RESEARCH IN THE NATIONAL PARK SYSTEM, AND ITS RELATION TO PRIVATE RESEARCH AND THE WORK OF RESEARCH FOUNDATIONS.

Prepared by the National Park Service

February 10, 1945.

I. SUMMARY OF RECOMMENDATIONS CONCERNING RESEARCH IN THE NATURAL SCIENCES, HISTORY, AND ARCHEOLOGY.

1. That additional administrative and technical personnel be provided, including the various field areas, in order that the following duties can be developed and performed efficiently:

   A. Continue and complete studies of all basic park resources with a view toward defining specific research needs for various areas, and integrating proposed research projects with administrative requirements.

   B. Outline a program of desired research projects for individual areas which can be most logically undertaken by cooperating organizations, and the development of liaison activities aimed toward the fostering of such cooperative assistance.

   C. Plan and carry out a systematized research program under National Park Service auspices in accordance with the needs of various areas in the National Park System.

   D. Organize and evaluate data derived from past and current research in a manner that will insure its ready adaptation to administrative and interpretive needs.

   E. Provide facilities and personnel required in an authentic interpretation of basic values in the various areas, as well as those which are necessary for the maintenance, use, and care of valued records, collections, etc.

   F. Secure and evaluate the basic data for Congress, the President, and the Secretary in considering historical, archeological, scenic, and scientific areas proposed for inclusion in the National Park System or newly acquired areas.

   G. Secure and evaluate the basic data needed in making a nationwide survey of historic sites to insure a systematic program of historical conservation for the Nation as required by the Act of August 21, 1935 (49 Stat. 666).

   H. Investigate, identify, and evaluate all features of outstanding scenic, scientific, historic, and archeological importance relative to existing and future recreational and inspirational resources of the National Park System in the United States and territorial possessions with a view toward recommending procedures designed for protection, perpetuation and proper utilization of such resources.

2. Embark upon a system of in-service training designed to broaden the understanding of Park Service objectives, administrative procedure and values of areas under National Park Service administration with a view toward developing and utilizing the full capabilities of personnel and bringing about as complete an understanding of values associated with integral units of the National Park Service organization as possible by all employees. This should include in-service training in the utilization of allied techniques of history, historical architecture, museology, and historical archeology in the identification, preservation, and interpretation of historic sites and objects.

3. That Civil Service requirements be revised so that men with specialized training and of highest caliber are given preference.

4. That research institutions and universities be encouraged to use more effectively the large collection of source materials found in the historical and archeological areas of the Service.

5. That research foundations be solicited for funds to undertake studies that will advance the frontiers of knowledge and aid the Service in the treatment, preservation, and interpretation of Service areas.

6. That the Office of the Director be transferred back to Washington so that its staff will have ready access to the large depositories of documentary and archival source materials.

7. That the Federal Government provide funds for research fellowships in specified universities and colleges for the prosecution of collaborative research studies helpful to Government agencies.

II. RESEARCH IN THE NATURAL SCIENCES

Basic research in geology, paleontology, biology, and botany is a necessary preliminary to planning for development and use of the 45 scenic and scientific areas exclusive of archaeological areas administered by the National Park Service. Research is an important adjunct to administration of Park Service areas since the location of buildings and roads must be based on a prior knowledge of the location and relative merits of geological features and biotic communities, first to avoid their destruction and second to make them accessible for visitor enjoyment where this can be done without detriment to their preservation and continuance in a natural state. A knowledge of park values is also vitally essential for authentic and proper interpretation which is a primary objective of the National Park Service. The basis of such interpretation is in organized research.

In a number of the parks which were created at an early date, basic research has been advanced to a reasonable degree, yet much more remains to be done than has already been accomplished. The need is particularly acute in the areas of more recent acquisition and those where travel has not as yet been extensive. This applies in particular to the areas administered by the National Park Service in Alaska.

