REPORT

OF THE

U. S. NATIONAL PARK SERVICE

DEPARTMENT OF THE INTERIOR

On

Wildlife Conservation in Areas Administered by the National Park Service 1930 to 1939

A report to the Special Committee of the United States Senate on the Conservation of Wildlife Resources

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REPORT OF THE UNITED STATES NATIONAL PARK SERVICE

INTRODUCTION

The National Park Service occupies a unique position in the field of conservation, since it is the only Federal agency legally obligated to provide for public enjoyment by giving absolute protection to all forms of life in the areas under its administration. Since establishment of this Service as a Bureau of the Department of the Interior by the organic act of August 25, 1916, and definition therein of the strict protection policies applicable to national parks, there has been built up a system of wildlife sanctuaries unequalled in the world today. The National Park Service now administers 192 areas scattered over 41 States,[1] Alaska and the Hawaiian Islands, and having a total area of 20,863,677 acres. To these areas last year came 15,454,367 visitors from all parts of the United States and practically all foreign countries, enjoying the inspirational scenery of the parks and acquiring a most favorable impression of conservation of natural resources. Thus our national parks are not only of immeasurable value in building up a national enthusiasm for wildlife conservation, but they are recognized as international "yardsticks" or models, used as patterns in the establishment of similar sanctuaries in many foreign lands. The attainment and maintenance of this national and international eminence in wildlife conservation has been and is being realized through adherence to certain policies and practices developed over a period of many years, and culminating in a stage of considerable effectiveness during the past decade. There is here presented a brief outline of National Park Service wildlife activities during the decade January 1, 1930 to December 31, 1939, with an analysis of progress and trends, followed by a statement of conditions at the close of the decade and a summary of future plans and needs.

The basic principle of complete protection to all life, as practiced in the national park areas, is stated in the National Park Service Act of August 25, 1916:

> 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 purposes of said parks, monuments, and reservations, which purpose is to conserve the scenery and the natural and historic objects and the wildlife 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.

Comparable statements appear in the organic acts establishing many of the national parks. The connotation of this principle was subsequently clarified by the several Secretaries of the Interior: Secretary Lane on May 15, 1918; Secretary Work on March 11, 1925; Secretary Wilbur on March 3, 1933; and Secretary Ickes on August 26, 1938. The first two expressed identical thoughts; Lane most succinctly—

[1] All but Delaware, Connecticut, Iowa, Kansas, Texas, Vermont, and Wisconsin.

"the national parks must be maintained in absolutely unimpaired form for the use of future generations as well as those of our own time * * * the national interest must dictate all decisions affecting public or private enterprise in the parks." Secretary Wilbur amplified as follows: "* * * in wildlife conservation, the preservation of the primitive rather than the development of any artificial ideal should be sought." Secretary Ickes condensed these thoughts into one short, pithy sentence: "The greatest function of national parks is to preserve what civilization, lacking them, would destroy," and went on to state that "A part of this function of conservation through the park system, and this is increasingly important, is the preservation of wildlife."

This principle has been given increasingly wide and practical application by the National Park Service during the past 10 years although the wildlife work even yet has not reached maximum effectiveness. In 1930, with 10,339,506 acres under its administration, no employees were assigned solely to the protection of animals and there were but 15 wildlife rangers and naturalists, none of whom (excepting the Yellowstone buffalo keeper) were able to spend over a quarter of their time on actual wildlife work, due to the urgency of other duties. Also one administrative officer in Washington devoted part of his time to wildlife matters. During the ensuing decade the total areas of parks and other reservations were doubled and there was set up a wildlife division that in 1939 consisted of 9 men; 4 paid from regular funds and 5 from Civilian Conservation Corps. Resident work in the parks continued to be done by rangers and naturalists on a part-time basis as before. Although the number of such men was increased to 54, a large proportion of them were unable to spend more than a few weeks out of each year directly on animal protection. This personnel increase may appear equable when compared to the 10-year increase in areas, but its inadequacy becomes immediately evident when compared with the increase in park travel. In 1930. national-park areas were visited by 3,246,656 persons; in 1939 the visitors had increased to nearly five times that number (15,454,367). It should be self-evident that increases in personnel during the past decade have been far from sufficient to fully benefit by the much greater increases in the potential value of the national parks as America's greatest educational exhibits of conservation. What has been possible of accomplishment toward this end is briefly summarized in the following paragraphs.

HISTORICAL OUTLINE

For some time previous to the decade 1930–40 it had become increasingly evident that the animal life of the parks was in need of more attention than had been previously given to it. Recognizing this need, and realizing the difficulties of quickly obtaining Federal appropriations, a young naturalist, George M. Wright, on May 1, 1929, secured the Director's permission to make a wildlife survey of the parks financed entirely with his personal funds. On July 1, 1929, field work was started under joint direction with Mr. Joseph Dixon and with the later assistance (May 24, 1930) of Mr. Ben Thompson. The necessity for such a survey was well stated by Mr. Wright as follows (letter of May 10, 1931, to Assistant Director H. C. Bryant):

(a) Animal life constitutes one of the important assets of the National Parks System.

(b) This asset is even more sensitive to the detrimental effects of civilization than almost any other park feature.
(c) The status of animal life in the parks is already far from satisfactory.
(d) Mere protection is not enough to restore this asset, more positive action being necessary to counteract the many unfavorable influences.
(e) The personnel of the Service does not provide qualified men with time to devote to the specialized problem of animal administration.
(f) Studies of park fauna by outside scientists have provided essential reference material but no practical methods for solving the animal problems confronting park administrators.

During the biennium July 1929 to July 1931 the truth of these six points was so well demonstrated by the privately financed survey that its organization and work was taken over by the National Park Service as rapidly as funds could be made available. During the fiscal years of 1932 and 1933 expenses were shared on about an equal basis by the Government and Mr. Wright. On July 1, 1931, Mr. Dixon was appointed field naturalist and finally on March 3, 1933, the Service set up a position of associate field naturalist, to which Mr. Wright was appointed, and designated Chief of the newly formed Wildlife Division of the Service. Later, as the importance of animal conservation became more fully realized, the Division was strengthened by addition of a supervisor of Fish Resources and an assistant chief.

The preliminary wildlife survey of the national parks was completed and the results made public in 1933 in a 157-page bulletin, Fauna of the National Parks of the United States. This publication became the basis for later management practices, and was the first of a national park fauna series put out by the Department of the Interior. Other bulletins in the series, all written by Wildlife Division personnel, are: Wildlife Management in the National Parks, 1935, 142 pages; Birds and Mammals of Mount McKinley National Park, 1938, 236 pages; and an Occasional Paper, History and Present Status of the Breeding Colonies of the White Pelican, 1933, 83 pages. Another bulletin, Ecology of the Coyote in the Yellowstone, is now in press. These bulletins constitute a record of the major wildlife investigations conducted by the National Park Service during the past 10 years, upon which have been based the conservation measures set forth in another portion of this report, together with accounts of a multitude of other investigations, more local in character.

Hardly had the animal conservation work of the Service been well started when on June 10, 1933, President Roosevelt issued an Executive order consolidating the functions of several bureaus into an enlarged office of National Parks, Buildings, and Reservations. Even greater expansion of work had already resulted during that year as the result of passage and approval, on March 31, of legislation authorizing emergency conservation work, under which the Park Service was given supervision over Civilian Conservation Corps camps in its own areas and also in State parks. By the end of the year the Service was supervising 175 camps containing 35,000 enrollees and approximately 2,300 foremen and technical advisers. All animal-conservation activities of these camps became the responsibility of the Wildlife Division. Twenty-four biologists were employed to assist the regular staff of three men in handling the wildlife work of the parks and the camps, the latter of which reached a maximum number of 117 national park camps and 457 State park camps in October 1935.

Near the peak of this expansion, and before the plans for wildlife work in the national parks had been fully realized, its originator and

leader, Mr. George M. Wright, met a tragic death on February 25, 1936.

After 1936 the Civilian Conservation Corps program was gradually decreased until, by the close of 1940, the total number of Civilian Conservation Corps camps in the National and State parks had been reduced to 310, with a disproportionally greater reduction of wildlife personnel to 9 (4 regular and 5 Civilian Conservation Corps).

On December 4, 1939, this reduced staff was, by order of the Secretary of the Interior, transferred to the Bureau of Biological Survey, with instructions that that Bureau should henceforth supervise all functions of the Wildlife Division, and act in an advisory capacity to the National Park Service on all matters pertaining to investigation and conservation of animal life in areas administered by the latter agency. As a part of this transfer, and to insure perpetuity of basic national park principles as applied to animal life, the following established park policy of wildlife management was signed by Arno B. Cammerer, Director of the National Park Service, and Ira N. Gabrielson, Chief of the Bureau of Biological Survey, and approved by Secretary of the Interior Harold L. Ickes:

No management measure or other interference with biotic relationships shall be undertaken prior to a properly conducted investigation.

Every species shall be left to carry on its struggle for existence unaided, as being to its greatest ultimate good, unless there is real cause to believe that it will perish if unassisted.

Where artificial feeding, control of natural enemies, or other protective measures, are necessary to save a species that is unable to cope with civilization's influences, every effort shall be made to place that species on a self-sustaining basis once more; whence these artificial aids, which themselves have unfortunate consequences, will no longer be needed.

No native predator shall be destroyed on account of its normal utilization of any other park animal, excepting if that animal is in immediate danger of extermination, and then only if the predator is not itself a vanishing form; when control is necessary it shall be accomplished by transplanting or, if necessary, by killing offending individuals, not by campaigns to reduce the general population of a species.

Species predatory upon fish shall be allowed to continue in normal numbers and to share normally in the benefits of fish culture.

The numbers of native ungulates occupying a deteriorated range shall not be permitted to exceed its reduced carrying capacity and, preferably, shall be kept below the carrying capacity at every step until the range can be brought back to original productiveness.

Any native species or subspecies which has been exterminated from the park area shall be brought back if this can be done, but if said species or subspecies has become extinct, no related form shall be considered as a candidate for reintroduction in its place.

Any exotic species which has already become established in a park shall be either eliminated or held to a minimum provided complete eradication is not feasible, and the possible invasion of the parks by other exotics shall be anticipated and steps taken to guard against the same.

Presentation of the animal life of the parks to the public shall be a wholly natural one.

No animal shall be encouraged to become dependent upon man for its support.

Problems of injury to the persons of visitors or to their property or to the special interests of man in the park, shall be solved by methods other than those involving the killing of the animals or interfering with their normal relationships, where this is at all practicable.

ANALYSIS OF PROGRESS AND TRENDS

Advances made by the National Park Service in the field of wildlife conservation during the past decade cannot be readily expressed by the use of statistics, since a large share of its benefit to the Nation

consists of an aroused public sentiment for animal preservation and a more universal appreciation of primitive nature; qualitative, rather than quantitative, assets. Neither can the value of such imponderable national resources be fully known by the present generation. The following compilation of facts and figures, constituting a record of physical achievements during the period 1930–39, inclusive, is but an index of the progress made toward building up a national heritage of wilderness values for future generations.

In retrospect the conservation of animal life in national parks during the past 10 years falls readily into four classifications: Increased effectiveness through administration of new areas, enlargement of public contacts, and protection of rare species; improvement of animal-visitor relationships; improvement of animal management; and progress in fish conservation.

