column ends were exposed at right angles to the glacier's erosive action. The debris embedded in the glacier ground and polished them to a fine finish, but weathering has taken a heavy toll. One still can find some polish as well as the striations of glacier movement.

Little is known of the Postpile's early history. Gold and silver veins had been discovered in the Mammoth Lakes area in 1877, starting a small boom (1878–1881). What with three small communities in the area and the old French Trail from Fresno Flats passing close by, it is surprising that neither of the two local newspapers made mention of the Postpile. It was not till 1905 that the Postpile is first mentioned in print, quoting Captain Alex Rodgers, Yosemite Park administrator, commenting on the proposal to return the southeast portion of the park to public domain: "The Devil's Postpile constitute in themselves a good reason for not cutting that country off the park."

Mining and timber interests, supported by the park's Army guardians, were instrumental in the formation of a special commission to study the boundaries of the park. The commission recommended, and the Congress was happy to approve, the amputation of more than 500 square miles from Yosemite National Park in 1905.

In the spring of 1910 the district engineer for the U.S. Forest Service, Walter L. Huber, received an application to dam the Middle Fork of the San Joaquin River for the generation of electric power for the limited mining operations in the area. An earth-filled dam was to be constructed from the Postpile formation. To preserve this geological oddity, he enlisted the aid of Professor J. N. LeConte of the University of California and the Sierra Club for arguments against granting this permit. John Muir and other conservationists joined in the battle. On July 6, 1911, President William Howard Taft, acting under authority of the Antiquities Act of 1906, proclaimed the area Devil Postpile National Monument. In the proclamation "Devil" appears without an "s," and it was not until 1953 that the U.S. Board of Geographical Names approved "Devils" (without an apostrophe) for general usage.

Each year some 125,000 people make the 18-mile trip, west of U.S. Highway 395, over 9,175-foot Minaret Summit, to visit this monument, which measures only 1 by 3 miles. Besides camping, fishing (the California Game Department stocks the area), and hiking (the John Muir Trail, which runs between Yosemite and Sequoia National Parks, passes through the monument), they will have enjoyed Rainbow Falls, which has a free drop of 140 feet, and will have examined glacial erratics, boulders that have been stranded when the ice melted, and mineralized springs such as Soda Springs, which has stained the gravel around it a reddish-brown because of its iron content. Pausing before the Postpile, many perhaps will have wondered at the awesome elemental force of nature that sculpted these strange geometric columns. ■



PRESERVING NATURE

The inspirational, scientific, and educational values of our national parks and wilderness areas depend heavily on our success in "preserving nature." But the natural forest ecosystems of some of our most cherished areas are presently endangered by subtle ecological changes, primarily because we have failed to consider the dynamic character of primeval ecosystems, and because "protection" programs frequently exclude the very factors that produce natural plant and animal communities. We have assumed that preservation is assured by prohibiting logging, grazing, mining, agriculture, hunting, or trapping, and by protecting the forests from fire, insects, and disease. Sometimes it is, where a climax ecosystem exists. But as we learn more about the life histories of plants and animals and the intricate interactions among environmental factors and plant and animal communities, we see more and more broken links in natural ecosystems.

Natural forest communities exhibit a remarkable adjustment to local geology, soils, topography, and climate. Each plant species occurs on soils to which it is adapted, and within altitudinal and latitudinal zones that meet its temperature and moisture needs. Many forests also exhibit a "layered" structure, with certain species occupying the upper canopy, while others form an understory. Plant species adjust to one another in competing for moisture, nutrients, heat, and light. Yet seldom does a single forest community permanently possess any given site.

Forests are born of change, and they die through change as well. Plant and animal communities are dynamic—ever-changing, ever-growing, maturing, and dying—to be succeeded by another community adapted to new circumstances.

The concepts of "pioneer" and "late successional" or "climax" communities help in understanding vegetational history. A "pioneer" forest is composed of trees and other plants capable of occupying denuded terrain, such as recent glacial moraines and exposed bedrock, or ground bared by fires, windstorms, avalanches, or erosion. Trees that form pioneer stands are sun-loving and well adapted to growing in the open but often poorly adapted to growing beneath a forest canopy. On the other hand, "climax" species tolerate shade; and as these trees grow up under the pioneer species, they gradually succeed them.

Pioneers have special adaptations for reproducing on open lands or after forest fires or other catastrophes. Some have light seeds easily transported by the wind—such as aspens, birches, willows, and certain pines and spruces. Some can sprout from the root collar or from underground stems or roots. Oaks, aspens, birches, many other deciduous trees, and coast redwood possess one or both of these abilities. Only under unusual circumstances does fire destroy the ability of such trees to repopulate burned land quickly.

One of the most fascinating adaptations to fire is the persistent, closed-cone habit of lodgepole pine, jack pine, and certain other conifers. These pioneer trees are killed readily by forest fires—either crown fires or severe ground fires. But their cones are borne high in the crown and remain attached and closed for years, storing huge quantities of viable seed. Fires sweeping through the forest kill the trees and scorch both crowns and cones. But temperatures usually do not reach lethal levels inside the cones, and the resins that seal the cone scales melt. After the fire the cones open and release the seeds, which fall upon ashes and exposed soil, temporarily freed of competing plants. These conditions are ideal for young conifers, and most forests of lodgepole pine, jack pine, and black spruce originated in this manner.

Red (Norway) pine and white pine in the Lake States and the Northeast, and ponderosa pine, sugar pine, larch, western white pine, Douglas fir, and giant sequoia in the West also reproduce following fires, but by a different mechanism. Their thick bark and long, branchless trunks enable them to survive severe ground fires, but they lack the closed-cone habit and shed their seed and drop their cones soon after the cones mature. Furthermore, in several species good seed years occur only at intervals of 2 to 5 years or more. In nature, intermittent ground fires kept down the undergrowth of competing shade-tolerant trees and shrubs and retarded the accumulation of organic matter. Eventually, however, a fire hot enough to kill most of the old trees occurs, setting up conditions for regeneration. The area is partially freed of tree cover; stand-

IN FORESTED WILDERNESS AREAS AND NATIONAL PARKS

Miron L. Heinselman

ing snags and scattered groves or individual trees provide partial shade; mineral-soil seedbeds are exposed because the humus cover has burned; and competition for nutrients and moisture is greatly reduced. Scattered "veterans" provide seed in good seed years, and the denuded area gradually seeds in to the original species. A new and nearly even-aged forest is formed, perhaps interrupted by groves of unburned or fire-scarred older trees.

In the absence of fires, insect outbreaks, or severe windstorms, most pioneer forests are gradually replaced by shade-tolerant species. This process is known as "succession." We once thought its ultimate product was a regional "climax" vegetation, capable of reproducing itself indefinitely on the same site, without the intervention of major disturbances such as fire or windstorms. This simplistic view of climax no longer is held by most ecologists, because the actual history of forest stands usually is far more complex and often punctuated by intermittent disturbances. Even the shade-tolerant "climax" species are replaced under some circumstances, and the environment itself may change through peat accumulation, climatic shifts, erosion, changes in animal populations, and other events. Some of the trees capable of growing beneath pines and other pioneers are maples; eastern and western hemlock; northern white cedar and western red cedar; red, white, and Englemann spruce; and several true firs. They are characterized by an ability to grow under the conditions associated with deep shade and to become established on thick layers of humus.

As forests grow old, trees gradually die and fall to the ground. The age at which this occurs varies greatly by species, local growing conditions, geographic region, and many chance factors. Generally, however, jack pine, lodgepole pine, and aspen trees are relatively short lived; most do not live more than 100 to 250 years. White pines, red pine, ponderosa pine, Douglas fir, and western larch may live 300 to 500 years or more. And the sequoia, redwood, western hemlock, western red cedar, and some other western conifers may live 800 to several thousand years. These differences in longevity influence stand composition.

Many forests contain mixtures of shade-tolerant trees, some of which reproduce successfully in small openings created by the death of individuals. Forests of this kind tend to develop a many-aged structure if they persist for long periods without serious disturbance by fires, insects, or windstorms. Examples are the hemlock, cedar, spruce, and true fir forests of the Cascades, Olympics, and Coast Range in the Pacific Northwest; the Englemann spruce and subalpine fir forests of the Rockies; the maple, birch, beech, and hemlock forests of the Lake States and the Northeast; and the balsam fir, spruce, and cedar forests of the New England mountains, the Adirondacks, and the northern Lake States.

But even these more stable forests often are ravaged by windstorms or insect epidemics. The spruce budworm, for example, recently has killed most of the balsam fir and much of the white spruce over millions of acres in eastern Canada, New England, and Minnesota. Fortunately, these forests also have a mechanism for replacing themselves. Thousands of tiny balsam seedlings usually are present on the ground, and many are not killed by the budworm. Thus when the budworm has consumed an old forest, the next generation of young firs is waiting to replace it. In the Rockies, vast areas of Englemann spruce sometimes are decimated by bark beetles. This has happened in some of our wilderness areas in the past few decades. But usually enough seed trees escape; and these, together with a few small seedlings not killed by the beetles, initiate a new stand. Insect-ravaged forests such as these may look desolate for a decade or more, but then the new forest appears, and life begins anew as it has for untold generations.

Fires can denude vast areas for long periods if they entirely consume forests of conifers lacking the closed-cone adaptation, or if they reburn young stands before seedbearing age is reached. Lodgepole pine, jack pine, and black spruce begin to bear seed between 10 and 20 years of age, but many conifers begin much later—often age 50 or more. Such reburns are uncommon, however, and usually scattered individuals or groves of mature trees escape. But changes in forest composition are to be expected after such fires, and the rebirth process may take several decades.

In presettlement times fires were caused both by lightning and by the accidental or deliberate firing of forests by the Indians. In fact, early man is thought to have burned the forests of North America in at least some regions for perhaps 10,000 years. But if man failed to ignite a flammable forest, sooner or later lightning produced the same result. This can be inferred from the evolutionary adaptations to fire of many plants (for example, the closed-cone habit of jack pine and lodgepole pine), and from records of ancient charcoal in peat bogs, lake sediments, and glacial deposits.

These fires did *not* destroy the soil nor rob the land of its fertility. In fact, in northern regions and cool mountains the gradual accumulation of needles, leaves, mosses, and rotting wood actually *ties up* essential plant nutrients and covers the soil with such a thick layer of humus that tiny conifer seedlings have difficulty getting established. Fires consume this organic mantle, bare the mineral soil seedbeds, and release the accumulated mineral elements. Thus fires can actually "rejuvenate" a forest by replacing an old, decadent stand with a new, vigorous one. This is precisely what has happened ever since the Ice Age in the famous pineries of the old North Woods; the great sequoia, ponderosa pine, larch, Douglas fir, and lodgepole forests of the West; and throughout the range of jack pine and black spruce in the Lake States and the boreal forests of Canada and Alaska. Fire scars or "catfaces" on old trees testify to this history. And the ages of many of our present forests can be related to the tree-ring records of fire scars on these veterans. Many of the most magnificent conifer forests in our national parks and wilderness areas owe their origin and present composition to these past fires.