The research program must procure a constant flow of essential facts relative to the natural features, the interrelations of life forms, history and prehistory and their interpretation to visitors or to administrative policies. To make the facts worthwhile, the researcher must be free to discover and report with complete impartiality all facts ascertained in a given situation. Basic data are frequently obtained through the cooperation of outside agencies since to date most parts do not have adequate funds and personnel to carry on a sustained research program. This cooperation in research has been forthcoming to a limited extent from universities, colleges, or qualified individuals as well as from other Government agencies particularly the Geological Survey and the Fish and Wildlife Service. Individuals and privately controlled universities have more opportunities to conduct pure research not limited to the immediate solution of a practical problem than have Government agencies.

The National Park Service has indicated a willingness to provide access to its areas and thereby has encouraged scientists and students from universities to utilize the park areas as field laboratories. In many instances, graduate students do actual field work in a national park area and prepare theses to support their candidacy for academic degrees. In such cases, the result of their field work is carefully checked by professors and in general can be relied upon. This type of research calls for the expenditure of little time or money on the part of the Service but often results in a valuable addition to the fund of available knowledge which can be applied to practical problems of administration and interpretation for the Public. In some instances

cooperative organizations, such as natural history or museum associations, usually directed by local interpretive personnel in the areas, sponsor research designed to produce data necessary in furthering interpretive programs. This should not be construed to mean that the National Park Service can avoid the responsibility of organizing and prosecuting a vigorous research program when time, funds, and qualified personnel are available. Results of routine observations or taxonomic studies are not classified as the results of research in the strict sense of the word. True research involves bringing to light new data, information of a new or revised interpretation. However, it frequently happens that such new data may arise from routine observations or taxonomic studies. Thus, these routine duties, usually carried on by park naturalists, rangers, foresters, etc., have an immense value in the park program. Investigations of plant assemblages, ecological problems, wildlife diseases, insect infestations, bird migration, and fish culture require a thorough and almost constant surveillance.

RESEARCH AND THE INTERPRETIVE PROGRAM

Information given to visitors by means of lectures, conducted trips, museum exhibits, signs, markers, and printed literature must be accurate and readily understandable. This interpretation of park features must be based upon research which is far more comprehensive and technical than the actual information imparted by the customary mediums of illustrated talks and prepared exhibits. Evaluation of previously accumulated facts obtained by basic research is necessary in developing an easily comprehensive portrayal of park values. This frequently involves comparisons with similar features or occurrences beyond the park borders; for example, the location, height, and volume of geysers, volcanoes, or waterfalls in other parts of the world are helpful in appreciating the natural wonders which the visitor is witnessing. Plant and animal species or human cultures related to those in the park or historical events which proceded and followed the local events are other common examples.

The preparation of museum exhibits involves a specialized type of research. Visual presentation by means of habitat groups, dioramas, and graphic devices requires an infinitely greater amount of factual information than is necessary in a printed description. Frequently the entire field of a highly specialized subject must be explored in an effort to supply missing details made obvious by the visual medium yet overlooked in what at first may appear to be an ample description in the graphic account. Original objects must be sought out, their significance evaluated and, in the absence of complete evidence, a careful reconstruction prepared by deduction. Effective interpretation also involves a type of research frequently overlooked and neglected. Visitor interest and comprehension must be determined by experiment

counts, sampling, and long-range observation of reactions. The problems are similar to those encountered in other fields of education and involve methods used in applied psychology.

Closely related to interpretation by the museum method is the matter of building and preserving systematic collections of scientific and historical objects. Only a small percentage of this material is used for general exhibition purposes but the housing and maintenance of the collections where they are readily available to the specialist and advanced students as well as members of the park staff concerned with research and interpretation is actually more important though less obvious than the public exhibit rooms.

AGENCIES COOPERATING WITH THE NATIONAL PARK SERVICE IN SCIENTIFIC RESEARCH

The following Government agencies have at various times assisted in major research projects for which they have special facilities:

U. S. Geological Survey, Fish and Wildlife Service, Smithsonian Institution, National Museum, National Herbarium.

Occasional research assistance has been given by the U. S. Bureau of Standards, Bureau of Soils and Chemistry, Bureau of Entomology and Plant Quarantine, and the Bureau of Plant Industry.