INCREASED EFFECTIVENESS OF WILDLIFE CONSERVATION

Mention has already been made of the increased sphere of influence resulting from bringing new areas under administration of the National Park Service. Although national park areas now equal only eight-tenths of 1 percent of the total area of the United States and possessions, yet certain areas considered individually are of great significance in animal conservation. In Alaska alone there have been additions to Katmai and Glacier Bay National Monuments totaling 2,744,320 acres; an area nearly as large as the State of Connecticut (Katmai addition, 1,609,600 acres, April 24, 1931; Glacier Bay addition, 1,134,720 acres, April 18, 1939). Both gave much-needed protection to the giant brown bear and other sub-Arctic species. Of the numerous other additions beneficial to wildlife only the larger or more important ones are listed as follows:

National Park Service land acquisitions of major wildlife value, 1930 to 1939, inclusive

Name	Date	Area acquired (acres)	Wildlife value
Mount McKinley National Park addition	Mar. 9, 1932	246,693	Winter range and added protection for moose, bighorn, beaver, and other species.
Yellowstone National Park addition	Oct. 20, 1932	7,600	Winter range for elk and antelope.
Grand Canyon National Monument established.	Dec. 22, 1932	273,145	Nelson bighorn range.
Death Valley National Monument established.	Feb. 11, 1933	1,907,720	Do.
Fort Jefferson National Monument established.	Jan. 4, 1935	86	The only sooty and noddy tern nesting colonies in the United States.
Organ Pipe Cactus National Monument established.	Apr. 13, 1937	330,687	Gallard bighorn range.
Channel Islands National Monument established.	Apr. 26, 1938	1,119	Many rare forms of life found only on these islands.
Olympic National Park established as enlargement of Mount Olympus National Monument.	June 29, 1938	349,270	Protection to Roosevelt elk and other Pacific Northwest species.

Accompanying these increases in area there have been even greater and more valuable enlargement of public contacts. The fivefold increase in park visitors during the past decade has resulted in an immeasurable amount of new interest in conservation throughout the

country and in foreign lands. Educational programs conducted in the parks have stressed protection of animals and of wilderness values. Also, by affording millions of people an opportunity to become closely acquainted with animals in a natural wild state, there has been given to our national conservation movement an impetus far greater than could have been given by speakers or writers alone. These latter methods of public contact have been used to full advantage by the personnel of the Service, not only through campfire talks in the parks but by numerous public lectures and broadcasts, participation in the activities of scientific and conservation societies, and publication of many scientific and popular articles. Employees of the Service have at all times maintained close relationships with the major biological and conservation groups of the country; and often, by their membership on policy-forming committees, have been able to direct sentiment toward worth-while projects.

PARK SERVICE BULLETINS

Mention has already been made of the series of Service bulletins on the fauna of the parks. These have had wide circulation, particularly among schools and libraries, and continue in great demand. To date 11,824 copies of Fauna No. 1 have been distributed. The number of articles written for scientific or popular periodicals by Service personnel is indicated by a record of 76 appearing in print during 1936 and 1937. Among the more notable of such articles was a 146-page bulletin on the life history and food habits of mule deer in California, which appeared in 1934, and has since received wide recognition as a reference work. Popular articles on trumpeter swans and bears have appeared in the Saturday Evening Post in 1938 and 1939, and a recent issue of the National Geographic contained an article on the deer of the world.

TRUMPETER SWAN

One of the most widely known achievements of the National Park Service, and one that has perhaps done more to influence public opinion toward conservation than any other single project of the Service, is the preservation of the trumpeter swans. It is interesting that this project coincides with the decade covered by this report. It was early in 1930 that Mr. George Wright and his associates started active work to preserve these, the largest and rarest of all American waterfowl; and now, at the close of the decade, there is in operation a definite plan which gives every indication of assuring preservation to the swans. In 1930 there were but 2 known breeding pairs in Yellowstone National Park. Each incubated 6 eggs, yet there was only 1 cygnet alive by late autumn. In the fall of 1931 there were known to be 5 breeding pairs, 10 birds not breeding, and 13 cygnets in the park. Others were known to be at the nearby Red Rock Lakes and in isolated parts of Canada, but Yellowstone was the only place offering complete protection.

More rigid protection against illegal killing outside the park was essential, so Mr. Wright solicited the aid of local gun clubs and the cooperation of the Montana Fish and Game Commission. In 1933 that organization posted a $50 reward for apprehension of swan

hunters. In spite of this reward, and the finding of 17 swans killed by shot, convictions proved difficult in the face of the common plea that the swans had been mistaken for geese. Since a majority of the few surviving swans were nesting outside the park on Red Rock Lakes, there seemed little hope of preserving the species unless these lakes could be made a refuge. Mr. J. N. Darling, then Chief of the Biological Survey, interested himself in the project at Mr. Wright's urgent request, and soon the active support of Secretary Ickes and the President was secured. On April 22, 1935, the Red Rock Lakes Migratory Waterfowl Refuge was established, and since that time the National Park Service and the Biological Survey have together taken a long stride toward preventing extermination of the trumpeter swans in the United States. Progress to date is shown in the following table, which also reveals the slow, natural rate of increase and the resultant necessity for great vigilance for many years to come. It is pertinent here to recall the following statement, made by George Wright in a letter dated May 2, 1934:

> If and when the census ever reaches something like 500 breeding pairs in Wyoming, Montana, and Idaho, I think we will be justified in a real hope that this bird will be preserved for posterity.

Trumpeter swan census in the United States, 1934–39, inclusive

Year	Yellowstone Park	Red Rocks Refuge	Nearby lakes [1]	Adults	Total cygnets	Total
1934	33			16	17	33
1935	27	46		41	32	73
1936	50	57		43	64	107
1937	69	90	9	85	83	168
1938	44	68	39	96	55	151
1939	70	109	20	123	76	199

[1] Bridger, Winegar, Wyodaho, and Hebgen Lakes, near Yellowstone Park; and Elk and Henry Lakes, near Red Rocks refuge.

GRIZZLY BEAR

The grizzly bear is another rare species that is nearing extinction in all parts of the country, but is reasonably assured of preservation within Glacier, Mount McKinley, and Yellowstone National Parks. In the first 2 there is now an estimated total of 150 grizzlies; practically the same number as were estimated for 1930. This static condition may be due to the fact that grizzlies, which wander long distances, often go outside the park boundaries where their chances for survival are small. Yellowstone, however, is large enough to afford year-round protection, and the grizzly population there has increased from an estimate of 167 in 1930 to about 300 in 1939. The park has long been famous as the only place in the world where wild grizzlies could be easily seen at any time during the summer. During 1939 the daily "grizzly's banquet" at Canyon was attended by 106,615 persons, who benefited by a close yet safe acquaintance with the animals and by hearing of conservation methods and ideals from the attendant ranger-naturalists.

The National Park Service has also expanded its usefulness through special protection to fur bearers, bighorn, antelope, and other rare species which are treated in another section of this report.

IMPROVEMENT OF ANIMAL-VISITOR RELATIONSHIPS

The preservation of the national parks "unimpaired for the enjoyment of future generations" brings about an apparently anomalous relationship between the conservation of primitive conditions and the recreational use of the same. Use of the parks by millions of visitors would quickly destroy their wilderness character were it not for the vigilance constantly exercised by the National Park Service in all phases of planning and management. Great progress in solving this unique problem has been made during the past 10 years. The Service policy against excessive road building has, under the far-sighted guidance of Secretary Ickes, been strengthened by emphasis upon strict wilderness preservation in which roads, trails, and other developments are kept at a minimum. The National Park Service is becoming more and more expert in handling large numbers of visitors so as to avoid harm to primitive areas and at the same time furnish the highest and most inspirational type of wilderness recreation. This trend has resulted in a more natural presentation of wildlife than formerly, with correspondingly greater benefit to both visitors and animals.

ANIMAL FEEDING IN PARKS

Ten years ago it was thought necessary to feed bighorn, deer, and other animals near the hotels in order that park visitors might easily see them. This was but an adaption of the old idea that herds of elk, antelope, deer, and bighorn should be fed hay during the winter in order to insure the continued presence of large numbers of animals within the parks. In Yellowstone National Park alone 1,075 tons of hay were fed the native animals during the winter of 1929–30. Early in the decade studies by wildlife experts of the Service showed that this so-called conservation measure was actually harmful to the animals, pauperizing them, and inducing unnatural concentrations that made them more susceptible to attack by disease and predators. In 1935 it was decided to limit feeding to cases of extreme emergency, and in 1937 all artificial feeding was stopped with the exception of the buffalo herd in Lamar Valley, Yellowstone, where winter conditions are such as to make limited feeding necessary so long as the herd is maintained at its present size. Good results from this changed policy are already evident. At Glacier, Rocky Mountain, and Yellowstone National Parks the health of the bighorn bands has noticeably improved. A typical example is Glacier National Park where the continued existence of the sheep had been seriously questioned because of large death losses noticed in the bands that were fed hay each winter. Since the animals have been let alone and allowed to live natural lives the rangers have noted improved health and satisfactory increases in numbers. The same is true of deer in many parks. Not only are the animals in better condition than formerly, but the visiting public derives much greater enjoyment from watching fine fat bucks go bounding through the forest than from the old practice of tossing grapefruit rinds and other trash to thin undersized camp scavengers.

ANIMAL-FEEDING PROBLEMS

The most difficult animal-feeding problem has been with black bears; difficult because these omnivorous animals so readily adapt themselves to human developments, and because both the bears and

the public have for over 40 years been conditioned to artificial bear shows at the garbage pits, a state of affairs completely foreign to the modern concept of wilderness parks. From eating hotel garbage to raiding campers' supplies was a natural step for the bears; and the visiting public, seeing the bears in a setting more suggestive of a zoological garden than a primitive park, inevitably reacted by "feeding the animals." Eventually the natural mutual distrust between bears and humans became almost wiped out, so that by 1930 the National Park Service found itself with a full-grown problem of bear injuries to people, bear damage to property, bears sick from too much candy, and visitors disgruntled by lack of wilderness atmosphere. This problem resulting from two generations of well-intended but unplanned wildlife practice has been vigorously attacked during the past 10 years, but a great deal yet remains to be done. Regulation and restriction of "bear shows" has resulted in replacement of the old garbage dumps with sanitary concrete platforms on which are placed limited amounts of fresh table scraps, and has reduced the number of staged exhibits from five to two, one each in Yellowstone and Yosemite. Removal of confirmed "hold-up" bears and those habitually harmful to persons or property has been increasingly effective through use of portable traps developed at Yosemite National Park in 1929. Where necessary, dangerous animals have been quietly eliminated. Bear-proof food caches and garbage cans, first developed at Yellowstone National Park in 1934, are now being adopted in several areas. More strict regulation of visitors has been possible since 1938 by Secretarial approval of a Service regulation expressly forbidding the feeding, touching, teasing, or molesting of bears. Of most importance, however, has been the educational campaign carried on by the Service during the past 3 years. Radio broadcasts, newspaper and magazine articles, lectures, and campfire talks in the parks have stressed the danger of feeding the bears and have begun to build up a greater public appreciation of natural wildlife in contrast to semidomesticated animals fed by hand.