Thus the usual concept of a "virgin forest" is misleading. Many people think of virgin forests as only the old and venerable communities of large trees and regard them as permanent legacies from the past that somehow escaped the ravages of fire, insects, and disease. We also require, and rightly so, that these forests never have been logged or cleared by man. Forests resulting from logging, clearing, burning, or similar disturbances are called "second growth" and are considered inferior. But the "virgin forest" must be redefined in the light of modern ecology, because we know now that many of our finest examples are really the products of presettlement fires, windstorms, insect outbreaks, and similar natural disturbances.

A better definition of virgin forest is that it simply be the product of natural processes, as opposed to a forest resulting from disturbances by man. By this definition a virgin forest can be either young or old, composed of large species or small, well-stocked or nearly open, and magnificent or homely. This is a far more ecologically defensible concept, for it admits all truly natural landscapes, whether the forests originated centuries ago or just last year following a fire or insect epidemic. We must then recognize that the "second growth" on a new burn today is to become the "venerable" old forest in our great-grandchildren's time!

Many species of wildlife are adapted to early successional plant communities, whereas others are characteristic of mature forests. Both kinds have a place in wilderness areas today if they were present in the primeval ecosystems. Species characteristic of burns, open areas, shrub communities, and early successional stages include the white-tailed and mule deer, elk, ruffed grouse, sharptailed grouse, hares, foxes, coyotes, bears, beaver, and many more. Some of these animals were more at home on the edges of disturbed areas than in the great open areas; nevertheless, they were associated with new successions. Species that seem to have been more abundant in mature conifer forests include the pine marten, certain squirrels, and several birds. Other species, such as moose, timber wolf, cougar, and woodland caribou, ranged widely between mature forests and new successional stages and are difficult to classify in this respect.

The implications of the foregoing natural history for wilderness and national park preservation programs are far-reaching. If we are serious about maintaining the natural ecosystems of these areas, then clearly the elemental forces of the past must still prevail. And when we consider past and present resource "protection" policies, we see important deficiencies.

We have "controlled" (mostly *eliminated*) the large carnivores, such as the timber wolf and cougar. Yet they were the only effective predators of the large herbivores—the elk, moose, and deer. Excessive herbivore populations and the consequent overbrowsing, overgrazing, starvation losses, and necessary herd-reduction programs are old stories now.

Until recently we have tried to control forest insect infestations with pesticides, or by felling and burning infested trees. Sometimes we "clean up" wind-damaged forests, and exotic plants have been introduced—even deliberately.

Fire policies have had the most powerful and pervasive effects. We have attempted to control forests fires for 50 years or more; in most areas we are now quite successful. Yet, by so doing we have sometimes accelerated successional changes over vast areas—causing the simultaneous aging of forests over entire landscapes, preventing the establishment of new pioneer plant and animal communities, eliminating the diversity of nature, and excluding the ecological niches of many forms of wildlife. The immediate impact is far greater in certain even-aged and short-lived pioneer forests such as jack pine, lodgepole pine, and aspen than in long-lived forests such as Douglas fir, red pine, ponderosa pine, and sequoia, or in shade-tolerant forests of maple-beech-birch, or spruce and fir. In a sense we are committing our parks and wilderness areas to a grand ecological experiment by inadvertently trying to produce climax forests over vast areas—on a scale that may never have occurred before. We clearly have this situation in the Boundary Waters Canoe Area, in Yellowstone, Grand Teton, and Sequoia-Kings Canyon National Parks, and many other areas.

The consequences of this program are not only unintended, but in most cases unknown, for ecologists can find few examples of such circumstances within comparable ecosystems. This is simply not "the way it was" in primeval nature.

If past policies are not resulting in the preservation of nature, then what *is* an ecologically sound policy? First, we must have clear, specific, and biologically attainable objectives for each area. Policy statements should spell out the philosophy of ecosystem management and the biological nature of the ecosystem to be maintained or restored. Philosophically, the focus should be on restoring the primeval *environment*. What we are interested in is preserving the total *system*—the ever-shifting mosaic of plant and animal communities. We cannot freeze nature into a static mold. But we *must* offset the disturbances caused by modern man.

Our concept of the ecosystem to be preserved or restored should be based on detailed studies of vegetational and faunal history, and on an inventory of present plant and animal communities. Fortunately, forests write their own history in tree rings, and many forests in our parks and wilderness areas still date from the primeval period. Sophisticated methods for reconstructing the primeval scene are available where such tree-ring records can be obtained. Ring counts on old fire-scarred trees can help determine the fire history for hundreds of years. And by obtaining the ages of forest stands over whole watersheds, it is possible to correlate the age structure of

present forests with this fire record. Written records or old photographs and drawings can also help, especially the early U.S. Land Office survey records, explorers' diaries, old newspapers, and similar sources. Preserved pollens, larger plant remains, and charcoal in lake sediments or peat bogs have recorded plant communities over much longer periods. They can be used to connect information about the recent past with the situation hundreds or even thousands of years ago. Indian and early-man archaeological sites are an important source of faunal records. And carbon-14 dating now makes it possible to place firm dates on many organic sediments, fossils, and archaeological finds.

Decisions on ecosystem objectives must be made when this assessment of the primeval ecosystem is complete, and when an inventory of present communities is available. The historical research and the inventory will allow judgments about the degree to which present ecosystems have changed from the primeval. The objectives should spell out the vegetational, faunal, and environmental characteristics to be achieved; but they are not to be viewed as static prescriptions for each landscape unit. They merely should detail such things as the vegetation types and successional stages to be encouraged, the approximate proportions of the area that might be occupied by each type and stage at any one time, the native fauna to be encouraged, and the significant natural environmental factors that may require attention. The proportion of the area to be occupied by various successional stages is a key decision. If possible, it should be based on virgin-forest age classes or other solid evidence of the frequency of new successions.

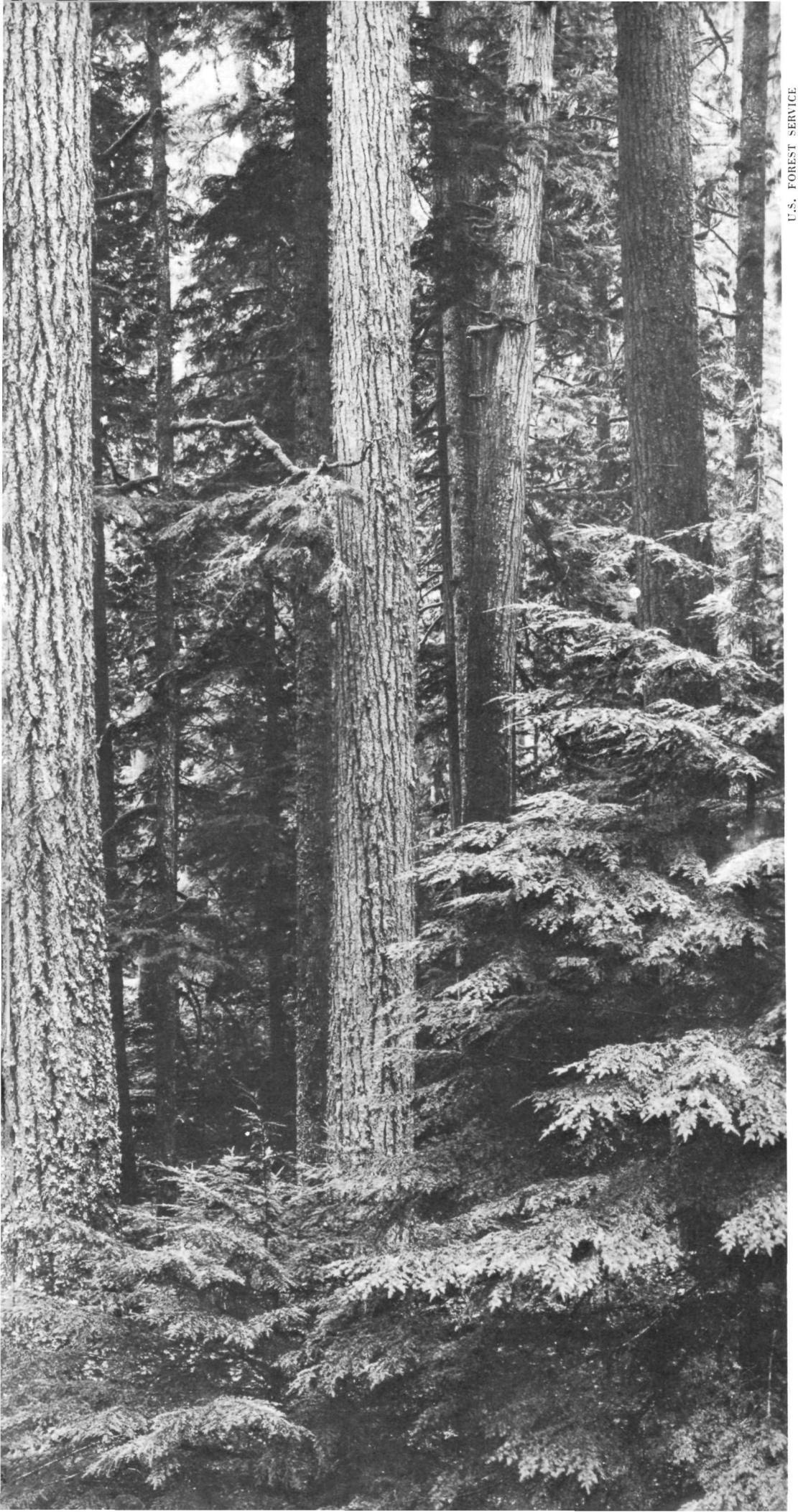
Once ecosystem objectives have been set, a strategy to achieve these goals is needed. Unfortunately, strategies are not yet available for many ecosystems, and in such cases the initial focus must be on relevant ecological research and technique development. But the basic general strategy is clear. It will be to replace missing vegetation types or faunal elements and to see that important natural environmental factors are present at approximately their natural frequencies. When these requirements are met, we accept as natural the changes in plant and animal communities that may occur in both place and time. We are not really trying to "manage nature" or "control succession." We must not insist on a given vegetation type or animal community for each site.

Fortunately, in the United States many park and wilderness ecosystems still are close enough to the primeval that drastic changes in flora and fauna will not be needed over much of the area. It is mainly the proportion of successional stages that will require corrective action. In contrast, in much of Europe, the Middle East, and the Far East virtually all primeval ecosystems have been destroyed for so long that the concept of the "natural" ecosystem is hardly relevant.

I can suggest several specific kinds of actions needed to implement this general strategy, some of which already are

Fires eliminate the old forest and expose ash or mineral soil seedbeds.

U.S. FOREST SERVICE



U.S. FOREST SERVICE

Magnificent virgin forests like this Douglas fir forest in Washington often owe their origin to past fires.

endorsed by the National Park Service, the Forest Service, and other agencies managing nature reserves:

1. Reintroduce missing members of the animal communities wherever possible, including both herbivores and carnivores.

2. Restore native vegetation where it has been badly disrupted by past logging, grazing, agriculture, and so on. (Soil preparation, seeding or planting, and mechanical vegetation control may be necessary where changes have been major.)