Non-Federal agencies other than universities which have given outstanding assistance are the Carnegie Institution of Washington, American Museum of Natural History, Carnegie Museum of Pittsburgh, and the Chicago Museum of Natural History.

Universities which have assisted by extensive research over a period of years are Yale University, University of Arizona, University of California, University of Michigan, and University of Illinois.

The Yosemite School of Field Natural History over a period of 25 years has been instrumental in giving applied training to naturalists who have engaged in specialized research for the National Park Service. Research has also been sponsored by a number of the 15 natural history and museum associations of the various parks and monuments. These quasi-government organizations were established to further the work of research and interpretation in their respective areas and have, insofar as funds permitted, underwritten the expenses of individual researchers in special problems related to the parks.

GEOLOGICAL RESEARCH

Interpretative programs, as well as many administrative procedures necessary in the administration of National Park Service areas are founded upon continuing research conducted in varied related fields. The field of geology is one of the most important since all of the scenic areas are of vital geological significance. Many are of primary geological importance and some, like Grand Canyon and Yellowstone, are recognized as unduplicated types in their particular field throughout the world.

An understanding of the varied earth forces, based upon careful research, is vitally important to an understanding and proper administration of these areas. Not only are these earth forces significant in themselves, since scenic grandeur is based upon past geological events and processes, but they are determining factors in the character and distribution of plant and animal life in these areas, their geography, their climate, their accessibility, the nature and culture of their inhabitants—both primitive and modern—and even their history.

While research done and observations noted during the brief span of twelve months is minimized by time's long perspective, these studies, if continuous, become impressive as the years increase the sum total of their findings and research assumes its true significance. Studies are made of the records of erosion from every cause. Recession and related actions of glaciers are studied in a number of the national parks, a project which is coordinated with similar activities sponsored on a broader scale to include glacier areas in many parts of the world by the Committee on Glaciers of the American Geophysical Union. Thermal activity, earth movements, the distribution of rocks and minerals are also studied. Ground water problems, particularly in the west and southwest, have been investigated. Of broad scope and far-extended value are the joint geology-engineering investigations which were conducted on structural stone and oils derived from various types of rocks. Extensive investigations were also made by Service geologists of oil and gas prospects in relation to new acquisitions in the Olympic National Park and adjacent terrain. This research was accompanied by maps and reports on the complex geology of that region as related to possible accumulation of oil and gas.

Studies related to vulcanology are of great importance in certain areas, notably in Hawaii National Park, Lassen Volcanic National Park, and Yellowstone since these are of primary value in the significance of those areas. In addition to seismological records, daily observations of volcanic activity is essential to an increase in understanding the relations of active volcanoes such as Kilauea to others in other parts of the world.

PALEONTOLOGICAL RESEARCH

Paleontological research is an important function in connection with a number of important Service areas. A few areas are of outstanding

paleontological importance, such as Dinosaur and Fossil Cycad National Monuments, while in others, such as Grand Canyon, Yellowstone and Big Bend National Parks and Death Valley National Monument, paleontological factors are of great significance in both interpretative activities and administrative consideration.

At Dinosaur National Monument the in situ profiling of fossil remains which will be the principal feature of visitor interest still requires extensive research and investigation before proper development can be obtained. In situ preservation, aside from correct identity of fossil remains, involves some highly specialized phases of chemical and engineering research to solve the many inherent problems yet unsolved in permanent housing, protection from deterioration and effective interpretive display.

THE PROGRAM OF WILDLIFE RESEARCH IN THE NATIONAL PARK SYSTEM

It is highly important that a comprehensive program of wildlife research be developed for areas under the jurisdiction of the National Park Service. That Service has a unique opportunity and a tremendous responsibility to preserve climax examples of Nature's scenic achievements, geologic wonders and outstanding wildlife communities. Not alone in America, but throughout the world, the national park idea is regarded as the implement for saving the primitive. Germany, the Netherlands, Belgium, the Union of South Africa, the Argentine, Canada, and many other countries as well as the United States, have established parks. In all cases, conservation of wildlife communities - the aggregation of plants and animals - has been a major objective.