The trend toward natural presentation of animal life is further shown by the elimination of exhibit corrals and pens. At Yosemite National Park an exhibit of cougars, bobcats, and other animals in pens was discontinued in 1932; and at Yellowstone National Park the use of the old dusty buffalo display corral at Mammoth ceased in 1936. An equally accessible and more natural exhibit is now maintained in a large pasture on Antelope Creek, and efforts are being made to place the entire herd on a more natural basis. Experiments in maintaining buffalo on natural range throughout the year, without resorting to hay feeding in winter as is necessary in Lamar Valley, were started in 1936, when 36 head were transplanted to Hayden Valley and 35 head to Fountain Flats. Both herds have done well so far.

It is readily seen that most efforts to improve animal-visitor relationships result directly or indirectly in improving the health of the animals. At times the health of the visitors becomes the major factor, as when potential outbreaks of bubonic plague must be guarded against by eradication of disease-carrying rodents around concentration centers. Fortunately such danger has developed in but few places, and in every instance the scientific work of the Public Health Service in conjunction with prompt action of the National Park Service has forestalled any trouble.

In addition to these direct methods of improving relationships between men and animals in the parks there is hardly a single wildlife activity of the Service that does not indirectly bear upon the basic problem of dual responsibility for human enjoyment and wilderness preservation. Realizing how closely interwoven are all the phases of park administration, the Service is guarding against future harm to wildlife by careful advance planning on all newly acquired areas. Wildlife surveys are made of an area as soon as it is proposed for national park status; and during the time that it is classed as a national park project, prior to actual dedication, even more detailed studies are made upon which to base a coordinated plan of management. On the Isle Royale National Park project, for example, a wildlife technician made a study of the moose and other animals in 1936, resulting in definite recommendations for management and for location of developments so as to interfere as little as possible with natural conditions. At Big Bend National Park project several scientists, both from the National Park Service and from cooperating organizations, made a complete survey of native animals in 1935–36 upon which can be based an intelligent plan for fully preserving wilderness values. Great Smoky Mountains National Park is undoubtedly the outstanding example of advance planning. Beginning in 1933 and continuing to date there have been from one to four biologists assigned to the area, cataloging the wildlife resources, recommending species or areas deserving of special protective measures, and making plans for most advantageous wildlife management and most effective presentation of biology to the visiting public. A thorough survey of native plants revealed that the park contained over 1,000 kinds, including 129 kinds of trees—one of the finest natural arboretums in the world. Management plans based on these studies have already shown results in increased numbers of turkeys, bear, deer, and other species, and in greatly improved fishing. This past summer an educational program of lectures and guided hikes was started, with a better backlog of accurate information than has been possible in any other recently acquired area.

IMPROVEMENT OF ANIMAL MANAGEMENT

An enumeration of the wildlife management projects undertaken between 1930 and 1939 would be so lengthy as to obscure with details the development and progress of national park conservation activities as a whole. Hence the following discussion includes only those projects that best serve to illustrate major trends in the wildlife work of the National Park Service. Throughout this report it will be noted that these trends all reflect the influence of a Nation-wide movement toward conservation of all biological resources as a unit, rather than emphasis upon protection of one species or group to the possible detriment of others. This changing concept is so closely related to animal conservation in the national parks from 1930 to 1939 as to merit a brief explanation. During the first quarter of the present century there was widespread interest in the preservation of the large game animals; a natural reaction to the wholesale slaughter of buffalo, antelope, and other game that so nearly resulted disastrously to wildlife between 1890 and 1910. Even in the national parks, dedicated to the protection of all natural resources, the pressure to give special

attention to game animals was so strong as to frequently overshadow the need for parallel programs of habitat protection. Hence in many cases grazing animals became so numerous as to damage the range; until finally between 1920 and 1930 the need for a broader and better integrated program became increasingly evident. During the past decade the Service has followed such a program, and has done much to remedy the damage caused by the old practice of specialized protection. Much yet remains to be done in restoring and maintaining a complete natural wilderness condition within the parks.

The problem of the northern Yellowstone elk herd is doubtless the best known example of what the National Park Service is doing to restore an equilibrium between grazing animals and available range. From 1928 to 1931, a careful study of the situation was made cooperatively by the National Park Service, the Bureau of Biological Survey, the Forest Service, and the Montana Fish and Game Commission. Studies were also made by independent scientists and sportsmen, particularly by members of the Campfire Club of America. In January 1935, all agencies concerned, led by the Federal Elk Commission, came to an agreement on the following points: The northern herd should be kept within the carrying capacity of the winter range; increase of this range through purchase should be continued; feeding of hay should be discontinued; and an annual reduction of 3,000 elk should be made by legal hunting, live shipments, and slaughter for Indians, State institutions, or relief organizations, with preference being given to the three methods in the order stated. Beginning with the winter of 1934–35 the National Park Service, Forest Service, and Montana Fish and Game Commission started a cooperative reduction program along these lines that has been continued up to the present time. Rough spots in the plan have been ironed out and it is now generally accepted by all conservation agencies as an efficient management project. In 1938, hunting in Montana adjacent to the park started on September 1 and continued until the desired reduction of 3,000 had been virtually attained on January 19. The unfavorable features of old time "firing lines" along the park boundary were prevented by closing such concentration points as Deckards Flat. During mild winters when the elk do not leave the park in sufficient numbers to permit full reduction by hunting, the National Park Service traps live animals by tolling them into specially constructed corrals, and ships them to zoos and to communities where stocking is desirable. Finally, if both these methods should prove inadequate in any one year, the necessary 3,000 reduction is completed by slaughter and distribution of the meat to Indians or relief agencies. During the 5 years that the plan has operated it has been necessary to slaughter only 617 animals. The average annual reduction of 2,953 head is tabulated as follows:

Elk reduction, 1935–39, northern Yellowstone elk herd

Method of reduction	1934–35	1935–36	1936–37	1937–38	1938–39
Hunting outside park	2,567	2,282	256	3,586	2,910
Live shipments	375	522	169	214	296
Slaughter	223		394		
Natural and accidental deaths [1]	100	129	27	112	605
Total	3,265	2,933	846	3,912	3811

[1] Incomplete estimates; accuracy is here obviously impossible.

ELK RANGE STUDY

In conjunction with the yearly reduction the Service maintains a constant check on the condition and productivity of the elk range. The most progressive methods of scientific range study have been used continuously since 1934 in an effort to adjust the size of the elk herd to such numbers as will not harm the forage nor the other grazing animals dependent upon it. These studies show that the average carrying capacity of winter elk range in the park and adjacent national forest land during the past 4 years was 7,334 elk, considering that the range must also support a yearly average of 817 deer, 175 bighorn, and 245 buffalo (antelope not considered since, because of their food habits, they do not compete so severely with the elk). The investigation also shows that a large part of the range deterioration during the past several years has been due to drought, aggravated by scourges of grasshoppers. Since 1937, the situation has been somewhat benefited by increased rainfall; for example, the density of vegetation increased 36.7 percent from 1937 to 1938. This increase, however, consists chiefly of weeds which are the first to come back on a rejuvenating range. It is estimated that from 10 to 20 years is required to effect complete recovery of a range so badly damaged as was this, but with continued management along the time-tested methods now in force there is every reason to forecast its successful accomplishment.

At Rocky Mountain National Park a somewhat similar elk problem, on a smaller scale, has recently developed, and is being handled this year by increased legal hunting just east of the park boundaries. The same method has been recommended to reduce a local overabundance of elk in parts of Glacier National Park. Also, at Olympic National Park, the cooperation of the State of Washington this year in opening a special elk season adjacent to the park has resulted in a legal kill of about 500 head, with consequent benefit both inside and outside the park. Investigations made in the park during the past 2 years showed that browse reproduction was suffering from too many elk; hence, the reduction is welcomed as a step toward maintenance of a more equably balanced conservation program. Similar mutually beneficial reduction programs have proved satisfactory wherever migratory animals, such as deer and elk, overly abundant in a park, move in winter to open shooting areas. The park benefits by a removal of excess animals potentially harmful to the range, and surrounding communities profit by increased revenue from visiting sportsmen.

In some instances it has been necessary to supplement hunting with a transplanting program, as is done at Yellowstone. The latter type of reduction was greatly facilitated in 1938 through passage and authorization of an act (52 Stat. 708) permitting disposal of surplus elk and buffalo from Wind Cave National Park. Under this authority the elk herd has been reduced this year from 150 to 135 and the buffalo from 291 to 192. Many of these were shipped to nearby Indian reservations, which is a preferred method of disposal as regards buffalo. The Crow Indian Agency in the winter of 1935–36 received 90 surplus buffalo from Yellowstone and has since shown considerable interest in managing them as a tribal herd. They use the surplus in various ceremonies intimately associated with their early life, as well as for food. Thus both the economic and social life of the tribe is improved. The Pine Ridge Agency also received 10 buffalo in

1936; and 811 other buffalo were shipped from Yellowstone to the above and other Indian agencies for stocking or for food during the past decade. Shipment of live animals has been used with equal success to relieve ranges overpopulated with deer, notably in cases where mule deer have altered their normal migratory habits and remained the year around in certain areas. Yosemite Valley and Zion Canyon are cited as examples. In the former the vegetation had begun to show effects of overbrowsing before 1930, and in that year an experimental shipment of deer was made from the valley to the northern part of the park, which had been almost totally stripped of deer as the result of a foot-and-mouth epidemic some years previous. The experiment proved successful, and the plan was continued throughout the decade as necessitated by range conditions and deer increases. It was also applied to Zion, Sequoia, and other national parks and improved methods of trapping were worked out. At Zion National Park, through agreement with the State of Utah, the deer were released in several places outside the park where it was hoped to thus improve hunting. One hundred and fourteen head were shipped out during the winter of 1938–39, as the first step toward allowing natural vegetation in Zion Canyon to recover from unusually severe overbrowsing. The expected increase in plant cover should also materially retard the severe erosion to which the canyon floor has been subjected.

A rather spectacular method of deer stocking was tried at Grand Canyon National Park in 1930, when 8 fawns were shipped by airplane from the North Rim to the South Rim. These and others shipped by trucks did well, and the South Rim herd is now estimated at from 100 to 150 head.

Many of the problems concerned with overabundance of grazing animals and deteriorating ranges are closely connected with the complete preservation of all forms of life in this way: Excess numbers of deer or other ungulates are in many cases due to subnormal populations of predators; and conversely, the restoration of an equilibrium between game animals and available range can often be aided by protection of sufficient predators to permit a natural check on the game. This was well illustrated on the Kaibab National Forest in 1931 when the National Park Service participated in a joint study of that classic deer problem. At that time it was recommended that the old practice of killing off the cougars should be modified to allow a certain number of these predators to naturally weed out the less fit deer from the herd. The plan was adopted, and in conjunction with regulated hunting has proven successful. The role of the predator is of even greater importance in national parks where hunting is not allowed, and where it is desired to conserve the finest possible examples of natural history. Just as predators were a vital factor in the evolution of fleet antelopes, alert deer, and powerful moose or elk, so today they are the one proven means of maintaining normal and healthy relationships among the animals in the wilderness communities of the national parks. Hence, on the basis of decades of practical experience the National Park Service gives protection to all predatory animals.