3. Avoid the introduction of exotic plants, animals, and fish. Eradicate exotics already present where feasible.

4. Allow native insect and plant diseases to reap their toll. Cease the application of all pesticides, herbicides, and similar chemical controls.

5. Do not "clean up" blowdowns, or insect- and disease-killed forest stands.

6. Assure a natural fire regime where fire was a significant environmental factor in the primeval ecosystem, by prescribed-controlled burning if necessary.

Only natural environmental factors should be employed—to the maximum extent feasible. Artificial seeding and planting, soil preparation, and mechanical vegetation control are justified only to offset major disturbances by modern man. Where seeding or planting are used, only local seed courses should be used.

Fire policies and programs need discussion, because fire is such a powerful environmental factor, and because it is one of the few major natural factors over which we exert control. Today, we are greatly reducing the area burned in many nature reserves where fire was once the single most important factor in generating new successions. In such ecosystems we have at least six fire policy options, and a decision cannot be avoided. These options are:

1. Attempt fire exclusion and accept the slow but pervasive changes in plant and animal communities that inevitably follow.

2. Allow "safe" lightning-caused fires to burn; allow also for some other wildfires that cannot be controlled, but extinguish the rest. If this option results in less than the natural fire frequency and burned area, so be it.

3. Allow "safe" lightning fires to burn, allow for some other wildfires that cannot be controlled, but prescribe enough additional controlled fires to assure the natural fire regime.

4. Suppress all wildfires to the extent feasible, and duplicate the natural fire regime with prescribed-controlled fires.

5. Allow all wildfires to burn unchecked unless life or property are directly threatened, and hope that a natural fire regime will result.

6. Abandon the ideal of natural ecosystems, and turn to full-scale vegetation and environmental manipulation by mechanical and chemical means, seeding, planting, and so on. Attempt to produce desired vegetation with the tools of applied forestry.

For most areas I favor either option 3 or 4, depending on the particular fire control, human safety, and property safety considerations of the area. Either option would provide approximately the natural fire regime and would avoid the risk of letting wildfires get out of hand before control is attempted.

The second option, allowing for "safe" lightning fires and some escapes, but not using prescribed fires, may be acceptable where it would yield close to the natural fire regime. In isolated mountain areas this policy may be valid if there is little possibility of fires escaping to lands outside the wilderness or park.

The last option, mechanized forestry, seems to me to be inconsistent with the basic philosophy and objectives of our national parks and wilderness areas. However, it is urged as the only realistic and practical choice by some foresters and by many of the forest industries, who point out that a commercial harvest of timber could be obtained as a byproduct. Timber cutting is now practiced in parts of the Boundary Waters Canoe Area, in Algonquin and Quetico Provincial Parks in Ontario, and in several other large "parks" in Canada and other countries. But in none of the cases with which I am familiar is there a serious attempt to duplicate primeval vegetation conditions following cutting. Unfortunately, this option, without commercial incentives, will have to be resorted to in some auto campgrounds and other high-use sites.

I reject the fifth option, allowing all wildfires to burn, both because it endangers life and property and because with recreational use the location and frequency of fires would be unnatural. We cannot endanger human lives either inside or outside wilderness areas, and we cannot risk damage to commercial forests or to structures outside.

It is clear also that I do not favor the first option—attempted fire exclusion. This is the present practice in many areas, but the ecological consequences are great and uncertain. A further problem, which we may be facing in many areas already, concerns the accumulation of forest fuels by excluding fire. In cool coniferous forests there is a gradual accumulation of litter and humus on the forest floor, and in severe droughts this organic matter can become a major fuel. Also, as forests mature, the total standing volume of flammable material increases, and often there is more dry, dead wood in old stands. Some forests certainly reached these stages under primeval conditions, and I do not mean to imply that old forests are unnatural. But if we attempt fire exclusion in an ecosystem consisting of maturing, even-aged forests, we may force a totally unnatural preponderance of old stands upon the landscape. If a wildfire does then escape during severe fire weather, the potential for a real conflagration is present. Its ecological consequences may be most unfortunate, to say nothing of safety problems.

I must emphasize that in most areas we are not yet ready to introduce prescribed fires of the kinds required ecologically, or on the scale needed to duplicate the natural regime. Much experimentation will be needed to achieve technical expertise in firing and control methods, in gauging weather and fuel factors, and in understanding the fire prescriptions necessary to achieve the ecological effects of the natural wildfire regime. The size of areas to be burned, the frequency of burning, and the burning techniques are all matters of choice that require research. There is no need—and indeed it may be impossible—to burn every year. One might allow major burns only once every 10 to 20 years. This will depend on the natural fire frequency as well as on burning weather.

There has already been much research in prescribed burning, and many applications are being made. But for ecosystem applications in the virgin wilderness, I am talking about the introduction of severe ground fires or even running crown fires in mature forests. In some cases these fires must be severe enough to kill most or all of the trees within the burn. Of course, only a small percentage of the park or wilderness would be burned at any one time. The aim would be to slowly reestablish the primeval distribution of forest age classes and vegetation stages. We have little relevant experience with prescribed burning to achieve this.

Research to develop the needed expertise in both prescribed burning and fire ecology is now underway adjacent to the Boundary Waters Canoe Area and in Sequoia-Kings Canyon National Parks. These studies are new, and much more work is needed. Meanwhile, as we await the development and acceptance of prescribed burning, ecologists and managers can proceed with inventories of present plant and animal communi-

ties and with historical research to document the primeval ecosystems. Fortunately, we do have some time yet, because most successional changes in vegetation are slow.

Meanwhile, the public must continue to exercise great care with fire in our parks and wilderness areas. Perhaps Smokey Bear has oversold his message; he should be telling us that some fires can help the forest and create new homes for wildlife. But we must leave prescribed burning to the experts and prevent all man-caused wildfires.

Air and water pollution and soil erosion are being suggested as arguments against the use of fire in ecosystem preservation programs. Fire opponents suggest that intolerable smoke would result and that there would be excessive inputs of soil nutrients and sediment into lakes and streams. However, I think these fears are unfounded. First, studies show that forest fire smoke is chemically different from urban or industrial smogs. Such smogs contain large amounts of sulfur and nitrogen oxides, carbon monoxide, ozone, and peroxyacetyl nitrate (PAN). Forest fire smoke contains far less of these injurious compounds. It is composed mainly of carbon dioxide, water vapor, smaller amounts of carbon monoxide, small quantities of olefins and ethylene, and particulate matter. It does add some pollutants, but it simply does not pose the same threats to human health or vegetation. Furthermore, urban and industrial smogs are emitted continuously and in the most densely populated areas. But fires in wilderness would occur only on a few suitable burning days, and then only in years when burning was feasible and needed, and in remote wildlands. The most serious urban smogs occur where the local atmospheric circulation permits accumulation of toxic gases. Fires in wilderness would contribute to these local problems only where a wilderness occurs within the same "airshed," which is not common.

Most mineral elements released in the burning of forests are not lost through runoff. They are recycled back into the plant and animal ecosystem. If this were not so, fires would have depleted the forests of North America long ago. The truth is that many northern conifer forests owe their vigor to this periodic recycling of nutrients—it is part of nature, and it has occurred countless times in the past. Although some past studies have provided data on this question, we are just now really getting the facts. Available studies suggest that there are some nutrient releases to streams following fires, but these releases may be no larger than those accompanying commercial timber harvests. Furthermore, fires in nature do not remove large volumes of nutrient-containing wood, bark, and foliage from the ecosystem as does commercial tree harvesting. And fires in nature or prescribed fires generally would occur on any one watershed only at long intervals.

The popular notion is that massive soil erosion usually follows forest fires. But personal observations over many years in many regions have convinced me that this rarely occurs in natural forests. (A dramatic exception is the chaparral type in Southern California.) On very steep terrain it may occasionally happen for short periods, but even there prompt revegetation of the burns usually stops soil movement within a year or two. On steep slopes, the combination of clear-cutting, careless road construction during logging, and slash-burning after logging may cause serious erosion. (And this is poor forestry, too!) But these practices should not be equated with the effect of fires in virgin wilderness. Again, if disastrous erosion had followed most fires in nature, the virgin wilderness of North America would not have contained the beautiful conifer forests still present in many fire-dependent ecosystems.

One may ask whether fires in parks and wilderness areas would not deplete atmospheric oxygen. But this argument is invalid, too. A tree will consume just as much oxygen when it dies and decays from causes such as wind breakage, disease, or insects as when it is consumed by fire. The *rates* of oxygen consumption are much different, but the *amounts* are identical. Inasmuch as all trees are mortal, it matters little to the earth's oxygen balance whether trees die gradually in an aging forest or suddenly in a fire that covers a limited region. The new forest on the burned area will be producing a large net output of oxygen within a few seasons, whereas the old climax forest may not produce any more than it consumes.

Regardless of these arguments, one thing is clear. Fire *was* part of the natural environment in many of our most cherished nature reserves. If we are to preserve natural ecosystems, we must allow fire to be part of the system again. And if such natural events in the past produced acceptable conditions, we can expect them to continue to do so in the future.

Today there are still areas of *de facto* wilderness outside designated wilderness areas, national parks, and other nature reserves, especially in the West and Alaska. The ecosystems of some of these areas are still fairly intact. But as our population rises and pressures on the land increase, the designated reserves may become virtually the only lands where relatively complete ecosystems can be maintained.

It is imperative that our major nature reserves be kept large enough to defend as viable ecosystems. They must be large enough so that reintroduction of fire is feasible and so the impacts from commercial forests, cultivated lands, and industrial areas will not impair them. The home ranges of significant animals and birds must be protected adequately —especially the rare or endangered species with large home ranges, such as the timber wolf, cougar, grizzly, caribou, and bald eagle. We have no firm guidelines for minimum ecosystem size. I suspect that they will vary for each area and each problem. But obviously, where the area is too small to protect from serious external impacts, we are in trouble. Problems affecting water levels in Everglades National Park are a case in point.

Preserving nature and managing national parks and wilderness areas will require more research, more time, more money, and more people trained in ecology. We are not talking about preserving a few parks and wilderness areas to be used as giant playgrounds. We are talking about keeping our perspective on human life in relation to the earth's ecosystems. And we even may be talking about the survival of mankind! For if we are to understand the living ecosystems of the earth—the only life in our solar system as far as we know—then we must preserve this natural system.

Have *we*, in our wisdom, already learned all that our *children* will ever want to know about the structure, functioning, and evolution of the natural world? Is it possible that they may someday need some of the genetic diversity of the plant and animal life that increasingly is confined to our remotest lands and nature reserves?