The objectives sought by establishment of these areas vary widely. Numerous countries have established extensive parks for much more restricted purposes than our own. A large portion of the Parc National Albert, Belgian Congo, is closed to all ingress by the general public as a means of preserving the primitive character of the native people. Kruger National Park, South Africa, was established for the benefit of the wildlife. People may enter and have accommodation, but only to the extent that they do not infringe on the "primary owners" - the animals.

The wildlife objectives for the national parks of the United States are as follows:

1. To preserve and restore, insofar as possible, the flora and fauna in its natural and undisturbed state in all park areas.

We should keep for ourselves and post-rity, characteristic portions of our country in the unspoiled pristine condition in which Lewis and Clark found it when they made their historic explorations

across the continent. To keep the primitive picture as it was is practically impossible, for not only have conditions changed within the park areas, but activities adjacent to the parks influence greatly the plant and animal life within them. The best that can be done is to approximate the primitive biological relationships.

The worthy objective of preserving samples of primitive America, which once destroyed cannot be replaced, is one which we are morally obligated to fulfill for the generations of the future. The right to use what our predecessors have left us is not vested in us alone to dispense with as we choose, for it may hereafter be a subject of sorrow, or a cause of injury to millions, if we consult only our present convenience. What is left us belongs as well to generations of mankind which are to follow us.

Minor objectives in park development such as might pertain only to Man's convenience, although of some merit in themselves, must receive secondary consideration when they conflict with the primary objective of preserving the primitive. This thought should override many developments which are harmful to the main objective and which can be dispensed with.

2. To provide the people with the opportunity for seeking the higher values of the plant and animal life of the park areas.

Provision of the opportunity for people to seek higher values must, of course, be coordinated with the preservation of the area; otherwise the purpose of the park is destroyed. The large crowds which more and more in recent years have been visiting the parks must necessarily be concentrated in restricted areas in order that the maximum amount of park lands may remain unspoiled. With careful planning, the needs of the people and the wildlife can largely be reconciled. Only opportunity for the higher uses of the parks should be encouraged for that is the purpose to which they are dedicated. Quality of enjoyment rather than quantity should be stressed. Constancy to the proper balancing of these first two objectives, namely "preservation of primeval conditions" and then "enjoyment by the people" can be made a certainty only by employment of a staff whose members are conversant with the policies of the Service, and imbued with a devotion to its ideals.

* * * *

3. To secure, through research, a thorough knowledge of the flora and fauna of all park areas.

The achievement of our first two main objectives is in a large measure dependent upon the fulfilment of this third objective. This will be pointed out under the four subheads below in which the uses of the information gained through research are discussed. Not only is this third objective necessary for the accomplishment of the first two objectives, but it is in itself a worthy end.

(1) The results of biological research will serve as a guide in planning park developments in such a way as to cause the minimum disturbance to the flora and fauna.

It is obvious that numbers of people cannot dwell in a park without displacing the fauna from human centers and otherwise disrupting the sensitive ecological relationships of nature. To minimize the disturbance to the biota as much as possible, development and administration must be based on information of the park wildlife.

(2) The knowledge of the biology of each park is necessary for the proper management of the flora and fauna to insure its perpetuation in a natural state.

Although poaching has been reduced to a minimum in all but a few parks where it, too, will be eliminated as conditions grow more favorable, yet this part of conservation has not been enough. The need to supplement protection with more constructive wildlife management has become manifest with a steady increase of problems both as to number and intensity. Time has proven that management of some sort would have to be involved to save certain situations, especially as the parks were opened to thousands of visitors causing fresh complications.

The rigors of civilization have injured the fauna of the country as a whole. In a national park the damage cannot be undone by policing a boundary line. This is protection and it is necessary, but it does not correct conditions already operative within the park. These must be sought out where they are doing damage and dealt with there, but it is important that the hand of interference should not be exercised beyond the point that is necessary to do the work. The aim of management is to restore a natural condition which will take care of itself.

