RESEARCH IN THE NATIONAL PARKS

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Being equipped by nature with the most complete and magnificent laboratories imaginable, it was inevitable that scientific research should become an important and popular activity of the National Park Service. Nevertheless, it is one of the newest developments in national park work, which is primarily of a human welfare nature.

National parks began back in 1872, with the establishment of the Yellowstone National Park, the first reservation of its kind to be established anywhere. At the time of its establishment, of course, no thought was given to the scientific aspects of the geysers and other natural phenomena, yet it was because of their presence that the explorers of the Washburn-Langford-Doane party conceived the idea of a national park and gained the support to put this idea through Congress.

The organic act establishing the park provides that the area be "set apart as a public park or pleasuring ground for the benefit and enjoyment of the people," and further that regulations be enacted by the Secretary of the Interior "for the preservation from injury or spoilation of all timber, mineral deposits, natural curiosities or wonders within the park, and their retention in their natural condition."

On this foundation has grown up the great national park and monument system that to-day contains 22 national parks and 40 national monuments under the jurisdiction of the National Park Service of the Department of the Interior.

As park after park succeeded the Yellowstone, each was founded upon principles of human welfare, upon the idea of public ownership in and enjoyment of the parks. Yet the underlying motive in establishing each park for the benefit of the people was to preserve something precious from a special standpoint which, when analyzed, proved to be based upon some natural phenomenon or other object of interest to scientists or historians.

Thus the Yosemite, paradise of beauty, also is a geologist's paradise. Some of the Big Trees, to preserve which Sequoia and General Grant National Parks were set aside, were young in the days of the Pharaohs. Mount Rainier, the next to be established as a national park, contains the greatest single peak glacier system in the United States--in addition to exquisite wild flower fields and other features of impressive beauty. So throughout the system.

When the nineteenth century closed, these five national parks constituted the national park system.

The first decade of the twentieth century brought more of Nature's interesting laboratories into the system. There came Crater Lake, a lake of exquisite blue in the crater of a volcano that collapsed or blew its head to bits sometime in the misty past; Platt, with hot springs possessing healing properties; Wind Cave, with unusual natural decorations and a strangely acting wind which blew in or out, apparently without rhyme or reason; Mesa Verde, ancient home of Basket-maker, cliff dweller, and Pueblo Indians, with a mysterious past that stirs the imagination of the ethnologist and archeologist, as well as that of the average layman; and Glacier National Park, that upturned section of the Rocky Mountains where ancient sedimentary rocks rest upon much younger strata, carved and scarified by great ice sheets and still holding in its mountain fastness the remains of sixty small glaciers.

The same year that Mesa Verde National Park was created Congress broadened the system by passing what is known as the "Antiquities Act." This legislation provided for the establishment, by Presidential proclamation, of national monuments of areas containing objects of historic, prehistoric or scientific interest.

As the national value of these parks and monuments became more apparent, the system grew steadily. The creation of Rocky Mountain National Park, including a typical area of the Rocky Mountains, was followed by two volcanic areas, showing a spectacular form of plastic surgery on the face of Old Mother Nature. One of these, Lassen Volcanic, contains our most recently active volcano on the mainland, and the Hawaii National Park, in addition to its vast dormant crater large enough to hold a modern city, also has two living volcanoes that periodically provide breathtaking displays of great beauty and sublimity.

Another far-away park, Mount McKinley in Alaska, contains the highest mountain on North America, snow-shrouded throughout the year. It affords remarkable opportunities for study of glaciers.

Three superb canyon parks in the Southwest, the Grand Canyon, Zion, and Bryce Canyon, show the wearing, tearing effects of water. Great granite mountains, glacier-laden, are the contribution of the Grand Teton National Park to the system. The huge chambers of Carlsbad Caverns National Park also attest to the dissolving, sculpturing powers of water, and the Hot Springs National Park also owes its place in the system to water--but in this case to medicinal waters, believed, ever since the days of the early Indians, to have definite healing powers.

Formerly a western institution, of recent years the National Park System has moved to the East. The Acadia National Park on the Maine Coast has ancient granite mountains that were old when the West was young; and the Great Smoky Mountains National Park, in addition to its hoary peaks, the highest mountain massing in the East, is famous for the variety and luxuriance of it flora.

The national monuments under the National Park System, established under the authority of the Antiquities Act, cover a wide range of objects. There are fossil plants, petrified trees, and the bones of the long-extinct dinosaur; cliff-dweller ruins and surface pueblos of long-vanished peoples; places connected with the lives of the first white men to settle in America and of early Colonial life; Revolutionary War Shrines; ruined churches erected by the padres who accompanied the gaily adventuring Spanish cavaliers to the New World; a fort built by the serious, patient Mormons--a wealth of areas of such scientific and human interest that their preservation is important to the advancement of our national culture.