We part with remnants of the natural world at our peril. The choice is simply a matter of priorities. If we can afford billions to recover a few bits of sterile dust and barren rock from the moon, perhaps we can also afford a realistic and ecologically sound program to preserve the life systems of PLANET EARTH! ■

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Jack-o-lantern fungus

PHOTOGRAPHS BY THE AUTHOR

Bolete

Mushrooms of the Mountains

THE MOUNTAINS RUMBLE with thunder, lightning sparks against the rocks, and like magic the mushrooms spring forth from moss and leaf mold. The Great Smokies are the richest mushroom area in North America, with some 1,800 known species of fungi to be found there. May and September are the "mushroom months." Climb the Alum Cave trail to LeConte, or any of the other hiking trails, on an afternoon that has, as Hardy wrote, "a fungus smell of out of doors," and see for yourself the vast variety of strange fungus growth to be found in the mountains.

Different species of fungi are found

Marie B. Mellinger

Polyporus fungus and uncurling crosiers of cinnamon fern

at various elevations from the lowest slopes to the high, cool spruce-fir forests and the heath balds of the summits. Both the dry, sunny ridges and the rich, wet coves have their own assortment of fungi. Mushrooms, fat and squat or tall and slim, rise out of the moss and line the trail. Fungi come in many forms and can look like elf-umbrellas, or goblets, or coral, or even blobs of gelatin dropped along the path. They can range in size from microscopic fairy caps to 30-pound puffballs. Colors range from dead white through all the pastels and dingy shades, to bright, vibrant reds.

Shelf and bracket fungi decorate old stumps and fallen logs and mingle with lichens and ferns at all elevations along the trail. Their affinity for wood gives them uniquely textured backgrounds. There are about 150 species of Polyporus in the Smokies, found mostly on dead and decaying wood. Rosettes of "hen and chickens" (*Polyporus versicolor*) cover logs and stumps all along the trail. They glow with color—pink, rings of tan and brown, soft grays, and even shades of blue, a rare color in fungi. Large colonial growths of the "chicken of the woods" (*Polyporus sulphureus*) are found on several species of deciduous trees; but they prefer the red oaks and chestnut oaks of the lower elevations. The creamy brackets of the seashell fungus, Schizophyllum, are found at all elevations. So, too, are the deep, dark red brackets of the beefsteak, Fistulina, found on a variety of dead and decaying deciduous trees.

At the lower elevations are found both the giant parasols (Lepiota) which sometimes form fairy rings, and the tiny conic umbrellas of Mycena and Marasmius, pyxies rising singly or in clusters from the moss and leaf mold. The humus of the forest floor also hosts stalked puffballs (*Lycoperdon pulatum*), known as devil's snuff boxes, and the small gemmed puffballs.

Fallen logs and stumps of oak and chestnut have honey-yellow colonies of the brick-top (Hypholoma) and the gilled bracket of Pleurotus. The ghostwood of the dead chestnuts has colonies of slaty Lepontias, with pallid gills, and the delicate-lobed bear's head, or Hydnum. Jack-o-lanterns (Clitocybe), pale tan to bright orange, grow on old oak stumps or at the base of dead trees. On damp nights they glow with fox-fire. Many forest trees have their own endemic species of fungi. Mountain magnolia, for example, has clusters of minute Collybias growing from the dropped seed cones. The beech tree has beech-babies, Boletus, that grow in association with its roots.

Shaded hemlock ravines are the haunts of the rusty Paxillus and two milk mushrooms, the pink Lactarius and the zoned Lactarius, both containing an acrid milky juice. These mushrooms grow from fallen hemlock needles usually at altitudes to 4,200 feet. Another polypore, *Polyporus tsugae*, with 2- to 8-inch shiny mahogany brackets, occurs on decaying hemlock wood. The purple-pretty *Lactaria ochropurpurea* and the sooty Hygrophorus grow in a mycorrhizal association with hemlock roots.

Laurel slicks, vast tangled groves of the great rosebay, *Rhododendron maximum*, and the heath balds of the high elevations have their own communities of fungi. Salmon Entolomas, with apricot-colored gills, grow under the rhododendrons to 5,000 feet. The fragile Russula, with bright coral-red top, grows on the heath balds. So, too, does the shaggy Chanterelle, *Cantharellus floccosus*, with orange-red, very shaggy funnels. Two boletes, the olive-green *Boletus marrissi* and spotted *Boletus maculosus*, grow in association with rhododendron roots.

In the mist-forests, up to 6,000 feet, the high-spruce firs host many fungi indigenous to conifer woods. A spine-mushroom (Hydnum)—weird growths with rubbery-gelatinous caps—is

Above, Polyporus fungus on oak
Below, clusters of tiny Marasmius pyxies

found on dead spruce trunks or fallen logs. The tufted Marasmius forms fairy rings on beds of conifer needles. Another milk mushroom, *Lactarius lignyotis*, with a velvet-brown cap is common in the spruce-fir forest. Olive, umbonate Entolomas grow at the highest altitudes, along with spotted Collybias and the variable Russula, with caps that may be pink, red, purple, or green. Among the wood sorrels and fancy crested wood ferns are colonies of elf-bells, Omphalia, and the brown cups of Paxillis.

There are said to be 75 species of Mycena found in the Great Smokies, and many of them grow at very high altitudes. The spotted *Mycena maculata* grows in solitary splendor, each slender stalk topped with a floppy tourist hat. But other species, some as yet unnamed, grow in clusters of 50 or more on rotting conifer logs. Cortinarius species are also common under spruce and fir.

Fir polypore, *Polyporus abietinus*, and the white brackets of expanded Pleurotus are found on decaying spruce limbs. Pale yellow cups of Peziza and yellow knobs of the irregular Mitrula are found on the fallen limbs and trunks of spruce and fir.

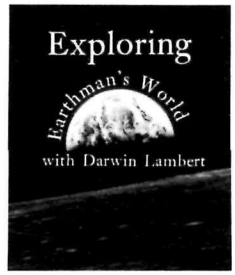
At all elevations most of these fungi play an important role in the mountain forest system. Not only do they serve in turning dead and decaying wood back into humus and topsoil, but many of them live in a mycorrhizal association with trees, lilies, or wild orchids in an arrangement helpful to both. The fungi get mineral trace elements from the soil for the roots of the higher plants, and the plants in turn provide the fungi with food. Much of this association still needs further study.

In the moist, mysterious depths of the far mountain ranges, there are still many mushrooms as yet unnamed and unclassified. They can become a fascinating hobby. Many people enjoy drawing or photographing fungi; to others they merely add to the mystery and beauty of the mountain trails. ■

NOTE—For those interested, we recommend reading *Mushrooms of the Great Smokies* by L. R. Hesler, 1960, University of Tennessee Press, Knoxville, Tennessee.

Maple mushrooms

A series of short articles examining man's relationship to nature.



anne t. feraru

THE POLITICS of EARTHMANSHIP

t he great question of the seventies is, shall we surrender to our surroundings, or shall we make our peace with nature and begin to make reparations for the damage we have done to our air, our land and our water?—Richard M. Nixon, State of the Union Message, January 22, 1970

The problems created by man's abuse of his environment have recently become fashionable subjects for public oratory and private conversation. Once the preoccupation of a few outdoor enthusiasts and natural scientists, environmental problems have been "discovered" by political leaders and activists around the world. Whether the talk leads to effective *action* is at heart an issue, not of science nor technology nor good will, but of politics.

Action will have to be taken primarily in the political arena by governments, because the complex nature of the problems makes voluntary, partial, and private solutions inadequate. The global ecosystem's social, economic, ethical, and technological aspects are so interrelated that a comprehensive framework for action is needed within which local, national, regional, and global government and private agencies can attack the problems. The hammering-out of that plan must be the responsibility of the world's political decision-makers. Only they can pull together the tangled strands of interests, make decisions, and commit resources sufficient to effect solutions.

Prospects that such action will be taken seem inauspicious, given the customary behavior of political leaders and their constituents, and the belief systems that underlie that behavior.

The political ethics of Western man, which have been spread through most of the world, assume that man's birthright is to dominate nature for his own profit and pleasure. Whether the inspiration is Locke or Marx, Western political thought almost uniformly takes for granted the legitimacy and necessity of man's arrogant exploitation of nature. That "vandal ideology" (as Scott Paradise has labeled it) is reinforced by the widely accepted idea that national "self-interest" is the highest responsibility of political leaders and requires national "development," meaning industrialization, urbanization, and ever-rising levels of mass consumption. These goals, relentlessly pursued by over 130 nation-states, now threaten to exhaust natural resources and to deteriorate the quality of life. No one would seriously advocate a global return to subsistence agriculture, but we need visions of alternatives to the "consumer society," and—in Anne Morrow Lindbergh's words—"a new ethic that thinks and acts in terms of guardianship of the planet and its life."

Prevailing habits of political behavior and governmental structures are also ill-adapted to cope with the tasks of earthmanship. In the United States, for example, environmental management is immensely complicated by the "pluralist" model of government in which power is fragmented among competing groups inside and outside government, and policy emerges from the rough-and-tumble competition among these groups. Other governments also face limitations on their capacity to make and execute national policies.

At the international level, the machinery for rule-making and enforcement is almost nonexistent. Governments have created WHO, FAO, and other specialized agencies with purposes related to ecological problems; but the agencies depend on member governments for execution of international regulations. If all countries concerned with a particular problem cooperate, existing international machinery may be sufficient. If, however, some governments do not, the international organization cannot compel their cooperation.

Whether the world's ecological problems "require" a world state with a global legislature and administrative apparatus is really not a live political issue. The existing territorial division of the world into nation-states, with governments and armies and ruling elites and supporting ideologies, seems too well entrenched to make such a transition rapidly. Perhaps the way to earthmanship lies in more modest increments in changed attitudes, adapted political styles, increased authority for existing agencies, creation of new ones where this is politically possible and technologically desirable.

The challenge of earthmanship may be met if the world's leaders and their followers recognize, in Aldous Huxley's words, that:

"To cultivate the religion of idolatrous nationalism, to subordinate the interests of the species and its individual members to the interests of a single national state and its ruling minority—in the context of the population explosion, missiles, and atomic warheads, this is bad and thoroughly unrealistic politics. . . . To work for the survival of the species as a whole and for the actualization in the greatest possible number of individual men and women of their potentialities for good will, intelligence, and creativity—this, in the world of today, is good, realistic politics." ■

Mrs. Feraru, who teaches international politics at the California State College, Fullerton, lives in the Los Angeles basin, which—in her words—"exemplifies what happens when private greed, public apathy, and political responsiveness to special interests combine to 'develop' a portion of the earth."

MANAGING THE YELLOWSTONE

THE PRIMARY PURPOSE of most of our national parks is to preserve natural ecosystems and so give visitors the chance to see and appreciate the scenery and the native plants and animals of primitive America. The preservation of natural ecosystems for their scenic, educational, cultural, and scientific values presupposes a unique use of the land; national park land is "different." Outside the parks, land and natural resources are used to supply man's needs and desires for food, shelter, fiber, minerals, and recreation, including the "harvesting" of wild animals as a crop. On such lands man's consumptive use of natural resources greatly alters the relationships between native wild animals and their food sources and environment—the balance of nature. Not so on national park lands. There man's spiritual and intellectual needs are served by preservation of the natural order, or should be, which brings us to the story of the elk of Yellowstone National Park.