Few persons, either park administrators or members of the public, are ecologists. Few have an understanding of natural processes, of ecological changes, and of the cycles to which plants and animals are subject in Nature. Proponents of "sky-line" roads seldom foresee the overwhelming blow that will be dealt to plant communities that lead such a precarious existence on the fringe of their soil and moisture requirements and their tolerance of sun and wind. Advocates of artificial measures for stabilizing a meadow, a brushy border, a pond or other feature, generally do not recognize the power or direction of normal succession. They do not know that each stage has its peculiar values and inhabitants, both animal and plant. Biological research can point out probable results of proposed cutting, planting or stabilization. Recognition that Nature is ever repeating, that death is essential for life, would greatly lessen the number of so-called "improvement" projects.

Although a start has been made for solving some of the many wildlife problems confronting the administrators in the various parks,

most of the work yet remains to be done. There are many situations awaiting study before their solution can be understood and natural conditions restored.

(3) The information secured through scientific studies will serve as a source of information for interpreting the flora and fauna to the visitors through the Service's educational program.

At the present time there are few manuals and booklets on the plants and animals of our parks. Visitors would be able to get much more from their outings in the parks if handbooks on the wildlife were generally available. However, in most parks the necessary studies and field work for these manuals have not been done and the information needed is generally lacking.

(4) A record of present conditions would serve as an historical record of the biology of an area for the use of future generations.

Nature is not static, but changing constantly so that one or two hundred years from now the wildlife in the parks will no doubt be quite different from today. These natural changes will probably be augmented by the effects of civilization adjacent to the park areas, and also by the continued use of them by many people. Because there is some permanence to parks, a biological record of existing conditions could be compared with future conditions on the same area. Such an historical record made today would be of inestimable value to future administrators in husbanding the animal life they inherit from us. An inventory of the park wildlife conditions would be a valuable park adjunct to preserve with it.

In the Act of 1916 establishing a National Park Service, Congress specifically excluded the fishes from the protection thrown around other animal life of the national parks. Despite this inconsistency, and the introduced artificiality of stocking, the National Park Service attempts to maintain a wilderness type of use of this resource. Seasons, creel limits and other factors are regulated to the end that the fish shall be as wild as possible and interference with the physical environment is not permitted. The national parks should therefore be excellent areas in which to pursue aquatic studies of a purely observational type. With greater and more pronounced deviation of non-park streams from the normal or original condition, comparative studies should become even more important to aquatic biologists and the fishing public.

The quality of fishing throughout this country as a whole has declined steadily, while in most of the national parks it has been maintained reasonably well. Anglers have naturally concentrated on the best remaining waters. As long as park law permits regulated utilization of fish life, continued investigation will be necessary to keep current our knowledge of stream and fish conditions, and means for maintaining them as well as wilderness-type use.

To execute this research program it is essential that a trained personnel be establised on a permanent basis. Only in a permanent staff can we hope to have men who would be thoroughly familiar with the flora and fauna of a region, so necessary to properly carry out a cumulative research program. Range studies and predator relationship studies must be carried on over a period of several years. On many definitive research problems, men on temporary assignment can produce good results by intensive application to a particular problem for a limited length of time. It is essential, however, that any such program be under the immediate supervision of permanent, trained technicians. Otherwise their efforts will result only in sporadic additions to the total fund of human knowledge which, although valuable in themselves, may be published at the end of an investigation and the results never reach application in the field.

Appendix "A" presents a comprehensive list of projects in wildlife research which should receive attention in the near future. Subjects on which work is being done at the present time are noted as "under way."

III. THE OPERATION OF THE HISTORIC SITES ACT AND THE WORK OF THE ADVISORY BOARD ON NATIONAL PARKS, HISTORIC SITES, BUILDINGS, AND MONUMENTS TO FEBURARY 10, 1945

The Act approved August 21, 1935 (49 Stat, 666), declares it to be a national policy to preserve for public use historic sites, buildings and objects of national significance; empowers the Secretary of the Interior, through the National Park Service, to plan and execute a program for the survey, acquisition, development, and operation of historic and archeological sites which possess exceptional value as commemorating and illustrating the history of the United States; and authorizes the appropriation of funds for these purposes.