THE PREDATOR PROBLEM

The past decade has witnessed an evolution of opinion regarding predators that is coincident with the changing concept of game conservation outlined in the previous paragraphs. The rapid recovery of

hoofed mammals following near extermination early in the twentieth century was but imperfectly perceived, and predators had been persecuted in the parks for at least a decade after they had become necessary to maintenance of a balance. Then followed a period of awakened scientific interest which, in 1929 and 1930, resulted in receipt by the Service of numerous resolutions from organizations condemning predator control without adequate justification based upon scientific investigation. As a result a National Park Service predator policy was established, and published in the May 1931 issue of the Journal of Mammalogy. This policy prohibits trapping and poisoning (the latter is excepted in such grave emergencies as control of diseased rodents), and allows predator control only when serious inroads are being made upon animals needing special protection. Two years later this policy was more specifically stated as a part of the wildlife-management policy in the introduction to this report. Following establishment of this policy the Service has placed increasing reliance upon impartial scientific data rather than ancestral prejudice against predators, and has carried on several investigations of areas where predator control had been urged by stockmen and others. At Yellowstone National Park a 2-year study, completed in July 1938, showed that coyote control is unjustifiable at present. No evidence was found to show that the coyote is a serious menace to antelope, mule deer, bighorn, geese, or trumpeter swans in that park. No general exodus of coyotes to surrounding stock ranges was found. On the contrary it was found that the population of grazing animals in the park was greater than could be properly supported on available winter range, a condition traceable in part to the wholesale destruction of cougars, wolves, and coyotes which took place in Yellowstone for many years. Completion, in 1939 of a similar investigation at Lava Beds National Monument showed that coyotes there were not detrimental to a natural increase in waterfowl, and that they benefited the range by eating large numbers of meadow mice. The most recent investigation has been at Mount McKinley National Park where the relationships of wolves to bighorn and other animals has been studied during the past year. Recommendations based on this work are not expected before next spring because of the large amount of data yet to be analyzed. It is expected that continuance of present methods will result in improved protection of hoofed mammals through prompt detection of any special needs for predator control, and more equal protection of all biological features through scientific study of relations between predators, prey species, and forage.

NONNATIVE ANIMALS

Still another phase of the Service program of wilderness protection is concerned with elimination of nonnative animals that at times have become introduced into various parks, often to the detriment of native fauna and flora. Several intentional introductions were made in times past upon the theory that the parks offered the only possible sanctuary for preserving diminishing species outside of zoological gardens. In 1921, when the dwarf California elk were nearing extinction, the Service allowed the California Academy of Sciences to place a small herd under fence in Yosemite Valley. Also in 1924, Dr. E. E. Brownell presented 12 Oregon antelope to the Service for planting in the Grand Canyon of the Colorado. They were brought

from Nevada, of a slightly paler race than those native to the south rim of the canyon, and did not do well in their new environment. At present there is but one buck known to be left. Apparently this is one problem of exotic species which has pretty well solved itself; and remarkable increases in numbers of antelope in Nevada and elsewhere during the past 10 years leave no cause for further need of such emergency protection as was attemtpted at Grand Canyon. In Yosemite, the dwarf elk experiment proved equally unfeasible, since the environment was not suitable for the animals. In 1930 it became evident that the Yosemite herd was not increasing enough to insure perpetuation of the race, which was rapidly nearing extinction in its native San Joaquin Valley due mainly to encroachment of agriculture. Also the elk were overgrazing a portion of Yosemite Valley needed for the native deer, and were damaging the appearance of the meadows. The Service finally solved the problem by cooperation with the California Division of Fish and Game, and in 1934 the herd was transplanted to a suitable protected area in Owens Valley, where it has done well.

More difficult of solution are those cases of exotics that have gradually drifted into the parks in the course of natural expansion from original ranges or from centers of introduction outside the boundaries. Mount McKinley National Park suffers from one such: Reindeer, originally introduced to Alaska from Siberia in 1891, have spread into the park and are hybridizing with the native caribou. The reindeer question is regional, rather than a local McKinley problem, and can only be solved, if at all, by cooperation of all agencies concerned. Investigations toward this end have already been contributed by the National Park Service, which has made scientific field study in McKinley in 1926, 1932, and 1939.

Another regional problem of this character affects Hawaii National Park, where the establishment of the park in 1916 found the area badly altered by a century of despoliation by such exotics as goats and pigs. Introduction of nonnative species—mammals, birds, and plants—has been so universal and successful in the Hawaiian Islands that there is no way of knowing what the original primitive wilderness was like, much less of preserving it within the comparatively small confines of the park. Hence the Service has concentrated upon protection of the remaining natural biota, and such control of the exotics as is practicable. Such outstanding rarities as the Hawaiian goose and the silver-sword plant are responding to Service protection, and field investigations in 1938 showed an increase in native birds including many species that have not been recorded in the area for many years. A long step toward elimination of feral goats has been made in the period 1936–38, when the Hawaii section of the park was fenced by Civilian Conservation Corps labor and funds, and over 4,000 goats inside the enclosures were rounded up and eliminated. The rough terrain made complete eradication impossible in one drive, but a campaign carried on continuously from 1938 to date gives promise of eventual success.

THE BURRO PROBLEM

Another problem of domestic stock gone wild is that of burros turned loose by early-day prospectors in the Southwest, which have become so abundant locally as to deplete seriously the range and to

interfere with such native animals as deer and bighorn. In Grand Canyon National Park the burros had been quietly and systematically hunted by the rangers for 7 years prior to the present decade, so that by 1930 it was estimated that but 20 remained. The great increase in vegetative growth caused by this reduction has since been maintained by such hunting as was needed to keep the burros down to approximately the 1930 figure. The entire campaign was conducted only after all important organizations of conservationists, humanitarians, and scientists had been informed of the necessity and method of control, and had expressed their approval. The same procedure has recently been followed in Death Valley National Monument, where the 1930 estimate placed the burro population at 600 and where studies made from 1935 to date showed that the burros were actually crowding the native bighorn off the range and endangering their existence. The approval of conservation groups was secured last spring and the control program has now been started, with every indication of an eventual return to more natural conditions of both forage and wildlife in the monument. At the Boulder Dam recreational area investigations during the past year indicate development of a burro problem in certain canyons tributary to the Colorado, and the question is now being given cooperative study by the Bureau of Biological Survey and the National Park Service.

Cooperation with various public and private agencies has been a vital factor in the success of many of the conservation measures effectuated by the National Park Service during the past 10 years. An account has already been given of the joint management of the northern Yellowstone elk herd, and mention was also made of the cooperation with the Bureau of Biological Survey at Boulder Dam recreational area, and with the Forest Service on the Kaibab deer problem.

A very widespread extension of conservation activities and ideals has come through the cooperation between the National Park Service and the various State park authorities initiated in 1933 and further implemented by the act of June 23, 1936 (49 Stat. 1894). Under this authority the Service has operated a total of 787 Civilian Conservation Corps camps in over 700 State parks, assisting with conservation work in every State except Delaware. An indication of the variety and amount of work accomplished is given in the following tabulation:

Projects in wildlife conservation accomplished by the Civilian Conservation Corps in State park emergency conservation work from April 1933 to January 1938

Classification	Project designation	Unit	Total accomplishments
101	Stream and lake bank protection	Square yard	2,948,241
122	Improving and enlarging diversion dams	Number	1,105
314	Sheet erosion planting	Acre	12,799
411	Water control structures other than dams	Number	734
501	Field planting or seeding (trees)	Acre	50,088
901	Fish rearing ponds	Number	[1] 151
902	Food and cover planting and seeding	Acre	10,108
903	Lake and pond development	Man-day	110,181
904	Stocking fish	Number	5,414,504
905	Stream development, wildlife	Mile	482
907	Wildlife feeding	Man-day	1,278
908	Wildlife shelters	Number	81
906	Other wildlife activities	Man-day	40,549

[1] Includes only rearing ponds constructed since Apr. 1, 1935.

Since the working basis in these State parks is cooperative, the Service has been concerned chiefly with the execution of work, and has left the policy-forming functions to the States. In a great many cases, however, the Service has been consulted on policy matters, and by advice or example has been able to contribute to basic State park policies and the development of improved techniques in wildlife management. This work also has carried practical conservation into numerous communities throughout the land that would otherwise never have been touched by the work of the National Park Service.

THE BIGHORN IN THE WEST

Preservation of bighorn in the west is another example of conservation rendered more effective through cooperation. This noble animal occurs in 13 of the areas administered by the Service, in all of which special measures are taken for its protection. In studying reasons for a general decrease in bighorn from 1930 to 1937, and in searching for remedial measures the Service has cooperated with the Bureau of Animal Industry, the Bureau of Biological Survey, the Montana Veterinary Research Laboratory, the California Academy of Sciences, and various other public and scientific organizations. Resultant improvements in bighorn management, coupled with natural environmental changes not yet fully understood, have produced a slight but noticeable increase since 1937. Recent broadening of cooperation gives promise of even better results in the future. The California Division of Fish and Game has for the past 2 years assisted with field studies in Death Valley, acquiring information that has already aided more effective management of the 500 bighorn living there. In the Rocky Mountain region all interested agencies—the States, the Forest Service, the Biological Survey, the National Park Service, the Colorado Museum of Natural History, and others, have agreed to pool the results of their several investigations for the common good of the mountain sheep throughout the region. This cooperative effort is made possible through Pittman-Robertson funds and is being headed up by the Biological Survey. The Park Service contribution for the past year consists of 8 months' study of habits and food requirements at Rocky Mountain National Park, several weeks of observation of spring conditions in Glacier National Park, and intermittent year-long studies at Yellowstone. Outside the Rocky Mountain area an equal amount of field study was done during the same period at Boulder Dam, Mount McKinley, Death Valley, and Organ Pipe Cactus National Monument. The above enumeration not only indicates the large part played by the Service in this year's cooperation, but is also representative of the amount and kind of investigation that it has been doing throughout the great part of the past decade.

PROGRESS IN FISH CONSERVATION

Angling is stimulated in 14 national parks and several national monuments and other areas administered by the National Park Service. Millions of sportsmen thus secure a great variety of fishing, all the way from deep-sea fish at Acadia to golden trout in Sequoia or Yosemite, and grayling in glacier-fed streams of Mount McKinley. Fresh-water fish within the parks include 10 kinds of trout, as well as other kinds listed in the following table.