Naturally, when the system was young, its first needs, like those of the young human, were protection and proper direction--or administration in the case of the parks. Protective or police organizations were first needed, then means to house the protective force and to care for the physical needs of the visiting public, in reality the parks' nonresident owners.

Once these elementary matters were well taken care of, the National Park Service turned to the aesthetic, or "higher educational" side of the parks.

Interpretation of their natural features followed. Why geysers "gyze" is perhaps the question asked most in the Yellowstone. In Yosemite, upon seeing Half Dome, visitors want to know what became of the other half--and with the opportunity thus afforded for tactfully imparting a little scientific information the educational work goes on apace, apparently casually, but always based upon careful research.

The guided field trips and popularly worded lectures of to-day, as well as the museum service, grew out of this demand of the visitors to know the "why" of the interesting phenomena--although most of them do not call it that--encountered along the way.

Museum work, in the parks particularly, is quite specialized. The museums are so arrayed as to give the observer a glimpse of the interesting things to be found out in the parks themselves --to interest him to see for himself what the museum suggests. In other words, the museum exhibits are only the indices to the real museum, which is the park.

In the historic and prehistoric members of the system, of course, the museums serve a different purpose. There they actually display relics of human lives--in the former, of our pioneer forbears; in the latter, of a vanished, almost unknown race. A prehistoric burial place yields a skeleton and a few trinkets; a plastered-up cache high in a cliff, when opened is found to contain pottery or basketry; here there is a grinding stone and there a weapon of the chase. These all are studied and gradually some idea of the lives of the prehistoric peoples takes shape. This is one of the most fascinating phases of the research work of the National Park Service.

Research is necessary not only to the preparation of interesting material to serve as a basis of the naturalist and historical service, but it also is fundamental to the actual protection of the natural features of the parks, as enjoined in the acts establishing the parks and in the act of August 25, 1916, creating the National Park Service. The latter act contains the following clause:

The service thus established shall promote and regulate the use of the Federal areas known as national parks, monuments, and reservations hereinafter specified by such means and measures as conform to the fundamental purpose of the said parks, monuments, and reservations, which purpose is to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations.

There are a great variety of natural objects in the national parks. There are the wild animals, objects of intense interest to visitors, who can not see elsewhere such a wide variety of species and numbers as in these areas, since only in the national parks and national monuments are they given complete protection. The plant life, both tree and wild flower, also makes a tremendous appeal to the average visitor, for one can imagine nothing lovelier than the fields of wild flowers that carpet most of the parks during the spring and early summer. Then there are the natural scenic, scientific, and historic features, the main object of the parks' establishment. All of these natural objects need protection, and in many cases research is necessary to determine the cause of some suddenly-appearing adverse condition.

Formerly protection of the wild life was primarily a protective function, involving long ski patrols in the winter to afford protection against poachers, both hunters and trappers, and the occasional supplying of food in emergencies. Also in the Yellowstone there has been for a number of years the winter care of the buffalo herd, numbering over a thousand.

Following fundamental protection came the restocking of certain depleted natural ranges. Before going farther with this particular subject, it is important to emphasize that the policy of the National Park Service is unalterably against the introduction of exotic species of animals or plants in the national parks or national monuments, except for the occasional stocking of an otherwise barren body of water with some species of game fish for the enjoyment of lovers of the Waltonian sport. Wherever animals are introduced, it is to restock a natural range which has become depleted because of some unnatural condition or series of conditions.

Prominent among the restocking experiments are those of the bison--more generally called buffalo--in the Yellowstone, and the antelope at the Grand Canyon. Yellowstone National Park, one of the great areas ranged by buffalo in their wild state, suffered

from a depletion in the herds of these animals almost to the point of extinction. A few new animals, specially selected from Texas and Montana herds, were introduced into the park, intensive management undertaken, and to-day the bison herd numbers over a thousand and could be much larger were the range sufficient to support a greater number.

In the Grand Canyon an interesting restocking effort with antelope is just passing out of the experimental stage. At one time these plains antelope were plentiful at the Canyon but changing conditions--possibly caused largely by the wide spreads of the descendants of hardy burros left in the Canyon by prospectors lured to other fields--brought about their disappearance from their former range. In 1924, twelve antelope kids, six bucks and six does were taken to the Canyon, fed and kept under close observation for some time, then released on the Tonto Platform, where it was hoped they would thrive and multiply. For several years prospects looked bad for the survival of these antelope, as they did not easily adapt themselves to new conditions and, possibly because of their careful raising by hand, easily became a prey to predatory animals. After five years of fighting against odds, by the end of 1929 the herd included only nine animals, four of them kids. During the past year conditions have materially improved, however, and there are twenty animals in the herd. Of ten kids born last spring, eight have survived. The outlook now is favorable for the building up of a large herd which it is hoped can be drawn upon a few years hence for the stocking of other natural antelope ranges in the national park and monument system.