Paleontological and glaciation records suggest that elk have inhabited the region that became Yellowstone National Park over a 25,000- to 35,000-year span. During the greater portion of these years substances that sustained life were cycled through plants, elk, other plant-eaters, and a variety of meat-eating animals in a natural ecosystem where the dynamic balance between plants, animals, and normal death and decay was not being altered by man. Animate and inanimate balanced. Nothing was wasted.

Primitive man may have first arrived in the Yellowstone country about 10,000 years ago. He, like the Indian tribes that followed, did not seem to have any substantial impact on the ecosystem. Accounts from the first visits of trappers and expeditions through the middle and late 1800's testify that the Yellowstone region abounded with elk, bison, mule deer, and antelope. Meat-eating animals such as the grizzly bear, grey wolf, and mountain lion were reported to be common or abundant.

Then modern man arrived in force, and the elk suddenly became a "problem." The first disrupting influence on the elk in the northern part of Yellowstone occurred when man began to reduce the grey wolf and mountain lion populations within the park. A known 134 wolves and 121 mountain lions were killed in the early 1900's, and the smaller coyote was vigorously "controlled" up to 1935. The universal attitude of these times was that the "good" animals had to be protected from the "bad." The idea that populations of larger native predators and plant-eaters can coexist in a mutually beneficial relationship, and as a part of the overall ecological balance, found few supporters. Both the grey wolf and the mountain lion were hunted close to extinction in the park.

Yellowstone elk dying of starvation, the price of overbrowsing.

The second disrupting influence on the elk resulted from man's restriction of their free-ranging movements and distributions. Hunting along park boundary lines, combined with other human disturbances from settlement, ranching, and mining on outside lands, tended to make the animals stay inside the park. Only the more severe weather or food shortages forced migrations. This situation led to excessive elk use of park winter ranges, while areas outside were lightly used.

Hunting seasons outside Yellowstone could have been designed so that the elk would have continued to move in their historical patterns. They could have served to reduce elk impact on park winter ranges, and could have compensated partially for the near elimination of large predators. But confusion and controversy over management objectives ultimately led to organized efforts to open the park to public hunting. Though unsuccessful, these efforts and the accompanying furor precluded the development of well-designed seasons. This resulted in a progressive increase in elk control by trapping and shooting within Yellowstone Park and a decline in hunting kills outside park boundaries.

Four major elk herds occur in Yellowstone National Park. A southern herd of about 4,000 animals summers in the south third of the park and migrates to the Jackson Hole region to spend the winter. This herd is routinely controlled by hunting on lands south of the park. Cooperative studies with Wyoming Game and Fish Commission personnel guide management.

A Gallatin herd of about 1,000 animals summers in the northwest portion of Yellowstone and migrates to winter ranges in Montana. A cooperative program with the Montana Fish and Game Department and the United States Forest Service provides for the management of these elk by hunting after they leave the park.

A resident park herd of about 1,000 animals remains yearlong within the general area of the Firehole, Upper Madison, and Gibbon Rivers. These elk, which are seen and photographed by many thousands of park visitors each year, are naturally controlled. Such control is accomplished by the combined action of the few remaining native predators and scavengers, natural incidences of disease, the temporary influences of weather, and the availability or quality of winter food. The elk lives as it did in primitive times in this

ELK

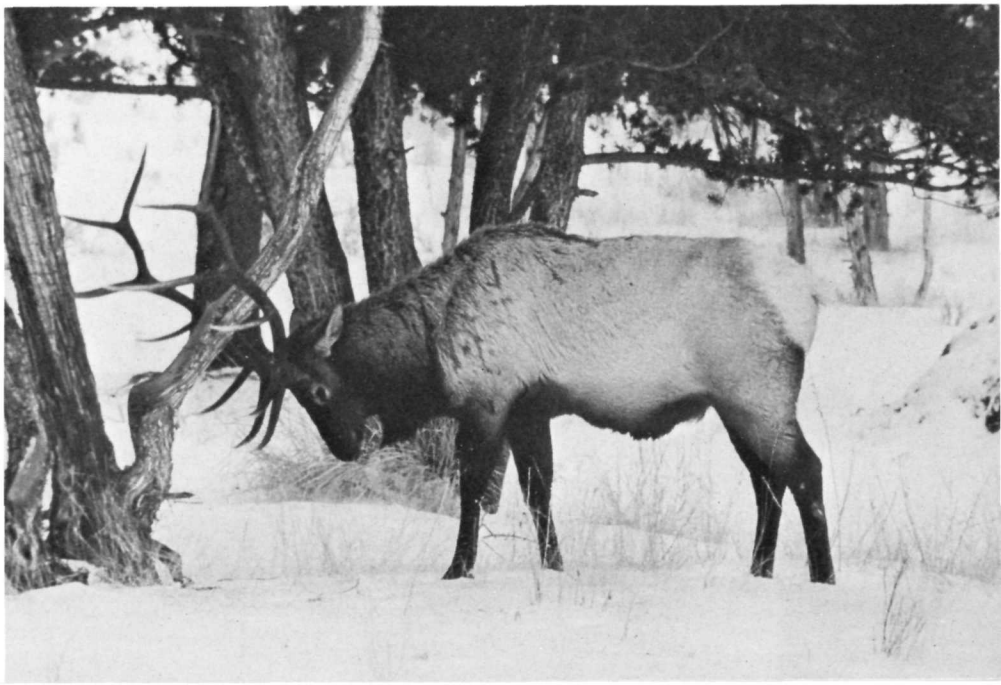
Glen F. Cole

NATIONAL PARK SERVICE

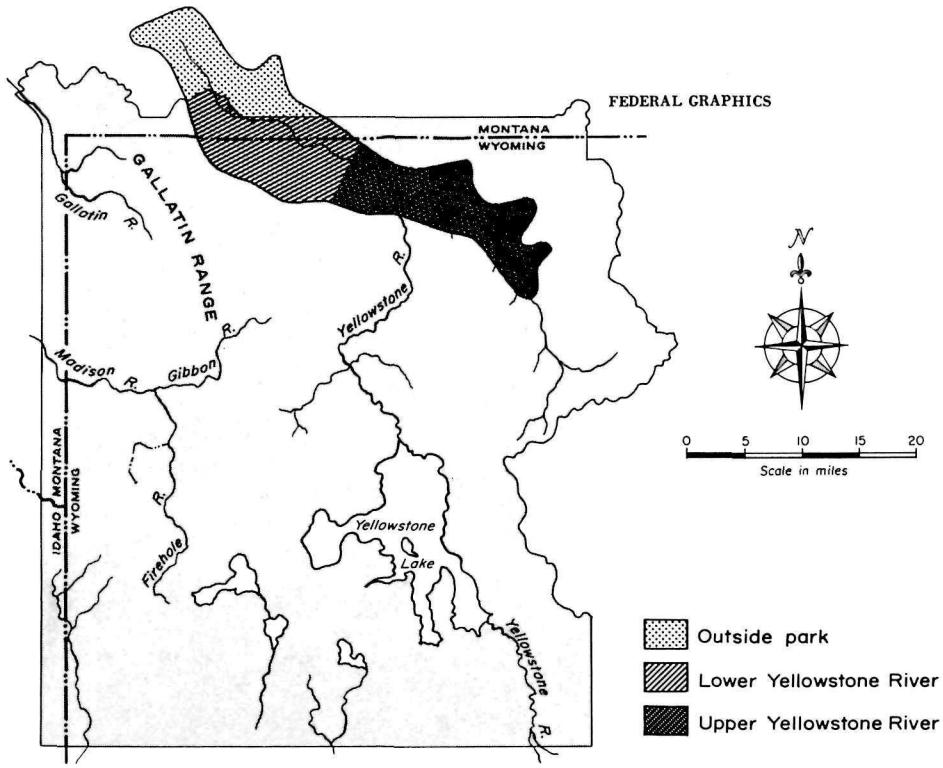
Fir on north park range stripped of limbs as high as elk can reach. (Below) Healthy elk spars with a branch; even under the best conditions winter health depends on slim bodily reserves.

ecologically intact portion of Yellowstone, and along with an existing bison herd it provides food for remnant groups of grizzly bears, grey wolves, and bald eagles, and for substantial numbers of coyotes, ravens, and other lesser meat-eaters. The scenic, educational, cultural, and scientific values of this portion of the Yellowstone ecosystem are outstanding and well represent the park's purposes.

A northern herd presently contains about 6,000 animals, which spend the summer mostly at high elevations within the park. A portion of this herd, the so-called "resident" segment, winters during even the most severe weather at low elevations within the upper half of the Yellowstone River drainage inside the park; another portion, the "migratory" segment, winters on the lower half of the drainage inside Yellowstone but also may use other historical winter areas that extend about 12 miles outside the park's north boundary. Greater numbers use these outside areas during severe winters. Winter distribution is governed by elevation, available forage, habit, the presence of other elk, human disturbances, and weather. (The tendency is for the elk to use the higher elevations first.)



W. J. McRAE



HISTORICAL WINTERING AREAS FOR NORTHERN YELLOWSTONE ELK HERD

Obviously, Yellowstone National Park does not represent a complete habitat for the herds or portions of herds that depend on winter ranges outside park boundaries. These animals may be hunted on lands outside the park without seriously altering basic relationships in the Yellowstone ecosystem or reducing the opportunities of visitors to see elk and other wildlife.

On the other hand, the elk that are yearlong residents of the more intact portions of the Yellowstone ecosystems cannot be controlled by man without taking critical winter or spring food from the park's predators. Such food is predominantly carrion, or animals unusually vulnerable to predation because of disease, old age, or injuries. If humans take elk from the resident herds either by hunting or in a control program, fewer elk compete for the short winter rations, and so fewer elk sicken or die under the stress of winter. Supplies of carrion and numbers of animals vulnerable to predation thus are much reduced. This artificial release of winter stress on the elk may be good "game management," but it hardly furthers the goal of the parks, natural relationships in ecosystems. One might as well shoot a predator as take away his food. By and large predators on large animals like moose and elk have not evolved to prey on healthy adults; wolves are not equipped to take on a vigorous, full-grown elk that decides to stand his ground. Even the largest elk herd, if it contains no culls, is a poor food supply for a wolf pack.

Elk control in the park through trapping and shooting by park personnel, as opposed to control by predators or hunting outside the park, had only one substantial benefit. That was to break the cycle of heavy pressure on large portions of the elks' winter range. With this done, the way was open to develop a program to restore hunting outside the park as the major method for controlling the migratory segment of the northern herd. This segment contained about 3,000 animals during the fall of 1969. Variable numbers of these animals can be expected to migrate to historical winter range outside the north boundary, depending on the severity of winters.

The remainder of the northern herd, the "resident segment," is found in a portion of the Yellowstone ecosystem that could become a working ecological unit. This part of the herd could be regulated by the same natural processes that control the herd within the Gibbon, Firehole, and Madison River regions of the park.