Status of fish resources and conservation in the 14 national parks having such activity

Park	State license required	Kinds of fish	How stocked
Acadia	Yes	Salmon, alewife, and perch	Bureau of Fisheries, 3 rearing ponds.
Crater Lake	No	Rainbow, silversides, and brown trout.	
Glacier	No	Black spotted, brook, rainbow, Mackinaw, Dolly Varden trout. Also pike and whitefish.	Bureau of Fisheries, 28-trough hatchery. 8 rearing pools. Another hatchery under construction.
Grand Canyon	Yes	Rainbow, brown	Arizona and Utah State hatcheries.
Grand Teton	Yes	Mackinaw, black-spotted, and brook trout.	Bureau of Fisheries hatchery at Jackson.
Great Smoky Mountains	Yes	Brook and rainbow trout: small-mouthed bass.	Bureau of Fisheries, 30-trough hatchery, 22 rearing pools; National Park Service 29 rearing pools (inside the park). Eggs also supplied by North Carolina.
Lassen Volcanic	Yes	Rainbow, brown, and brook trout.	California State hatcheries.
Mount McKinley	No	Dolly Varden and native trout; also grayling.	No planting.
Mount Rainier	No	Rainbow, black-spotted, brook, and brown trout.	Bureau of Fisheries, 34-trough hatchery, 6 rearing pools.
Rocky Mountain	Yes	Rainbow, black-spotted, brook, and brown.	Colorado State hatchery, 40-trough hatchery, 46-trough hatchery, 6 rearing pools.
Sequoia	Yes	Rainbow, eastern brook, brown, and golden trout.	California State hatcheries. Rearing pools in park.
Yellowstone	No	Black-spotted, rainbow, brown, Mackinaw, and brook trout; also whitefish and grayling.	Bureau of Fisheries, 4 hatcheries, totaling 202 troughs, 3 rearing pools.
Yosemite	Yes	Rainbow, brook, brown, black-spotted, Tahoe, and golden trout, also grayling.	California State hatchery inside the park, 52 troughs.
Shenandoah	Yes	Brook and rainbow	Virginia State hatcheries.

NATIONAL PARK FISH POLICY

Since the taking of fish in the national parks, which is in contradistinction to the complete protection afforded all wildlife, is authorized by the act establishing the Service and has been amply justified on the grounds of high recreational value, the National Park Service has sought such improvement of fishing as has appeared consistent with wilderness preservation for the highest recreational use. As revealed by the foregoing tabulation, several parks contain nonnative fish, the result of introductions made prior to the present decade. Even up to 1936 the old practice of introducing new species, still almost universally practiced outside the parks, was followed to a limited extent. An example may be cited in the planting of 45,000 Montana grayling in Yosemite in 1930. In itself this was an outstanding achievement, it being one of the first successful attempts at artificial hatching and planting of grayling, pioneering and grayling hatchery erected at Grebe Lake, in Yellowstone, in 1933, where the Bureau of Fisheries hatched 2,000,000 eggs the first season. Grayling are native only to Yellowstone (Montana grayling) and Mount McKinley National Parks (Arctic grayling); the planting of them elsewhere or the planting of any other species not already established in a park has been definitely guarded against since 1936. In that year the Service laid down the following fish policy:

No introduction of exotic species of fish or other exotic aquatic life shall be made in national park or monument waters now containing only native species.

In waters where native or exotic species now exist, the native species shall be definitely encouraged.

In waters where exotic species are best suited to the environment and have proven of higher value for fishing purposes than native species, plantings of exotics may be continued with the approval of the Director and of the Superintendent of the park in which such waters are located.

The wider distribution of exotic species of fish within the national parks and monuments shall be prohibited, and a thorough study of the various park waters shall be encouraged to the end that a more definite policy of fish planting may be reached.

The number of any species of native nongame fish should not be reduced even where such reduction may be in the interest of better fishing.

All forms of artificial stream improvement which would change natural conditions should be avoided, but the restoration of streams and lakes to their natural condition is permissible where thorough investigation indicates the desirability of such action.

In cases where a lake or stream is of greater value without the presence of fishermen, there should be no stocking of such waters.

This statement of policy was signed by Arno B. Cammerer, Director of the National Park Service, and Charles E. Jackson, Acting Commissioner of the Bureau of Fisheries, and approved by the Secretary of the Interior, Harold L. Ickes on December 18, 1939, in connection with the transfer of all National Park Service fisheries to the Bureau of Fisheries on that date. Fisheries activities of the Service during the past decade, culminating in the definite establishment of a policy compatible with wilderness protection, can best be reported by a brief summary of major events.

It will be noted by reference to the table of fish resources that in seven parks—General Grant, Grand Canyon, Lassen Volcanic, Rocky Mountain, Sequoia, Shenandoah, and Yosemite—the stocking of fish is done in cooperation with the respective States,[2] which retained jurisdiction over such fish resources at the time those parks were established. To facilitate the stocking of the other parks a cooperative agreement was effected in 1929 between the Bureau of Fisheries and the National Park Service, granting to the Bureau the function of building and operating certain hatcheries and egg-collection stations within the parks in return for preferential stocking of park waters. Acting on this basis new hatcheries were built at Yellowstone Lake and near Mount Rainier in 1932; one at Grebe Lake, Yellowstone, in 1933; one at Great Smoky Mountains in 1936; and one now under construction in Glacier. Rearing pools were also constructed in or near various parks. The operations at Yellowstone Lake are conducted on an immense scale. Between 17 and 41 million eggs of black-spotted trout are collected annually, and as many as 16 million young trout have been returned to waters in Yellowstone and other parks in 1 year (1935). The magnitude and importance of fish activities made it advisable for the Service to establish a new position, supervisor of fish resources, which was done in 1934. Thus provided with an efficient liaison officer more closely to coordinate fish activities of the Service, the Bureau of Fisheries, and the various States, rapid progress was made toward practical conservation. In 1936 was formulated the fish policy previously recorded, and thenceforth active steps were taken to carry out its provisions. A working agreement with the Bureau of Fisheries in 1934 made possible an equable distribution of fish from the Yellowstone hatchery to all parks where black-spotted

[2] True to a limited extent at Great Smoky Mountains National Park.

trout were native, with resultant improvements in fishing. Stream surveys were made wherever funds and personnel permitted; regulations were modified to better protect the fish while providing adequate sport for the millions who visited the parks expressly because of their superior fishing; and numerous adjustments and cooperative agreements were made to quickly aid field projects without cumbering them with slow routine. One of these agreements was so outstanding as to merit detailed narration here.

At Lake Mead, impounded behind Boulder Dam, there was prior to 1939 a fish situation that could have resulted in endless argument, and resultant harm to conservation. Large numbers of fishermen were already coming to the new lake, attracted by the phenomenal catches of large-mouth bass. But the lake was subject to the divergent State game laws of both Arizona and Nevada, and various phases of its administration were, and are, handled by the Bureau of Reclamation, the Bureau of Fisheries, the Bureau of Biological Survey, and the National Park Service. The game commission of Clark County, Nev., also claimed some local jurisdiction. The conflicting ideas of these seven agencies might easily have resulted in a cross-fire of regulations harmful to both the fish and the fishermen. However, following the passage of facilitating legislation in both States, representatives of the seven groups convened at Boulder City on April 8, 1939, and came to agreement upon a set of regulations designed to insure proper conservation of fish resources in Mead Lake. Reasonable creel limits were set, and provision was made for an interstate license, good only on the lake, with proceeds from the sale thereof to be equally divided between the two contracting States. The participants to this agreement are to be complimented upon the production of such an outstanding example of cooperative wildlife conservation.

Although fish-stocking statistics are not complete for the entire decade, some conception of their extent and volume in the national parks can be gained from the following tabulation for a representative year.

Fish stocking in national parks, 1936

Park	Rainbow	Black spotted	Steelhead	Golden	Brook	Loch Leven	Grayling	Total
Crater Lake	60,000		50,000		75,000			185,000
Glacier	243,039	2,053,766			67,201			2,364,006
Grand Teton		660,000			45,477			705,477
Great Smoky Mountains	63,450							63,450
Lassen	(1)				(1)			377,000
Mt. Rainier	20,000	164,000	72,205		12,000			268,235
Sequoia	(1)				(1)			896,000
Shenandoah					29,944			29,944
Yellowstone	636,696	8,013,896			40,800	95,200	1,998,000	10,784,492
Yosemite	(1)			95,000	(1)	(1)		896,000
Total								16,569,604

[1] Indicates species planted but not reported as break-downs of the total.

WILDLIFE CONDITIONS AS OF OCTOBER 1939

Taken as a whole, census reports received from the various parks and monuments in 1939 show a general improvement in numbers and condition of animals, reflecting not only favorable environmental influences during the past 2 years but also a distinct upward trend in methods of wildlife management. In order to present a concise and

accurate account of present-day wildlife conditions, the Service has this year prepared a 40-page multilithed bulletin, "Wildlife Conditions in the National Parks," from which the following factual and statistical information is excerpted. It should be understood that wildlife censuses in the large areas under Service administration cannot be absolutely accurate except in the few cases, such as buffalo, at Wind Cave, where it is possible to actually count the individual animals. A census is at best a reasonably close approximation to the truth, and its value is directly proportional to the skill and experience of the field workers. Within the parks the annual animal counts are conducted uniformly each year so as to limit the variability of the unavoidable factors of error. Results for 1939 are tabulated as a part of this report, in appendix A. It will be noticed that the above inventory includes all national-park areas important from a wildlife standpoint, with the exception of Katmai and Glacier Bay National Monuments. Both of these areas are of very great value as wildlife sanctuaries, but neither has even received an appropriation for protection, much less for making a census.

Factual information on the other parks and monuments is quoted from the previously mentioned bulletin as follows:

ACADIA NATIONAL PARK, MAINE

Studies and surveys have been conducted on a growing deer problem. Decreasing food supply, winter losses, and unusual injury to gardens in nearby communities indicate that too many deer are present.

Beaver are increasing, spreading to new areas and reoccupying old ones. The trapping season for 1938–39 outside the park was poor. Red squirrels are very plentiful but few gray squirrels use the island. Flying squirrels, chipmunks, and muskrats are common. The latter species has become quite numerous in the last 2 years. Varying hares are more common now than at any time in the past 4 years. Harbor seals, assiduously hunted for a State bounty outside the park, are gradually becoming fewer. Raccoons are decreasing.

The most abundant nesting waterfowl is the black duck with approximately 100 nesting pairs on Mount Desert Island. Possibly 500 pairs of woodcock used the island for breeding this year. Ruffed grouse seem to be approaching the peak of their population cycle.

BOULDER DAM NATIONAL RECREATIONAL AREA, NEVADA AND ARIZONA

Desert bighorns are apparently on the increase in the entire Boulder Dam area, due, it is thought, to an abundance of water and protection now afforded against poaching. They are well distributed throughout the area with greatest known concentrations in Grand, Iceberg, Boulder, and Black Canyons. No evidence of predator inroads of any importance has been found. However, the most abundant large mammals are wild burros and, by competing for food, they jeopardize the bighorns. It is estimated that 680 of these exotic animals are now present, concentrations being in the lower end of the Grand Canyon, in the Virgin Basin and in Black Canyon. Range conditions are rapidly becoming critical wherever burros are numerous.

Beavers are well scattered along the Colorado River below the dam as far as the Searchlight Ferry. A few areas above the dam have some beavers and food is abundant in all places known to contain colonies. Coyotes are relatively well established on both the plateaus and desert mountains. Bobcats are uncommon. Tracks of single cougars were seen in two localities when they passed through a narrow section of the area. One wolf track was measured and recorded by Mr. A. A. Nichol in May 1938 but no evidence of the species' existence was found during 1939. Foxes are common. Porcupines appear to be well distributed but infrequently encountered throughout the pinyon-pine-juniper forests of the Hualapai Plateau. They undoubtedly occur elsewhere, but observations are lacking. Raccoon tracks are found in abundance along the stream courses in Spencer and Twin Canyons and the lower end of Grand Canyon. Other doubtful records have come in, but it is believed raccoon distribution is local and not general.