Another interesting experiment at the Grand Canyon has been the transportation of deer from the North Rim across to the South Rim. At first these animals were transported across the Canyon by truck over a long detour covering a distance of 240 miles and requiring from twenty-four to thirty hours to make the trip. Later, for several years, young fawns were transported by a combination airplane and truck trip which was made in three hours. Introduction of these animals to the South Rim, and enlargement of the semi-tame herd over a period of five or six years, has been the means of presenting the public with a highly interesting feature of wild life. In addition, this herd has attracted other deer from regions adjacent to the park, thus increasing the herd to an estimated total of 1,200 head.

Of recent years it has become evident that ranger protection and restocking are not sufficient for the complete preservation of the wild animals. While in the parks it is true that the animals live as nearly as possible under primitive conditions, civilization comes close to the park boundaries, modifying the wilderness conditions; the animals wander back and forth across the boundaries, often coming in contact with domesticated animals, and thus meet vastly different conditions to those experienced by their ancestors back in the middle nineteenth century. Because of this, many situations have arisen necessitating scientific study.

Again, to mention the Yellowstone buffalo, an epidemic broke out several years ago which threatened the decimation of the herd. Experts of the Bureau of Animal Industry were called upon and studies made of the disease. It was diagnosed as hemorrhagic septicemia, and the buffalo were vaccinated against it--not an easy task, as any one who has ever seen these enormous animals in stampede will realize. To-day the herd is thriving--so much so that animals have to be given away each year to keep the number of bison in the park down to the number the range can support satisfactorily.

So one study has followed another, to relieve emergency conditions, and in all such cases the National Park Service has received the unstinted cooperation of the Biological Survey and the Bureau of Animal Industry.

It has become increasingly evident, however, that a management plan of some sort must be inaugurated by the National Park Service, in order to restore and keep the park wild life in its primitive state despite the effects of human influence. This necessitates, first of all, complete investigation.

Realizing the need of this, an outline of wild life studies was prepared and work along this line undertaken in 1929 with funds made available by George M. Wright, who had become interested in the problem while serving with the educational department in Yosemite National Park. Joseph S. Dixon, economic mammalogist and scientist connected with the Museum of Vertebrate Zoology, was persuaded to assist in this work and he, Mr. Wright, and Ben H. Thompson have carried on the studies with increasing interest and vigor. Since 1931 the National Park Service fortunately has been able to assist in financing this work, and during the coming fiscal year will take over practically all the expense.

In their first printed report on the result of their studies, the members of the Wild Life Studies Group report as follows:

...throughout the preliminary survey, fixity to the main purpose of obtaining a perspective of the problem in its entirety has been the paramount consideration. Consequently, the search focused on the general trends in the status of animal life, with particular regard to the motivating factors. If a finger can be placed on the mainsprings of disorder, there is hope of discovering solutions that will be adequate in result. Meeting existing difficulties with superficial cures might be temporarily expedient and, in cases of emergency, necessary, but if continued would build up a costly patchwork that must eventually give out. It would be analagous to placing a catch-basin under a gradually growing leak in a trough and then trying to keep the trough replenished by pouring the water back in. The task mounts constantly and failure is the inevitable outcome. The only hope rests in restoration of the original vessel to wholeness. And so it is with the wild life of the parks. Unless the sources of

disruption can be traced and eradicated, the wild life will ebb away to the level occupied by the fauna of the country at large. Admitting the magnitude of the task, it still seems worth the undertaking, for failure here means failure to maintain a characteristic of the national parks that must continue to exist if they are to preserve their distinguishing attribute. Such failure would be a blow injuring the very heart of the national park system.

One of the most interesting studies undertaken by this group is in connection with the trumpeter swan, one of the birds of present-day America that appears to be fast approaching the end of its journey to join the dodo in the limbo of forgotten things. It has been found that in the Yellowstone region these birds are making a last stand, and the Wild Life Division, with the cooperation of Yellowstone National Park officials, is bending every effort toward affording the necessary conditions in the park to permit the rehabilitation, if one may call it that, of this magnificent species of bird. Reports now indicate that the possibility is good for giving this species a new lease on life, just as was done in the case of the buffalo.

Typical of wild-life research of a cooperative nature has been the study of the Yellowstone elk by William Rush, an investigation initiated by the writer when superintendent of Yellowstone National Park, and later supported jointly by the Forest Service, the Biological Survey, the Montana Fish and Game Commission, and the National Park Service.

Plant life problems, while perhaps not as pressing as those pertaining to the wild animals, are equally important. Forest fires present a constant potential menace to the trees, but improvement methods of fire prevention and combat are handling this problem excellently.