In 1968 a new approach to control of the northern herd was inaugurated by a memorandum of understanding between Yellowstone National Park, the Montana Fish and Game Commission, and the U.S. Forest Service. The new program allows unrestricted movement of the migratory segment outside Yellowstone before hunting begins. The program is expected to maintain the prehunting season size of the segment within a 3,000- to 5,000-animal range. This is to be accomplished by a variable-quota hunt system. Yearly quotas for hunting may range from no required kills up to a ceiling of 2,500 animals and a required kill of 800, depending on prehunting season herd sizes and the numbers migrating outside park boundaries. After the greater migrations that usually occur in severe winters, the variable-quota system can serve to return winter herd numbers to the 2,500 base. In interim years lesser numbers of elk would be taken; the slackened hunter pressure would allow the animals to reestablish habitual migrations. The variable-quota system should be considered tentative and subject to adjustment as studies indicate needed refinements. Elk numbers are considered less important than establishment of distributions and movements that avoid excessive overuse of winter ranges or conflicts with other park wildlife.

The resident segment of the northern herd contained between 2,500 and 3,000 animals by the fall of 1969. Data from eight average to severe winters between 1929 and 1961 suggest that this population is in equilibrium with periodically severe environmental conditions. Allowing these elk to be regulated naturally should reestablish an important food source for grizzly bears, the now precariously low numbers of grey wolves in the area (which hopefully will respond to increased food), and a variety of other native predators and scavengers that were originally more prevalent in this portion of the Yellowstone ecosystem. If natural controls on these elk cannot be fully restored, occasional selective removals by trapping "problem" herd groups can substitute for absent natural processes. It is hoped, however, that this measure will not be needed.

Researchers, including the park's five staff biologists, will control the program and point out necessary adjustments. Each year field personnel from cooperating agencies will submit recommendations for the management of the migratory segment of the northern herd. These recommendations will be supported by documented evidence.

Such a documentary approach should avoid the misunderstandings and controversy that led to artificial elk control inside the park as a substitute for properly designed hunting seasons outside boundaries. It should also provide for some understanding of the park's efforts to restore the natural relationships between wildlife and its environment in a significant portion of the Yellowstone ecosystem.

Glen F. Cole is Supervisory Research Biologist at Yellowstone National Park.

POTOMAC RIVER DAMS

Anthony Wayne Smith

For nearly a decade the Army Corps of Engineers has been pushing plans for a system of big dams in the Potomac River basin. Though the Army's justifications for the dams have varied considerably from time to time, two major "benefits" have been claimed with consistency—water supply for metropolitan Washington and pollution dilution. The National Parks and Conservation Association has been in the forefront of opposition to the Corps' big-dam system, which at one point called for 18 large impoundments and more than 400 small ones. Earlier this year the Corps included requests for authorization of the first two dams in the system in the Omnibus Rivers and Harbors bill. NPCA President Anthony Wayne Smith testified on invitation against the dams at Senate hearings on the bill. He was joined by representatives of several other organizations that with NPCA have formed a coalition in defense of the Potomac basin. Mr. Smith wants the testimony printed in full here so that members are informed about NPCA activities. Following are Mr. Smith's testimony and excerpts from the remarks of other witnesses at the hearings.

SENATOR SPONG: The Subcommittee will be in order.

We have, gentlemen, until 2:30, at which time I will have to return to the Senate floor for a vote. I would very much appreciate if you would be as concise as you can with your statements in order that we might make maximum use of that time.

The first witness is Mr. Anthony Wayne Smith, National Parks Association.

Mr. Smith, I have had the pleasure of hearing you testify before. It is nice to see you again.

MR. SMITH: Senator, it has been a pleasure to appear before you in the past, and I appreciate the opportunity to be here on the Potomac River problems.

My name is Anthony Wayne Smith, 1701 18th Street, Northwest, Washington, D.C. I am President and General Counsel of the National Parks and Conservation Association, further identification attached.

I appreciate the official invitation of the committee to testify in these hearings, and I am happy to respond.

The President of the National Audubon Society has authorized me to testify for that society, also, in response to your kind invitation to him, which he appreciates.

The proposed Sixes Bridge and Verona dams in the Potomac River cannot be justified, and should not be recommended by the committee for authorization.

I plan to read my short statement now, hopefully in 5 minutes as requested, appending a longer statement and exhibits for the record, with the request that they be printed. I hope you will permit me to use the additional 5 minutes assigned to the Audubon Society because I have a supplemental statement to present for them.

The Army Engineers contend that Sixes Bridge has a benefit-cost ratio of 1.2, whereas it is only 0.6; they contend that Verona has a ratio of 1.9, whereas it is only 0.5.

The Army Engineers attribute the following annual benefits to Sixes Bridge:

Water Supply	$105,000
Water Quality	386,000
Recreation	689,000
Preservation of Stream Environment (PSE) (Flow over Great Falls)	347,000
TOTAL	$1,527,000

This morning we had testimony from a gentleman from Staunton to the effect that they greatly hoped that water will be coming out of this reservoir for Staunton. The reservoir is 9 miles below Staunton, downriver. The benefits attributed to water supply by the Army Engineers from the Staunton reservoir amount to 4½ percent of the total benefits attributed by the Army Engineers to that reservoir. Of that 4½ percent, most of it is for Washington.

So the water supply factor in the locality of Staunton is trivial. It could be provided much more quickly and easily by a headwaters reservoir of the watershed management type, and for the construction of a reservoir of that kind the people in Staunton and Verona would have the full support of the conservationists and farm and labor organizations which are opposing the Verona Dam.

Most of the water supply and all of the PSE benefits in both projects are for Washington. They can be provided more cheaply by constructing a supplemental water-supply intake in the fresh-water tidal estuary at Washington to satisfy the occasional seasonal needs of the Washington area; hence, these estimates—and by that, we mean the water supply benefits and PSE benefits—should be reduced.

The attributed water quality benefits are specious. They are based on storing water to flush and dilute pollution. Public opinion and federal law will shortly require the elimination of pollution at source. These so-called benefits should be excluded entirely.

In support of the above, I submit an engineering study entitled *The Financial Feasibility of Six Reservoir Projects*, by Ellery R. Fosdick, Consulting Engineer to the Senate Committee on Interior and Insular Affairs, and to the National Parks and Conservation Association.

Recreational benefits of reservoirs are difficult to imagine when one is aware of the effects of drawdowns. Above, at a public recreation area of the Youghiogheny reservoir in southwestern Pennsylvania, sun-cracked mud sprinkled with broken glass, rusty cans, and half-rotten logs greets fishermen and autumn foliage viewers. The boat dock is left high and dry. Deep drawdown affects tributaries as well as the main river. Below, on Crabtree Creek, a tributary above the Savage River I reservoir in western Maryland, the juncture between the light and dark rocks at right indicates the "conservation pool" level. Tree-trunk remnants in the mud of the left foreground indicate scale and the severity of the drawdown. Both these reservoirs are comparable to those proposed for the Potomac River basin. Both were built by the Army Corps of Engineers—Savage I in 1952, Youghiogheny, in 1948. These photographs were taken in November 1963. They could have been taken any time after October 1 and would have shown essentially the same scenes. Had they been taken in late summer, the drawdowns would have been somewhat less severe but still noticeable. Had they been taken later, they would have revealed conditions even more severe. (From: A Statement on the Basic Facts About Reservoir Drawdowns, *published by National Parks & Conservation Association. Available free.)*

Economic development in the affected localities will be severely burdened if these dams are built. The communities will have to share the reservoir costs and will shortly have to build tertiary treatment plants in addition; there will be a double burden.

I don't think the gentlemen from Staunton had been informed as to those facts when they testified this morning.

When the above corrections have been made, the remaining attributed benefits are mainly so-called recreation; Sixes Bridge, 93 percent, Verona, 91 percent.

The total cost of Sixes Bridge will be about $22.5 million; of Verona, about $25 million. Does this nation propose to spend millions of dollars in this way for motorboat recreation? The tidal estuary of the Potomac and Chesapeake Bay are only a short distance away and afford ample opportunity for motorboating.

In contrast to the total cost of these two projects, the supplemental intake in the estuary can be built for about $5 million.

I submit herewith a report entitled *The Potomac River Estuary*, by Fosdick, published by this Association, confirming these statements.

If the communities in the affected localities need to store water in reservoirs for local water supply purposes, this can be done more quickly and cheaply by watershed management impoundments under local control.

I would say, again, to you, Mr. Chairman, that if this approach were to be taken, the water supply requirements of Staunton, Waynesboro, and other communities could be taken care of very rapidly because this approach would have the support of all the organizations which are opposing the Army type reservoirs.

The Army projects represent an approach to water quality which has become intolerable, the expenditure of public funds to subsidize municipal and industrial pollution. The sewage from Waynesboro, Staunton, and Frederick will be dumped into the rivers after partial treatment and flushed downstream by reservoir water.

The same is true of industrial pollution from the Du Pont plant at Waynesboro, the Merck plant at Elkton, and the American Viscose plant at Front Royal, Virginia. I attach a supplemental statement on this municipal and industrial pollution.

On my Audubon Society time, I would like to turn to that statement which has been submitted to you. I submit a list of the major industrial and municipal polluters on the South Branch of the Shenandoah and the Monocacy which would benefit by the Verona Dam and the Sixes Bridge Dam.

The public interest would be served better by loans or grants to the municipalities or directly to the industries to install tertiary treatment. Prevention of pollution at source is essential, and storage for the dilution of pollution is socially, economically, and ecologically objectionable.

Communications have been addressed to the municipalities and corporations listed inquiring about the cost of tertiary treatment—I wrote to all of them this week—inquiring about intentions of polluters with respect to prevention at source. Permission is requested to file replies with the Subcommittee for its information when received.

The table shows Staunton polluting a flow of 1.5 million gallons a day, 80 percent treatment, 30 pounds of phosphorus, 160 pounds of nitrogen. These are the plant nutrients.

Waynesboro, 2.3 million gallons a day, giving only 63 percent treatment, 435 pounds of phosphorus, 195 pounds of nitrogen.

This is the Federal Water Quality Administration data, and they note that Waynesboro will expand.

Front Royal, Virginia, 1.2 million gallons a day, 40 percent treatment—40 percent treatment, primary treatment only.

Frederick, Maryland, 4.88 million gallons a day, 55 percent treatment. Very low secondary, or perhaps merely primary treatment. This is a new plant.

Industrial pollution, the Du Pont Company at Waynesboro, Virginia, organic chemicals, 11 million gallons a day, BOD removal 75 percent. That is poor secondary treatment. Cooling water, 15,900 gallons a day.

Merck and Company at Elkton, Virginia, 7.7 million gallons a day, 66 percent. Poor treatment, poor secondary treatment.

Then they are dumping enormous quantities of phosphorus and nitrogen into the stream seasonally.

American Viscose at Front Royal, organic chemicals, 8.64 million gallons a day, 30 percent treatment, low primary treatment, with big quantities of phosphorus and nitrogen.