About 15 burro (or desert mule) deer are found in Black Canyon below the Boulder Dam. Range conditions in this locality are unsatisfactory due to inroads by bands of wild burros. On the plateaus food is ample with an abundance of cliff rose available as winter food. Thus far, the Rocky Mountain mule deer, which is more common than the burro deer, is apparently restricted to the plateaus and side canyons in the lower end of Grand Canyon and in the Gold Butte-Bonelli Peak region.

CRATER LAKE NATIONAL PARK, OREGON

Black bears are numerous and their population has been carefully estimated this year to be 50. This number is higher than in previous years, but does not indicate an increase in bears. Rather, it was arrived at from more detailed field work than in the past.

On August 24, on the southerly slopes of Union Peak two does and a fawn yellow-tailed deer (*Odocoileus virginianus ochrourus* Bailey) were observed by park rangers. This is the first substantiated record of the species' presence for many years, although it has long been considered a part of the park fauna by some persons. This year's estimate of 80 Columbian black-tailed deer is 20 percent less than in 1938. However, it is felt that the new figure is a much fairer estimate than last year and the species is, if anything, slightly more common now. The Rocky Mountain mule deer population remains practically unchanged. Elk tracks are still reported from parts of the park, particularly the southwest area.

Observations of martens plus an abundance of tracks in the snow indicate a definite increase in the marten population this year. Pacific beaver are considered as part of the park fauna. One dead beaver was found inside the park this year. This is the only record from an actual specimen. Fresh cuttings were found in the park at three places and old cuttings have been noted along many park streams.

Varying hares were probably more common during the winter of 1938–39 than for the past several years.

DEATH VALLEY NATIONAL MONUMENT, CALIFORNIA

In 1938 and again in 1939, Park Service personnel and representatives of the California Division of Fish and Game made a study of the bighorns. Members of the 1939 party agreed on a population estimate of 500 for the Death Valley National Monument. Feral burros, 600 in all, are giving the sheep such hard competition that control measures by shooting have become necessary. The burros have been definitely on the increase with concentrations in the Panamint and Cottonwood Mountains where they have driven the bighorns from much of the range. It is hoped that control will alleviate the trouble within the next 5 years.

Cougars and bobcats are rare; the former were not recorded this year, but are believed to be present as in the past. Black bears may now be completely extirpated. One bear that frequented the Wildrose district in the Panamints in 1935 and 1936 has not been reported since.

Excellent food conditions for the year resulted from abnormal precipitation during the winter of 1938–39. Jack rabbits are especially numerous. With dense cover and perennial water, cottontails are more common, with as many as 20 noted around a single spring. Coyotes brought off good litters of pups and found ample food in the expanding rodent population.

Six gray foxes were observed at intermediate elevations during the year. Tracks, presumably of this species, have been recorded at several points. Kit foxes, which are now so rare in many places, have a population in the monument probably two or three times as great as the coyotes. The little animals are frequently seen at night along roads and near human habitations.

Both valley and mountain quail are found where ecological conditions are favorable to their existence. All reports indicate that the quail are increasing.

FORT JEFFERSON NATIONAL MONUMENT, FLA.

Since 1937, the noddy population has been dropping off. At first it was believed that rats were the cause, but even after those exotic animals were trapped out

the noddies did not increase. At the present state of our investigations, no reason can be given for this decline. In 1938 it was estimated that 413 noddies nested on Bush Key and Garden Key (the former nesting area, Bird Key, washed away from 1928). In 1939, the number of noddies was estimated by the Florida Audubon Society to have fallen off about 20 percent below that of the previous year's count.

Eastern sooty terns nested on both Garden and Bush Keys in 1937 and 1938. During the 1939 season, sooties used Bush Key exclusively. The 1938 census estimated 64,057 sooty terns; in 1939 it was at least 70,000. A colony of roseate terns has been located on the Dry Tortugas for many years and remains at less than 100 birds. A group of about 25 least terns were on Bush Key in 1939. Nesting in 1939 for all species was favorable. Predation by man-o-war-birds and crabs was calculated to have taken not over 3 percent of the young sooty terns.

GLACIER NATIONAL PARK, MONT.

Available summer range is sufficient for a larger number of herbivorous animals than is now present in the park. The limiting factor is winter range, for in Glacier Park heavy winter snows make a sharp division of seasonal ranges for ungulates. Sometimes, as in the winter of 1938–39, extreme mildness permits the animals to utilize the areas that would ordinarily be snowed under. This, as well as other factors, allowed the ungulates to come through the past winter in extraordinarily fine condition.

Elk are well scattered through the park and are found on all major drainages. Generally, their winter range is still in good condition and the herds are increasing in size. Practically the only elk that drift out of the park comprise a band of approximately 300 that go into the Blackfeet Indian Reservation during the severest weather. Since artificial feeding of white-tailed deer was stopped, the deer have scattered to various sections of the park and "in general * * * have improved tremendously since they have been rustling for their own food." Special studies of browse conditions are being conducted along McDonald Lake and in the Logging and Quartz Creek area where greatest winter concentrations occur. Mule deer inhabit higher elevations than the white-tail, although winter ranges of the two species occasionally overlap. About 250 mule deer from Waterton Valley drift into Canada in December and return to the park late in April. Similarly, about 75 mule deer of the Belly River drainage spend the severe part of the winter across the international boundary. Approximately 75 mule deer were killed by trains last winter (1938–39) between Belton and Lincoln Creek when caught between large snowdrifts. Moose appear healthy. They are rare on the eastern side of the park but well established along the west side and in Waterton drainage. No records have been made of moose in the St. Mary drainage since the last two disappeared several years ago after straying out of the park.

Special attention has been continued on the bighorn problem. It is gratifying to report that this year's estimate of the bighorn population shows a decided increase over the 1938 count. For example, only 17 animals remained after a pneumonia epidemic in the Many Glaciers band in 1936. Now there are 40, including 5 lambs. Most of the sheep use the park exclusively, although a band of about 10 drifts back and forth from Canada. Rocky Mountain goats along Going-to-the-Sun Highway were seen by numerous tourists. The goat population continues normal.

Grizzlies and black bears were noted in widely scattered sections of the park. No damage to persons or property was definitely attributed to the former species during the season. Black bears caused some inconveniences in trail camps after the berry season was over when they were seeking other foods. Twelve black bears were trapped and moved to other sections of the park.

Beavers are operating in all major drainages. Martens are, fortunately, doing well. It is estimated that the ratio between male, female, and young martens is 1 : 1 : 3, respectively. The first fisher observed in many years within the park was at a trail camp on Flattop Mountain where that rare furbearer was seen several times during the fall of 1938. Signs observed in the Belly River drainage indicated the presence of two other fishers there. Tracks of two different wolverines were observed in the Waterton Valley during the winter of 1938–39. The coyote population has remained constant for the past 5 years, for any tendency to increase has perhaps been checked by predator control on the adjacent Blackfeet Indian Reservation. Cougar records indicate a slight increase over the past 5 years but the species is still extremely rare. One wolf was observed.

The gray ruffed grouse is the most common gallinaceous bird in the park at the present time and is not restricted to any one district. Columbian sharp-tailed grouse, after nearing extipration, are now increasing along the eastern side of the park from Belly River to and including the Lubec area, but they are still decidedly uncommon.

GRAND CANYON NATIONAL PARK, ARIZ.

Although herbage within the park during the 1939 summer season was short due to drought, the mule deer thrived and entered the 1939 winter season in good physical condition. Increased hunting adjacent to the park on the South Rim and on an inadequate refuge resulted in an almost complete removal of bucks from the entire region during the last two hunting seasons. Very few fawns have been reported in 1938 or 1939 and barren does increased in proportion to the number of bucks killed outside the park.

Nine pronghorns range in and out of the park at the present time east of Grand Canyon Village. During the winter months this small band migrates to the north side of the park area where snow is lighter. One pronghorn, a buck, is the sole survivor of the herd stocked at Indian Gardens in 1924.

GRAND TETON NATIONAL PARK, WYO.

The location and size of Grand Teton National Park is such that the wildlife population is greatly affected by hunting beyond park boundaries. It is to be noted also that available winter range is almost exclusively in the Jackson Hole area east of the park and very few elk or mule deer remain in the park during the time of deep snows. Of the latter species, probably not over 15 stay in the area during cold weather. Generally favorable conditions have resulted in an increase of deer this year. Moose are observed more frequently than any of the larger game animals in the park. Although some drift outside the population within the boundaries is relatively stable with all animals reported in excellent condition.

Actual and reliable observations of bighorns have been decidedly infrequent this year. Wide study of conditions indicates that the bighorns are holding their own against the heavy odds of restricted winter range and probable poaching beyond the western boundary of the park.

The hunting factor exerts considerable influence on both black and grizzly bears and has offset the natural increase. Park rangers estimate that the number of both bears is unchanged since the preceding year. Grizzlies are extremely wild and difficult to see, but some of the black bears have been seen nightly near refuse pits. Beavers are common. Martens have been consistently observed throughout the park and are believed to be increasing under protection. Snow shoe rabbits, pika, marmots, and other small mammals are found commonly in suitable habitats over much of the park area.

GREAT SMOKY MOUNTAINS NATIONAL PARK, TENN., AND N. C.

Signs and actual observations of black bears continue to show that the species is becoming well established. The number killed outside the park by legal hunting or poaching is considered to be negligible. White-tailed deer are ranging in places where they had been unknown until recent years. Small groups now exist at the

Greenbriar area, near Hannah Mountain, in the Twenty-Mile, and perhaps other places. Gray foxes are increasing throughout much of the lower limits of the park area while at the same time red foxes are not reported very often in this heavily wooded park. Gray squirrels are more numerous than 3 years ago and occasionally roam to fairly high altitudes. One was reported on the summit of Mount Le Conte. Red squirrels, on the other hand, have not fared so well due possibly to a temporary scarcity of spruce and fir seeds.

A few stands of chestnut still persist in the Smokies, but the blight is killing them gradually so that probably none will be left in a few years. Eastern wild turkeys, which thrive on chestnuts, are believed to be fewer than last year. However, in other places in the East where the chestnut is gone, turkeys are able to increase, so the loss of chestnuts may not be the reason. Other natural foods are available. The duck hawk population continues to be improved with adults bringing off young at a satisfactory rate. Ravens are not seen as often as in the preceding 2 years. They apparently are not molested very much outside the park and no cause for a decline in the population has been determined. The ruffed grouse status is about the same as that of a year ago.

LASSEN VOLCANIC NATIONAL PARK, CALIF.

Of interest was the observation of a complete albino Columbia black-tailed deer fawn—one of a pair of twins. The black-tailed deer population remains relatively stable with the greatest numbers concentrated in the southern and western portions of the park. An age and sex-ratio count during the last week of August at Kings Creek Meadows indicated a buck, doe, fawn ratio of 21:24:15. Mule deer are concentrated in the northeastern section of the park. With a few exceptions, they are in good condition.