Pursuant to the authority conferred upon him, the Secretary of the Interior, on February 28, 1936, established a Code of Procedure to put into force and effect the provisions of the Act of August 21, 1935, and directed the National Park Service to study and investigate historic and archeologic sites and buildings throughout the United States and list, describe, tabulate, classify, and evaluate such sites for the purpose of developing a comprehensive, long-term plan for their acquisition, preservation, and use. At the same time, as authorized by Section 3 of the Historic Sites Act, the Secretary appointed an Advisory Board on National Parks, Historic Sites, Buildings and Monuments, composed of 11 persons, including nationally-known authorities in the fields of history, archeology, and architecture. At present, the membership of the Board is as follows:

Mr. Edmund H. Abrahams, Chairman.
Dr. Clark Wissler, Vice-chairman.
Dr. Frank M. Setzler, Secretary.
Dr. Thomas Barbour.
Dr. Herbert E. Bolton.
Mrs. Reau Folk.
Dr. Ralph W. Chaney.
Dr. Fiske Kimball.
Dr. Waldo G. Leland.
Mr. Charles G. Sauers.
Mr. Thomas Wallace.

The establishment of an orderly program under this legislation requires the systematic nation-wide inventory, investigation, and classification of historic sites to determine which possess national importance within the scope of the Act. Determination of national importance is reached by joint consultation between the Advisory Board and the National Park Service.

In executing the work of the historic sites survey, this Service, together with the Advisory Board, has adopted a policy of classifying

historic sites under 15 groups, representing the main phases of American history, and of classifying archeological sites into 5 groups, representing the prehistoric culture areas in the United States. Within these groups, the most representative and most significant sites will be designated as of national importance within the scope of the Act.

To survey and designate an historic site under the Act of August 21, 1935, certain successive steps must be taken with regard to that site, each of which involves a definite amount of research and study. The steps are outlined in a Code of Procedure established by the Secretary on February 28, 1936. These steps include:

1. A study of the site and a determination of its national importance within the scope of the Act. Before classifying a site as of national importance and, therefore, eligible under the Act, the Advisory Board requires a comprehensive report, involving research and field investigation, which will serve as a permanent basic record with regard to the area involved. This applies whether a site is approved or disapproved. Comprehensive, accurate, and definitive reports on proposed sites are necessary in order to protect the Federal Government in classifying sites as eligible for appropriations under the Historic Sites Act or as ineligible for such appropriations.

2. If a site is determined to be of national significance, and protective measures are necessary, a boundary study and other technical studies are then made. If the site is to be administered under a cooperative agreement, the terms of the agreement must be worked out and final contract examined and submitted to the President, through the Bureau of the Budget, to make sure that the project is in accord with the financial program of the President. Submission of the project to the Prsident is not required by the terms of the Historic Sites Act but has become a settled policy.

560 historic sites in 48 States and the District of Columbia have been inventoried in the 15 groups representing the main phases of American history and are ultimately to be investigated in accordance with the wishes of the Advisory Board and the provisions of the Act. 334 archeological sites have been listed in the 5 groups representing pre-historic cultures in America. The latter sites were selected by a committee of nationally-known archeologists and recommended for prior consideration to the National Resources Board in 1934. Reports on 9 of the 15 themes representing the main phases of American history have been completed and the preliminary work undertaken on several others. Progress with regard to the 5 archeological themes has been made, but the work proceeds at a slower pace because the National Park Service historic sites survey staff in archeology has been much smaller than the staff of historians.