These are the people who are going to be subsidized to continue their pollution if the Staunton and Sixes Bridge dams are built.

I want to add one other thing at this point. That is, as to the destruction which will be occasioned by these reservoirs, unless Mr. Frederick of the National Grange is present and is preparing to put these figures in.

Mr. John Scott, the National Grange Master, was present this morning with the intention of testifying for the National Grange against these projects. He could not stay for this afternoon. They will undoubtedly be filing their statement.

I think you gentlemen should have these figures before you. A general description of the Verona Dam is contained in the Potomac River Basin Report, Army Engineers, 1963, Volume 2, page 39. The dam will be highly destructive to people, agriculture, and the rural countryside, as admitted in the following paragraphs from the report, pages 40 and 46. This is in Virginia:

"Impact on agriculture will be relatively severe as 64 farms, 19 part-time farms, and 22 rural residences would be affected to varying degrees by the project. Of these, 39 full and part-time farms and 8 residences totaling about 50 families would be relocated. Most of the area for the Staunton reservoir is adaptable to livestock agriculture. Most of the agricultural land is moderately high in productivity, especially the low-lying, gently sloping sides of the stream valleys. The farm practices in use in reservoir areas are generally good and above the county average. The agricultural productivity of the lands affected by the reservoir represents an appreciable part of the total productivity of the Augusta County area. Its losses could measurably lessen the agricultural income in the county and must be considered at least temporarily to have a moderately severe impact."

That is not my brief. That is the Army Engineers speaking in 1963.

A general description of the Sixes Bridge Dam is contained in the following paragraph, page 56: "The reservoir is located within one of the most productive agricultural areas in the Potomac Basin and is close to a steady market for dairy and livestock products. Farm management and improvement is at a high level and is reflected in the high agricultural income. Most of the farms are family operated on a full-time basis. Construction of a reservoir would have a rather severe impact on the agricultural income of the immediate area and a measurably significant impact, if only temporary, on the agricultural income of the valley."

That is the language of the Corps of Engineers.

The American people are going to demand the return of waste water to streams in completely pure condition. This committee should not countenance public subsidies to polluters by the big dam system.

The available public money needs to be spent instead on

preventing pollution at source; for example, in grants or loans to municipalities to build tertiary treatment plants to receive both municipal and industrial waste.

It is understandable that Sixes Bridge and Verona may have the support of the fishing tackle and motorboat lobbies. It is objectionable that the public should be asked to subsidize these industries.

The drawdowns of water levels at these projects will be severe. The all-year figures, not seasonal figures, must be used in both cases because year-round recreational and residential values are involved.

The vertical drawdowns at Sixes Bridge every fifth year, according to the 1963 report, will be more than 8 feet, and possibly 37 feet; at Verona, more than 25 feet, and possibly 60 feet.

This is represented as being a recreational project, a drawdown of possibly 60 feet.

The horizontal drawdown at Sixes Bridge will be very severe because the terrain is relatively flat. The map of this reservoir in the 1963 report makes this very clear in connection with the flood pool which is very large for a small vertical surcharge.

The Washington Suburban Sanitary Commission has stated that it will use Sixes Bridge heavily, almost certainly resulting in deeper vertical drawdowns than set forth in the 1963 report.

Supplied herewith is a photographic folder of the effect of drawdowns on water levels in comparable reservoirs in the Potomac region. This kind of defacement of the life environment is intolerable.

The people of the Potomac basin have been fighting these reservoirs for 15 years. The hearings held by the Army Engineers in 1962 turned into mass protest meetings; a hearing by the Board of Engineers in 1963 drew 1,200 protesters from all over the basin.

In the course of this resistance, an organized coalition developed for the defense of the basin, including practically all of the national and regional conservation organizations, all the farm organizations on the eastern seaboard, and two national labor organizations. A list of these organizations is contained in the publication supplied herewith entitled *Analysis of the Potomac River Basin Report*, 1963.

The coalition has organized permanently as the Citizens Permanent Conference on the Potomac (Citpercon).

There will be a witness here this afternoon.

A few national organizations have dropped out of the coalition, but their State and local affiliates work with the coalition, and new national organizations have been added.

I supply herewith and request that it be printed in the record a list of the organizations with which directors, alternates, and observers of Citpercon are connected as of today.

The Army-type reservoirs will have continuing opposition by conservationists and their allies. Authorization will be opposed in both Houses; if the projects are included in the Omnibus Bill, a veto will be recommended; if authorized, appropriations will be opposed; if appropriations are granted, expenditures will be opposed.

On the other hand, suitable watershed management structures for local water supply if needed will have the support of all the groups which oppose the Army-type reservoirs. The local water supply needs of the localities can be met much more quickly by rejecting Sixes Bridge and Verona and substituting local storage facilities.

In conclusion, two paragraphs from my extended statement.

These Army-type dams are objectionable in themselves; but, worse, if they are ever built, they will touch off the building of a chain of dams throughout the Potomac area, 18 all told. The Army dam-building program for the Potomac will cost upwards of $500 million, perhaps $1 billion. The proposed estuarial intake will solve the major water problems of the Potomac for $5 million now, perhaps $10 million eventually, or for 1 percent of the cost of the dams.

The people of the Potomac Basin should not find it necessary to fight year after year against a callous and destructive agency of the Executive Branch. The Committee of Congress charged with the responsibility for river basin management should undertake to defend the people beginning by rejecting the Sixes Bridge and Verona Dams. ■

The benefits imputed to the projects are typical of some fallacies utilized in the past for justification of proposed water projects. The present practice of accepting the evaluation made by the agencies that are sponsoring the projects is no more reasonable than accepting a business firm's evaluation of its own products or rating of its own bonds. —LLOYD TUPLING, Sierra Club

Each of us has a responsibility in the preservation of our vanishing and irreplaceable natural areas. The Potomac River Basin Plan basically disregards this responsibility, as conceived and modified, and is out of phase with the enacted National Environmental Policy Act of 1969 which most Congressmen endorsed.—KARL N. KEEVER, The Nature Conservancy

If money is to be spent on the Potomac, it should go for treating pollution at the source. Tertiary treatment for the area and initial storm sewer treatment for Washington, D.C., are necessary to improve the quality of the water. And with or without dams in the river, it must be improved. Flushing pollution is not the best way to cope with the problem. That just moves it downstream.—SAM LOVE, Environmental Action

Certainly, we know so much that is positive about using the estuary as a source of supplemental water, we should await the findings of the two studies currently underway before saying the estuary cannot be totally relied upon as the source of additional water for the area.—JONAS V. MORRIS, Citizens Permanent Conference on the Potomac River Basin, and the Citizens Committee on Natural Resources

TEXAS HIGHWAY DEPARTMENT

COWS on PADRE ISLAND

Ungrazed dunes inside a fenced experimental tract on Padre contrast with the near-desert left by overgrazing outside.

CLARENCE COTTAM

PADRE ISLAND is the longest and one of the loveliest beaches in America, With great effort and at the staggering cost of $16.6 million Padre Island National Seashore was acquired by the federal government to afford recreation and bring happiness and rest for all who could visit it. It now appears that the seashore is to be shared with free-ranging cattle that presently are engaged in destroying the vegetation on which Padre depends for its existence.

When the national seashore was authorized in 1962, an appropriation of $5 million was made for land acquisition. This appropriation seemed reasonably adequate to most people at the time. (In 1962 the portion of the island in Kenedy County, the major part of the 119,000-acre national seashore, was assessed at 50¢ per acre for taxes.) However, in the fall of 1969 the federal government was required to pay $16.6 million for this property. Some units of this purchase containing nothing but mud flats cost more than $1000 an acre.

Much of Padre Island National Seashore had for many years been used as a cattle ranch. In keeping with the common custom of federal services gradually to phase out existing uses of the newly acquired land, grazing rights on the island were leased back to the original owners. The lease will expire on December 31, 1970. An item in the grazing permit stated clearly that the permit was not renewable past December 31, 1970. Thus it was surprising to learn that the grazing lessees had through some mysterious means obtained assurance of a renewal of their lease to extend for two more years.

The Aransas National Wildlife Refuge north of Corpus Christi, which permits cattle grazing as a wildlife management practice, is comparable in grazing value to the Padre Island National Seashore area. Its grazing fee is $1.75 per animal month (AMU). Grazing on the National Seashore has been at the rate of 15¢ per animal month! The lease for cattle grazing on Padre permits up to 1200 head. Assuming 1200 head at 15¢ per AMU, the fee for the government is $2,160 per year. If $1.75 per AMU had been charged, the government would take in $23,040 per year. The economic appeal of this minuscule fee of 15¢ per AMU is easy to understand, especially considering that no fencing and little or no management are demanded (although they are greatly needed). It would indeed be profitable for the two lessees to continue operations for as long as they could obtain a lease.

It is to be remembered that the purchase of this land was at an exorbitant price; there is no reason why the former owners now merit a grazing lease at less than 1/10 the going rate for grazing on public land. But there are other commanding reasons why more grazing would seriously harm the public interest. Padre Island is nature's bulwark protecting the mainland from hurricanes and heavy seas on the open Gulf. The barrier islands with their high, vegetation-covered dunes have always given the mainland its best protection. To establish a dune and cause it to grow, the sand must be held in place. This is best done by developing a good plant cover. Sea oats, cord grass, and soilbind or beach morning-glory are especially important plants in such an area.

Dune buggies and motorcycles in the area north of the seashore and overgrazing within the seashore, along with some burning before the area was acquired, have destroyed much of the dune vegetation and prevented the dunes from growing and serving as a better barrier. In places north of the seashore where vegetative covering was removed, dunes have been largely eliminated by wind and storms. Within the seashore sparsely covered dunes were flattened by hurricane Beulah. Only well-vegetated dune areas held up under the pounding of this wild hurricane and the recent hurricane Celia. Where cattle are permitted to graze on a dune, re-seeding and fertilizing cannot be successful. Fertilizer-stimulated vegetation attracts cattle and other herbivores and failure is nearly certain. Cattle trails and grazing on the dunes are highly inimical to dune stabilization and growth. Experiments have shown that where cattle are allowed, the dunes are overgrazed; where they are excluded by fences vegetation is dramatically improved (see photograph). Where the protective covering of Padre's dunes has been removed by overgrazing, these dunes are moving westward. The blowing sand fills swales and covers vegetation behind the original dune area.

Insect pests often drive the cattle across the dunes to the beach where they bed down for the night. Travel on a beach littered with cattle is hazardous and accidents have already occurred. After a night of cattle bedding down the lovely beach assumes the smelly, unsightly aspect of a feed yard. A number of cattle have died on the beach and have been left there to rot. Some overnight campers have been considerably frightened and irritated by roaming cows. (These free-ranging cattle at times become belligerent.) The number of complaints are increasing. The people generally do not want the cattle on the island and continually ask for their removal.

More than 407,000 visitors were recorded on Padre Island National Seashore during the first six months of 1970. Upwards of a million people may use this recreation area this year. Surely their interest should supersede the grazing interest.