Marten are commonly seen throughout the heavily timbered sections, but no fisher records were obtained this year. Badgers are said to be common near the lava flow east of Cinder Cone and around Butte Lake; elsewhere in the park they are rare. About 18 black bears regularly range in the park. Cougars, as usual, are rare and tracks within the park were seen only once this year. Due to heavy snowfall and migration of deer, cougars undoubtedly leave the park in the fall. Marmots and porcupines are common in favored localities.

MESA VERDE NATIONAL PARK, COLO.

Mesa Verde National Park includes only part of the mesa north and west of the Mancos River. It is just a small segment of a large and important faunal unit. Around the entire northerly boundaries of the park erosion is marked. It is aggravated by sheep grazing during winter months. When the mule deer move to lower levels to escape winter snows, they find only about 15 percent of the normal forage. The National Park Service has inaugurated projects for restoring range conditions as much as possible and already the canyons of the eastern section are assuming a somewhat more natural appearance. But the problem can probably never be permanently solved as long as Mesa Verde National Park contains such a little part of the mule deer range.

Black bears are not common in the park section of the mesa. Generally, the Mesa Verde lacks surface water, although in the great canyons on the Ute Indian Reservation west of the park bears are reported to be quite common. Cougars are rare in the park. Coyotes are well established and range through all sections of the park. The only two coyotes' feces examined contained porcupine quills. Abert squirrels appear to be on the increase, but are still not at all common.

The spring and early summer seasons of 1939 were ideal for young blue grouse. All those observed appeared to be in good condition, and several sight records of broods indicated a low chick mortality. Generally, it can be said that blue grouse are more numerous than in the past 5 years.

MOUNT MC KINLEY NATIONAL PARK, ALASKA

Generally speaking, the native fauna is in better condition now than it has been for a number of years. Varying hares and ptarmagins are "exception" for both are at the low in their population cycles. Other forms however, profited by the second successively mild winter with excellent food conditions everywhere. The increase of Dall sheep and high percentage of lambs is particularly gratifying. For a number of years, characterized by a cycle of abnormally cold winters, the lamb crop has been poor and the sheep population was gradually declining. Dr. Adolph Murie spent most of the 1939 field season engaged in a study of the

relationships between wolves, sheep, and caribou. His findings are not yet available for publication.

Visitors to Mount McKinley National Park this year saw thousands of caribous on their yearly migration, Toklat grizzlies, moose, Dall sheep, some wolves, and a few red and silver foxes.

MOUNT RAINIER NATIONAL PARK, WASH.

The Rocky Mountain goat population for Mount Rainier National Park is now estimated at between 400 and 500. About 160 goats in one band stay in the vicinity of Indian Bar, on the east side of Mount Rainier. Columbian black-tailed deer appear to be present in about the same numbers as last year (1938) both inside the park and on adjacent areas. Park visitors persist in feeding deer in developed areas, a practice that the National Park Service wishes to discourage because of detrimental effects upon the animals.

Twelve black bears in Paradise Valley District and nine in the Longmire District were trapped and transported to remote sections of the park. The animals had been causing trouble in and around camp grounds. The total black-bear population for the past few years has varied but little.

While snow was on the ground, marten tracks were seen in many sections of the park, especially at higher elevations. No records of fisher, otter, or wolverine have been made in recent years. Red foxes were seen daily at Paradise Valley during the spring months. Beavers are not common, but are sufficiently well established to be spreading out in the park. Porcupines are definitely increasing. There appears to be a slight increase in the number of coyotes along the boundary of the park that borders the Cascades. Raccoons are common at Longmire. One wolf was seen in the park last year near the east boundary.

OLYMPIC NATIONAL PARK, WASH.

A mild winter with little snow brought the Roosevelt elk through in excellent condition. Although these magnificent wapiti do not perform marked migrations like those of the elk of the Rocky Mountains, there is some movement to lower elevations during the period of heavy snowfall. It is believed that there are approximately 3,000 in the park during the summer season, but many move beyond the park boundaries during the winter. Most of the elk range on the western slopes of the mountains.

Columbian black-tailed deer survived the winter of 1938–39 with relatively few losses. The number of these deer in the park has not yet been estimated, although a few years ago it was believed to be about 3,000. Range competition with Roosevelt elk is not considered to be serious because the black-tails are generally distributed where elk are few. Mule deer are present but are not native to the park. The Washington State Game Commission released 7 (2 bucks and 5 does) on Hurricane Ridge (Elwha Game Reserve) in 1936. This area outside the park has been opened to hunting this year and there is a possibility that many of the mule deer will be eliminated because they are very tame.

No change has been noted in the status of Rocky Mountain goats which were introduced to the Olympic Peninsula about 15 years ago by local game authorities. The pioneer goats were planted on Storm King Mountain. Some of these animals, or their progeny, have since been seen on Mount Constance near the eastern boundary of the park. The total population is thought to be about 20.

The Puget Sound wolf has been extirpated for some time; but coyotes arrived on the Peninsula rather recently and are already well established. Evidence of coyotes was noted in all districts of the eastern portion of the park. Cougars are not as plentiful as had previously been believed by some observers. Three deer kills were reported on the Elwha River and cougar signs were seen in only three other places during the year.

At one time martens were abundant in what is now the Olympic National Park. Constant trapping so decimated the population that the species is now rare. None was recorded in the winter of 1938–39 and only a few signs were seen during the summer to indicate the martens still inhabit the park. Ecological conditions are excellent for martens as well as for fishers and otters and it is hoped that these fur bearers will eventually become more numerous.

ROCKY MOUNTAIN NATIONAL PARK, COLO.

The bighorn population has been more carefully tabulated than before and now stands at about 300. Elk as a whole are healthy and the reproductive rate and survival of young is almost "abnormally good." The species has probably reached,

if it has not surpassed, the carrying capacity of the range. Lands adjacent to the park are opened to hunting this year. The mule deer population is about the same as in 1938. Deer are in good condition despite the fact that many suffered from cold weather and lack of food during the winter of 1938–39.

Black bears are increasing and will probably create a problem within a few years. Beavers are locally abundant. Martens are definitely on the increase and more often seen.

SEQUOIA NATIONAL PARK, CALIF.

There are two centers of black bear concentration; Giant Forest where 58 different individuals visited the garbage trays during the summer, and Redwood Meadow where 25 individuals have been observed. The highest count at Bear Hill showed a male, female, cub ratio of 19:14:25. Of unusual interest was the appearance of two sets of quadruplets. The bears came out of hibernation as early as March this year. No change in population was noticeable.

California mule deer estimates for 1939 are lower than those given in previous reports; but this is not indicative of a decrease in numbers—merely improved census methods. Food is plentiful and mule deer are in excellent condition. It is noteworthy that hand-fed deer around camp grounds are strikingly different in appearance than the healthy specimens away from the influences of man. Inyo mule deer are uncommon in the park. Further study is needed, but the Inyo mule deer seem to be found only in the southeastern section of the park where they do not mingle with the California mule deer.

Sierra bighorn have been known to move in and out of Sequoia National Park from adjacent lands, but they cannot be termed residents of the park.

No badgers were seen by rangers this year. Their workings, however, were observed in three places. Conies are well established near and above timber line throughout the park. Gray foxes are locally distributed and seem to be most common on Ash Mountain. Marmots are generally found from altitudes of 7,500 to 12,000 feet. The status of martens is debatable. They are believed to be more plentiful than the records show. Sierra hares are rare with no records west of the Great Western Divide. The status of the wolverine is probably the same as reported for the past few years—rare. Two were seen this year by park rangers. Old signs of mountain beavers in Big Arroyo, altitude 10,000 feet, were the only evidence of the species this year.

Intensive trapping activity has been in progress along the western boundary of the park and has resulted in a loss of many coyotes from that general district. In other areas coyotes are well established at lower elevations. Cougars are no more numerous than in other years.

Golden eagles are uncommon but may be seen by a careful observer without much trouble. Occasional band-tailed pigeons were seen in small groups west of the Great Western Divide during the summer. In fall, they were observed in large flocks of 50 to 100 feeding on acorns in the Upper Sonoran Zone oak belt. It is estimated that 50 American ravens were in the park this year.

WIND CAVE NATIONAL PARK, S. DAK.

Bison entered the winter of 1939–40 in good physical condition despite unfavorable range conditions. Two hundred eighty-eight were counted in the 1938 roundup, and 41 calves were produced in 1939. Eighty-three bison were transferred to Indian agencies, 24 to Custer State Park, 9 to various zoos, and 9 died from natural causes. Reduction was necessary to keep the herd within the limits of its food supply. Elk also have been reduced by releasing 11 cows and 3 bulls to the adjacent Custer Recreational Demonstration Area.

Depletion of the prairie has made it necessary for antelope to seek forage in the forested areas of the park. The count was therefore not so accurate as in previous years because the animals could not be checked in bands in the open. No losses have occurred since the fencing of the park, and the antelope are in satisfactory condition.

The small area of the park affords range for but a few coyotes. Those that are present roam in and out at will. Five prairie dog towns are now in the park, two of which are expanding rapidly.

YELLOWSTONE NATIONAL PARK, WYO.

The basic and most important problem at Yellowstone continues to center around the condition of the range in northern and northeastern sections of the park. Elk is the most abundant species and, as in the past, depletes the forage of other ungulates using the same range. Through the cooperation of the Mon-

tana State Fish and Game Department and the United States Forest Service, hunting was permitted after the wapiti left the park for their winter range. A census was not possible this year because, the snow remaining soft and loose, elk were widely scattered throughout the winter. The 1938 count was 10,976. Hunting outside the park and other mortalities accounted for about 3,811 elk. Adding this year's calf crop, a mathematical estimate of the northern herd for 1939 is 10,794. The Gallatin herd and the animals remaining in the interior of the park are estimated to be about the same as in 1938.

The antelope population remains practically stationary. Noteworthy was a drifting of about 400 of these animals beyond the park boundaries during the winter. Sagebrush and other plants showed marked signs of overbrowsing in areas where elk also concentrated. This may have been the reason for the movement of many antelope from the area. Everything indicates that a maximum population has been reached for the present carrying capacity of the range. Bison came through the winter in excellent condition and had produced a good calf crop. The Hayden Valley and Fountain Flat herds planted in 1936 remained in the general areas where they were released.

During the past winter bighorns were observed in Abiathar and Baronett Peaks and on Mount Norris, while previously they had been found only on Rose Creek and Druid Peak in the Lamar district. Checks were made on the Mount Everts band in December 1938. During the winter and spring months, the bighorns were in poor condition due to range conditions, respiratory diseases, scabies, and various parasites. Bighorns, mule deer, bison, and antelopes all compete for range with the elk. No change in the mule-deer population is noticeable.

More black bears and grizzlies were actually counted this year than had been recorded since 1935. The largest number of grizzlies was found in Canyon and Lake districts, while some were reported in each of the other park areas. Apparently the badger population remains relatively stable with a few scattered individuals in the park. Rangers believe that it is "highly probable" that all suitable beaver habitats are stocked to capacity. Martens are distributed through the park and their status remains unchanged.

No count has been made of moose since 1936; however, the reports of various district rangers indicate no noticeable increase or decrease in numbers. The condition of the moose is excellent and no range problem is evident.