Other enemies of park forests are insect infestations and tree diseases. Just as in the case of the wild animals, changing conditions outside park boundaries affect the trees inside. Insect devastations generally start outside the parks, from there encroaching on the trees inside.

Recent surveys show several serious forest situations prevailing in the national parks. One of the worst occurs in the Yellowstone, where the mountain pine beetle threatens the destruction of the lodgepole pine that constitutes about eighty per cent. of the park forest. This epidemic has been carefully studied by experts of the Bureau of Entomology, as well as by Park Service men and officials of the adjoining national forests. It appears that there would be perhaps a fifty-fifty chance of saving these lodgepole pines if a five-year program of control could be undertaken immediately, at a probable cost of from $3,000,000 to $5,000,000.

This matter was discussed with the Appropriations Committee of the House of Representatives over a year ago. At that time it was decided that such an enormous expenditure was not justified,

particularly as there is no definite assurance that even with such appropriations could the ravages of the infestation be stopped.

Another menace to park forests exists in the white-pine blister rust, which first appeared in the East, moved across Canada, and is now coming down into western United States through Washington, Oregon and Idaho. Blister rust control measures have been carried on successfully for several years in Acadia National Park in Maine, and it is believed that by the end of this year the white pine of Acadia will be out of danger through the eradication of host plants. In Mount Rainier Park, in the State of Washington, control measures were inaugurated last year to save a few selected stands of white pine. This work will have to be followed up intensively for a year or two, however, if any worthwhile areas of white pine are to survive in that park.

Blister rust is a fungus, its alternate host plants being the currant and gooseberry. It has been discovered that the fungus can move only a small distance from host to pine, but that after reaching the pine it can move a long distance to other host plants. So the method of control is to eliminate the host plants within the necessary radius. Present indications are that in the West control measures can be taken effectively.

If this is not done, experts of the Bureau of Plant Industry state that the resultant damage to the five-leafed pine forests of the West will be a national calamity.

A tree problem in Sequoia and Yosemite National Parks was involved in the use of the Big Tree areas by the visiting public. It was found that the constant tramping of feet around several of the oldest and largest of these trees was wearing away and packing down the ground cover to an extent that was threatening the very life of the trees. Careful studies of existing conditions led to the protection of the tree-root areas from encroachment, and the soil, which had been heavily compacted, was brought back to normal by covering the ground with forest litter and the planting of native shrubs. Dr. E. P. Meinecke, general adviser to the National Park Service on matters of forest pathology, reported recently that the oldest of the Big Trees in Yosemite, the Grizzly Giant "is in decidedly better condition now than it was six years ago. The little branchlets no longer droop as they did a few years ago, but have come back a normal bright green." This means that this old tree, estimated to be about four thousand years old, has been brought back to health, and may watch the generations come and go for a few more thousand years.

So it goes on, through a long list. As one floral or faunal problem is solved, another is presented. And the inorganic features also have their problems, often requiring a great deal of research before a solution is reached. Volcanoes are studied, investigations are made of the geyser fields, where activity in

one place ceases, only to break out in another. The effects of glaciers and of running water on granite and other rocks are given attention by one group of scientists, while another is interested in the formation of great colorful canyons by the effects of wind and rain.

An especially interesting discovery at the Grand Canyon, made possible through the cooperation of the Carnegie Institution of Washington and the National Academy of Sciences, was of fossil plants and the traces of many extinct animals. Both plants and animals dated back to the age of coal plants. In the Algonkian rocks, the strata which represents one of the earliest periods from which remains of life have been obtained, were found fossils of algae, or very low types of plant life.

More than twenty distinct forms of hitherto unknown animals were discovered, not from petrifications or fossilized bones, but merely from footprints made by these creatures in soft, probably moist sands. Some quick covering of the sands hardened and preserved the footprints, to the end that ages later some of them might be unearthed as workmen split the rock in building a new trail, to become part of the educational program at the Grand Canyon National Park.

Increasingly experts of the National Park Service are making studies along various specialized lines, while at the same time the Service welcomes the many investigations inaugurated and carried through by organizations and individual scientists.

While perhaps not strictly in line with the general trend of this article, which has referred to research primarily from the standpoint of education, some mention should be made of the valuable research being done along landscape and sanitary lines, the former by landscape architects and architects of the National Park Service, and the latter by sanitary engineers of the Public Health Service in cooperation with the Park Service.

Again from the educational standpoint--the incalculable value of the national parks and national monuments as research laboratories has been recognized by a number of schools, including important universities, and many field classes are held therein, particularly in ecology, geology and archeology.

There is no doubt but that this use of the parks as field schools will increase in the future, side by side with the growth in tourist travel. Thus the parks have an important destiny in the future of our national life, from the standpoints of educational, spiritual and recreational values.

Horace M. Albright was Director of the US National Park Service when he authored this report in 1933.