NPCA Board Chairman Clarence Cottam is director of the Welder Wildlife Foundation in Sinton, Texas.

news & commentary

FEDERAL ENVIRONMENTAL PROGRAMS CONSOLIDATED

President Nixon recently announced two major executive branch reorganization plans, designed to eliminate the confusing overlapping spheres of authority shared by agencies involved in environmental problems. The plans will establish by executive order an Environmental Protection Agency (EPA) as a new independent agency and a National Oceanic and Atmospheric Administration (NOAA) within the Department of Commerce. Unless objections are raised by the House or Senate, the plans will become effective by early September.

EPA will have an estimated FY 1971 budget of $1.4 billion and 5,650 personnel. It will encompass the following: (1) the Federal Water Quality Administration (FWQA) from the Department of the Interior; (2) the National Air Pollution Control Administration (NAPCA) from the Department of Health, Education, and Welfare; (3) parts of the Environmental Control Administration (Bureaus of Solid Waste Management and Water Hygiene and a portion of the Bureau of Radiological Health) from HEW; (4) the pesticides research and standard-setting program of the Food and Drug Administration, from HEW; (5) the pesticides registration authority of the Agricultural Research Service, from the Department of Agriculture; (6) certain pesticide research authorities of the Department of the Interior; (7) authority to perform general ecological research, from the Council on Environmental Quality (CEQ); (8) the environmental radiation protection standard-setting function of the Atomic Energy Commission; and (9) the functions of the Federal Radiation Council (FRC).

NOAA will coordinate programs previously scattered among four departments and one agency. Unlike EPA, which will be an independent agency, NOAA will fall under the jurisdiction of the Department of Commerce. It will have an estimated FY 1971 budget of $270 million and over 12,000 personnel. It will include the following: (1) the Environmental Science Services Administration (ESSA), already in the Department of Commerce; (2) most of the Bureau of Commercial Fisheries, from the Department of the Interior; (3) the Marine Minerals Technology Program of the Bureau of Mines, from the Department of the Interior; (4) the marine sports fishing program of the Bureau of Sports Fisheries and Wildlife, from Interior; (5) the Office of Sea Grant Programs of the National Science Foundation; (6) elements of the United States Lake Survey of the Department of the Army; (7) the National Oceanographic Data and Instrumentation Centers from the Department of the Navy; and (8) the National Data Buoy Program of the Department of Transportation.

The reorganization plans 3 and 4 were recommended by the President's Advisory Council on Executive Organization, chaired by Roy Ash. The President intends that EPA and his Council on Environmental Quality, under Russell Train, will complement, not compete, with one another. Basically, the Council will focus on broad environmental policies, whereas EPA will determine and monitor pollution control standards.

Many conservation groups are concerned, however, with the placement of NOAA within the Department of Commerce, which is concerned primarily with the promotion of industry and commerce. Many environmentalists feel that scientists would be allowed greater objectivity in their research under the jurisdiction of an independent agency such as EPA.

Congressman John Blatnik (D-Minn.), chairman of the House Government Operations Subcommittee on Executive and Legislative Reorganization, has been critical of the Ash Commission's proposals for including only 9 of more than 50 environmental programs, scattered among other agencies, in the proposed EPA. As an example, he cited the $200 million sewer grant program to remain in the Department of Housing and Urban Development, while FWQA will be in the new EPA. Blatnik, in stating his support for EPA, questioned the potpourri of environmental programs that remain in other agencies. Ash admitted that great resistance was exercised by several Departments fearful of losing prestigious, big-money programs —bureaucratic plums. The Federal Aviation Administration, for instance, would continue its noise and air pollution "responsibilities."

NPCA has endorsed for some time the need for an independent agency, like EPA, to coordinate environmental research and administration of pollution abatement programs. EPA must have greater independence in research, standard-setting, and monitoring of environmental programs. To include some but not all major pollution abatement programs is to create greater splintering of jurisdiction, which is what EPA is intended to eliminate. These recommendations present a clear

danger that many programs will fall between the cracks of scattered jurisdictions. EPA must do more than reshuffle old programs. It must coordinate a broader spectrum of responsibility in environmental problems.

CHICKEN

We applaud the speedy, firm prosecution of a callous despoiler of our precious heritage, the air we breathe. The long arm of federal justice has weighed a Maryland chicken-rendering plant and found it sorely wanting. With the failure of its last court appeal, the Bishop Processing Co., of Bishop, Md., must stop rendering chickens, thereby giving off nauseating interstate odors. (Odors that stay within state boundaries seem to be beyond the reach of even the federal arm.)

It is hard to imagine how the Bishop Processing Co. could summon the temerity so blatantly to inflict its miasmas on the public. Though it is true that the emissions did not kill people or wildlife, nor contribute to upsetting the Earth's carbon cycle and atmospheric heat balance, nor coat the surrounding country with grime, they were *terribly* smelly. Action was obviously imperative.

Into the fray, therefore, went the doughty National Air Pollution Control Administration. NAPCA's lawsuit was historic. Filed in 1968, it was the first suit brought by the government under the Clean Air Act of 1963; furthermore it is the first case of an air polluter's being forced to halt the polluting activity. Employing a full 35 of Bishop's citizens, most of whom are members of the town's leading families, the Bishop Processing Co. definitely was a force to be reckoned with. The bitter struggle swayed back and forth. However, the 5 years that NAPCA had been able to devote to organization and preliminary training forays showed through in its preparedness for the conflict. In late May the Supreme Court refused to hear the chicken plant's appeal, and NAPCA had won its spurs!

At this rate, we may be able to deal with *all* the nation's chicken pollution by the turn of the century. Surely a federal agency charged with the awesome responsibility of cleaning up the nation's air can do better than one tiny success every seven years!

KNOWING-THE-ENEMY DEPARTMENT

And the enemy is us. Mark Cross, a New York fashion leader, has most wisely and commendably halted the sale of articles made from crocodile skins. "Crocodile" among the less scrupulous often has meant illegal alligator. In any event crocodilians the world around are in serious

trouble; with human numbers as they are, few wild animals can support a fad for one or another of their body parts. So Mark Cross decided to forego $500,000 a year in crocodile receipts, and it held a clearance sale for its croc inventory. But the remarks of two ladies shopping at the sale, reported by the *New York Times*, show that we have a long way to go:

"As long as they're here, I don't feel guilty," said Mrs. E. H. Tuttle of Rochester, N.Y. "After all, I didn't go out and shoot the crocodile myself."

"Ugh!" said an unidentified shopper. "I don't like crocodiles. I'm afraid of those animals. Now if it was a very tame animal, I'd feel badly."

NPCA AT WORK

In a letter to National Park Service Director George B. Hartzog, Jr., NPCA President Smith expressed the Association's satisfaction with the establishment by the Park Service of a master planning team for Carlsbad Caverns National Park and Guadalupe National Park.

"The issues which this team must resolve with respect to primitive wildernesses, and roadless area protection are portentous for the whole National Park System," the letter says.

"The National Parks and Conservation Association favors the maximum primitive, wilderness, and roadless area protec-

tion [both surface and underground] for both of these parks. While we shall be making our own proposals in the situation, we give general support to the proposals of the National Speleological Society."

The letter notes that NPCA does not support one of the NSS proposals—that for an aerial tramway in the parks. "The NPCA will be firmly opposed to the introduction of railways, monorails, and aerial tramways into the National Park System, and our position on this question will apply to Carlsbad and Guadalupe."

• NPCA President Smith has written President Nixon to urge him to "insist" that Interior Secretary Walter Hickel remain at his post. In a second letter sent to Mr. Hickel at the same time, Mr. Smith commends him for his recent action in halting Interior's use of 16 persistent pesticides, takes note of rumors that he might leave Interior, and urges him to remain.

Mr. Hickel came into his job over the opposition of many conservationists. In his time in office, however, he has done little with which conservationists can find fault and much that is worthy of high praise.

"Allow us to commend you on having the Honorable Walter J. Hickel in your Cabinet as Secretary of the Interior," Mr. Smith said in his letter to the President.

"In the short period of his tenure, Mr. Hickel has achieved real stature as a conservationist and an environmentalist.

"His work in supporting your decision to stop the proposed Jetport in Florida is but one of his outstanding accomplishments. His recent policy banning the use of pesticides on lands managed by his Department is another example of sound judgment.

"We hope that you will insist upon his remaining as Secretary of the Interior."

In the letter to Mr. Hickel, Mr. Smith said: "Rumors that you might leave the Cabinet are disquieting, and we hope that you will remain."

NOTE

Humpback whales, reports Dr. Roger Payne of the New York Zoological Society, sing. The cetacean arias are elaborately patterned and are fair music, if you like modern electronic compositions. The scientists make the rather drab assumption that the sounds serve merely to identify individuals and keep contact between members of a pod as they cruise the murk. They may indeed be right. After all, what have whales got to be happy about?

CONGRESSIONAL REPORT

At the request of Senator Edmund Muskie (D-Maine), chairman of the Senate Public Works Subcommittee on Air and Water Pollution, the National League of Cities and the United States Conference of Mayors has prepared a report estimating the nation's water pollution control needs for the next 6 years. The report indicates a need for $33–$37 billion, based on a 5-percent inflation factor. The survey compares with an Administration recommendation to authorize a 4-year $4 billion program as the federal share of a $10 billion construction program. Muskie's bill, S. 3687, pending before the Subcommittee, calls for authorization of a federal share of $2.5 billion each year for five years as part of a $25 billion construction program for municipal facilities. The survey encompassed 1,008 cities, counties, and special districts responsible for water pollution, serving 89.4 million people.

• The Senate recently passed S. 2108, introduced by Senator Joseph Tydings (D-Md.), to provide for population and family planning assistance. The bill, now before the House Interstate and Foreign Commerce Subcommittee on Health, would establish an Office of Population Affairs in the Department of Health, Education, and Welfare under the Assistant Secretary for Health and Scientific Affairs, and the Deputy Assistant Secretary for Pollution Affairs. HEW would make project grants for family planning services, administer population and family planning research grants, serve as a clearinghouse for domestic and international programs, and provide and support training of manpower for family planning programs.

• Legislation now under consideration would establish several new national parks, including Voyageurs National Park (HR 10482); Big Thicket National Park (S. 4); and Gulf Islands National Seashore (HR 10874).

Magnificent bull elk rests in the snow at Yellowstone National Park. Winter for elk is not as comfortable as it looks here. White men arriving in the elk's western range greatly reduced the numbers of large predators, the natural regulators of elk populations. Later, in the park, these predators were deliberately hunted to near extinction to protect the "good" animals from the "bad." Consequently, elk suffered a population explosion and overbrowsed their range; and when winter came, they starved. Park rangers were forced to go out and kill some of the "good" animals too. A better way is discussed in the article beginning on page 20.

You can help your Association in several ways: by helping secure new members, by contributing to the Association over and above regular dues, or by remembering the Association in your will. Such contributions and bequests are deductible for federal tax purposes.

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