Trumpeter swans were found in two areas near the south and southeastern arms of Yellowstone Lake. Forty-seven adults and 17 cygnets were counted in the park in the summer of 1939. The total number of trumpeters in the Yellowstone district, which holds the last individuals in the United States, was 199 for this year, or an increase of 27 over the 1938 census. By the Yellowstone district is meant Red Rocks Lakes (Biological Survey Refuge), Yellowstone Park, and nearby waters in national forests.

YOSEMITE NATIONAL PARK, CALIF.

The black bear population in Yosemite National Park is estimated to be 29 percent higher than that of 1938. This has been a good cub year with, among others, five sets of triplets and one set of quadruplets. Two hundred known individuals were counted at various camps and garbage-disposal areas accessible by automobile. Trailside observations accounted for the remainder which were not "regulars."

Fur bearers are doing very well. It is gratifying to know that fishers are present and very well established in the park. Their status remains about the same as in previous years. Both track records and observations throughout the year show an increase of 10 percent in the marten population. In areas where otters have been regularly recorded year after year, an increase is believed to have taken place. A new group of otters were seen in September 1939 on a lake on the west slope of Jack Main Canyon. Otters are still uncommon, but the park personnel believe that there are about 4 percent more than last year. No mink records have been made in the park since 1915.

Three reports of cougars during the summer and occasional track records seem to signify that there are about as many of these mammals as last year. Mountain coyotes are common. There is no basis for figuring any change in the number of bobcats. Probably over 200 are present judging from tracks.

Mule deer are in excellent condition after passing through a light winter and unusually early spring. They seemed to congregate at higher altitudes than in the past until snows in the high country during late September and October (1939) drove them down. As a result, many deer left the park early and reports indicate that hunters are having the best season in several years.

At least two pairs of golden eagles nested in Yosemite Valley this year. One pair may have nested twice. Eagles were seen at various other places in the park. They seem to be on the increase with an estimated population of 20. Gallinaceous birds, particularly mountain quail, were more numerous in 1939 than for the past few years. Sample plot counts of mountain quail showed an average of three pairs per square mile in roughly 300 square miles of quail cover. The counts varied from one pair for 2 square miles to a high in the Deer Camp area of nine per square mile. Later observations showed an average of five young birds per brood surviving in August. The total census estimate of mountain quail, 6,300, is an increase of approximately 58 percent over 1938 counts. Sierra grouse showed an estimated increase of 5 percent with 2,100 as this year's total. The number of band-tailed pigeons in the park during 1939 appeared to be about double that of previous years. They nest in large numbers on the south talus slope of Hetch Hetchy and a number of nests were observed in Yosemite Valley. This increase coincided with reports of more pigeons in the foothills and the San Joaquin Valley.

ZION NATIONAL PARK, UTAH

A recent survey shows that although the deer in Zion Canyon are now in better condition than in former years, the vegetation has not yet had an ample opportunity for recovery. Trapping operations will therefore be continued during the coming winter. The mule deer population of the park is now estimated at 550.

The status of other species is satisfactory. A small band of Nelson bighorn has continued the slow but steady increase first noted about 3 years ago; 20 animals is the estimated total for this fall (1939). As usual a few elk wander into the park from the prolific herd introduced into Dixie National Forest from Yellowstone National Park several years ago. Carnivores and other fur-bearers showed a slight increase during the past year.

SUMMARY OF FUTURE PLANS AND NEEDS

Future plans for wildlife conservation in the areas administered by the National Park Service are centered around one objective: The insurance of a perpetual equilibrium between maintenance of natural conditions and public enjoyment of the same. This apparent anomaly requires that wilderness conditions be somewhat modified for public use, and that public use be restricted so as to interfere as little as possible with preservation of the primitive. These two operations require an unusual application of practicality and idealism. Complete attainment of this difficult and unique objective will probably never be realized, but may be closely approached if the Service is supplied with a full quota of the following necessities: First, adequate and properly trained personnel; second, land areas of adequate size and suitable location; and third, adequate freedom of action through cooperative agreements and legislative authority. All three are now possessed by the Service to a certain degree; but for maximum future success in public enjoyment of practical conservation an expansion of each one of these three requirements is necessary.

Increases in personnel are needed both for better protection of wildlife and for more thorough investigations of all problems connected with this protection. Since the functions of biological research have recently been transferred to the Bureau of Biological Survey and the Bureau of Fisheries, specific recommendations for such additional research workers as may be needed must come from those agencies. Suffice to say that the staff of 9 persons transferred to the Survey and 2 men transferred to Fisheries has for several years been entirely inadequate for the number of investigations vitally needed in the National Park System. Justifications for increases in the technical and administrative staff have been presented to the

Bureau of the Budget each year since 1933. In that year there were but 2 regular positions; in 1936 there were 27 (4 regular, 23 CCC); at the close of 1939 there are 5 regular and 6 CCC positions. Increases in protective personnel are even more necessary. Of the 20 national parks and monuments listed in the preceding section of this report not one can be truthfully said to have a ranger force large enough for its numerous requirements. Other areas, such as Katmai, Glacier Bay, and Joshua Tree National Monuments have had no protection since their establishment. The need at Glacier Bay, recently enlarged to include valuable brown-bear territory, is acute, and for 3 years has been vigorously presented to the Bureau of the Budget without avail. Inspections of both Katmai and Glacier Bay show poaching to be prevalent. Lack of active patrol of these areas has seriously lowered public opinion of Government conservation throughout Alaska as well as among informed sportsmen and conservationists in the States.

Complete conservation of wildlife is still impossible in several parks because their present boundaries do not include sufficient spring, fall, or winter range for the animals summering within them. Establishment of the parks was too often based solely upon inclusion of mountain-top scenery, disregarding range requirements of the animals which formed an indispensable part of the wilderness picture for which protection was sought. Other countries—Canada, South Africa, Belgian Congo, and Russia—have profited by our mistake, and have established their major parks as complete and independent biological units. The best we can do now, in the face of rapid commercial development, is to make such boundary extensions as are absolutely essential. Investigations show that the greatest needs for extensions to aid wildlife protection are at Yellowstone, Grand Teton, and Rocky Mountain National Parks.

Adequate freedom of action in wildlife protection has been more nearly achieved than have the other two basic requirements, namely, increases in land and personnel. It is hoped that the recent transfers of biological research to the Bureau of Biological Survey and the Bureau of Fisheries will facilitate efficient administration of conservation matters by the National Park Service in all of its areas. There are still some local problems that will require closer cooperation with State fish and game authorities, but with the broadened influence obtained through the above-mentioned transfers, it is believed that these can be handled more easily in the future than heretofore. Need for legislative authority in addition to that already possessed is not now apparent except as regards disposal of surplus animals. Existing authority covers surpluses at Yellowstone and Wind Cave National Parks only. It would be desirable to have this authority extended to all park areas, permitting disposal of such surplus animals as might be detrimental to the range, to other animals, or to humans. Through such authority the National Park Service could in every park more nearly fulfill its obligation to preserve for the public all the various natural components that go to make up a complete wilderness area.

APPENDIX A.—WILDLIFE CONSERVATION IN AREAS ADMINISTERED BY THE NATIONAL PARK SERVICE OF THE UNITED STATES DEPARTMENT OF THE INTERIOR, 1930–39

Compilation of census data, 1939

LARGE MAMMALS

Areas	Black bear	Grizzly	Wapiti (elk)	White-tailed deer	Black-tailed deer	Mule deer	Moose	Caribou	Prong-horn	Bison	Bighorn	Mountain goat
NATIONAL PARKS												
Acadia				800								
Bryce						200						
Carlsbad						125						
Crater Lake	50		6	6	80	20						
General Grant	5					200						
Glacier	350	100	1,950	1,600		1,100	230				200	750
Grand Canyon						250			20		200	
Grand Teton	60	10	250			225	110				20	
Great Smokies	225			40								
Hawaii												
Lassen	20				650	150						
Mammoth Cave				6								
Mesa Verde	5					(1)						
Mount McKinley	10	50					200	14,000			2,000	
Mount Rainier	100		25		650							450
Olympic	(1)		(1)		(1)							(2)
Platt						4				21		
Rocky Mountain	80		1,000			1,400					330	
Sequoia	150					1,200					(2)	
Wind Cave			135			50			60	204		
Yellowstone	500	300	12,300			1,000	700		800	850	250	
Yosemite	515					7,000						
Zion			5			550					20	
SOME OF THE NATIONAL MONUMENTS												
Bandelier	5					100						
Gunnison	3					130					55	
Boulder Dam						115					270	
Canyon Chelly	10											
Capulin Mountain						20						
Chaco Canyon						3						
Chiricahua				35								
Colorado						(1)				18		
Craters of Moon												
Death Valley						6					500	
Lava Beds						800			(2)			
Natural Bridge						10					4	
Organ Pipe				50		50			10		25	
Saguaro				15		35						
White Sands									14			

[1] Common.

[2] Rare.

Compilation of census data, 1939—Continued

OTHER MAMMALS

Areas	Marten	Fisher	Wolverine	Otter	Badger	Red fox	Gray fox	Coyote	Wolf	Cougar	Bobcat and lynx	Beaver
NATIONAL PARKS												
Acadia						(1)						200
Bryce					25	(2)	30	30		4	30	
Carlsbad					2		50	10		4	25	
Crater Lake	(1)	(2)		(2)	(2)	10		5		(2)	(2)	(2)
General Grant								12		4		
Glacier	700	4	3	35	35			500	1	15	{4 / 4 20}	900
Grand Canyon				(2)	(2)		(1)	(1)		5	(1)	10
Grand Teton	(1)	(2)		(2)	(2)	(2)		50		3		(1)
Great Smokies						150	500				(2)	
Hawaii												
Lassen	(1)	(2)			(2)	(2)		(2)		3	(2)	
Mammoth Cave						(2)	(1)					
Mesa Verde								(1)		(2)	(2)	
Mount McKinley	200		10	(2)		200			50		(3 4)	200
Mount Rainier	(1)					35		300	1	7	200	55
Olympic	(2)	(2)						(2)		(2)	(1)	(2)
Platt											2	
Rocky Mountain	(1)					(2)		125		10	(2)	(1)
Sequoia	(2)	(2)	(2)		(2)		(2)	(1)		25	(2)	
Wind Cave								5				
Yellowstone	(1)			(2)	(2)	(2)		(1)			{(2) / (3 4)}	(1)
Yosemite	300	75		150		(2)	(1)	(1)		20	225	
Zion					15		60	10		15	50	
SOME OF THE NATIONAL MONUMENTS												
Bandelier							5	30		2	(1)	4
Gunnison					(1)			(1)		2		
Boulder Dam							(1)	(1)		5	(2)	200
Canyon Chelly								75				
Capulin Mountain								3			5	
Chaco Canyon							15	50			12	
Chiricahua								(2)		1		
Colorado							(2)	(1)		(2)	(2)	
Craters of Moon												
Death Valley					(2)		25	250		10	50	
Lava Beds								40		(2)	60	
Natural Bridge					5		20	6				
Organ Pipe								25		4		
Saguaro								25		2	10	
White Sands					15		20	40				

[1] Common. [2] Rare. [3] Uncommon. [4] Indicates lynx.