In the period between February 1936 and February 1945, the Advisory Board, or its Interim Committee, has met 20 times and has given

consideration to 379 projects involving proposals to establish historic sites, monuments, memorials, or additions to existing historical areas. Of those, 257 were approved as eligible, within the scope of the Historic Sites Act, for some form of recognition to be accorded by the Secretary of the Interior (honorary designation, marking, cooperative agreement, or acquisition, as might be deemed practicable); 55 were disapproved; and further consideration of 67 was postponed until the Advisory Board could judge them in relation to similar areas in their respective thematic classifications. It should be noted that the Advisory Board decision has reference to the question of the relative historical importance of sites. The Secretary has deemed it practicable and desirable to establish only a small fraction of the historic sitestheoretically possible because of the rich heritage of the Nation. Since August 31, 1935, only 16 historic sites have been established under the Historic Sites Act. Of these, 6 are in non-Federal ownership and are privately administered by agencies cooperating with the National Park Service. Of the 10 that are Federal property, the cost of administration in one case is taken care of by a group of cooperating "associates," and, in another case, the cost of both administration and maintenance is being borne by a cooperating agency. In still another instance, a cooperating Association (Roanoke Island Historical Association) has agreed to donate profits from its annual pageant, above a certain percentage, to be used for the enlargement and improvement of the area. One national historic object has been designated under the Historic Sites Act. This is the famous Cyclorama of Gettysburg. The Historic Sites Act afforded a means of acquiring this celebrated painting for Gettysburg National Military Park, without cost to the United States, through a cooperative agreement with the owner, by which the interests of the owner will be liquidated by small fees collected from visitors.

It is thus obvious that the Historic Sites Act provides a means of effecting great economies and savings to the Federal Government in the operation and maintenance of historic sites; and it should be remembered that, in the long run, the cost of operation and maintenance exceeds the cost of acquisition. The Historic Sites Act provides a means of having much of this long-term cost met by agencies other than the Federal Government. It has still other possibilities for good. The Association for the Preservation of Virginia Antiquities owns and administers a portion of historic Jamestown; the Federal Government owns the remainder of Jamestown and Jamestown Island and has placed it under the administration of the National Park Service. The establishment of the Jamestown Island National Historic Site has, for the first time, made possible a unified program of interpretation and development for the whole Jamestown Island area, giving increased efficiency and effectiveness to the historical program of this portion of Colonial National Historical Park.

The Advisory Board on National Parks, Historic Sites, Buildings, and Monuments is a general advisory body to the Director of the National Park Service and the Secretary of the Interior on all matters

relating to the national parks, whether scenic, scientific, or historical.

A great variety of projects and problems in the field of the natural sciences have been referred to the Board for consideration and advice. Among them have been the question of restoring the Lamar bison herd of Yellowstone National Park to its original status as a wild herd, in order to reduce the infringement of artificial management measures on the primitive environment. The Board has spent some time on the problem of surplus hoofed animals, which in a few units of the National Park System have become so numerous as to threaten to create permanent impairment of natural values and the general aspect of the landscape. Consideration has also been given and recommendations made on the need for factual studies in geology essential to interpretation, a survey and mapping of the geophysical characteristics of the National Park System, Scientific Reserve Areas, damage to natural values caused by excessive recreational use, acquisition of collections and the use of park lands for military and defense purposes.

Scenic and scientific areas which have been suggested as additions to the National Park System have been examined, evaluated and recommendations made for or against such acquisitions based on their individual merits.

Procedures in developing interpretative facilities with due consideration for the preservation of natural values have received the attention of the Board in several instances; for example, the problems inherent in the proposed profiling of an in-situ exhibit of fossil remains at Dinosaur National Monument.

Recommendations have also been made regarding the research program of the National Park Service directed toward the assurance of continuity of research facilities by Service personnel.

IV. HISTORICAL AND ARCHEOLOGICAL RESEARCH AND INTERPRETATION IN THE NATIONAL PARK SERVICE.

The National Park Service is at the same time playing the two basic roles of curator of research materials and research investigator. Neither function can be neglected without great detriment to the sound administration, scientific preservation and authentic interpretation of the eighty odd historical and archeological areas now in the National Park System.

In this report we wish to outline the types of basic primary source materials in history and archeology of which the National Park Service is curator or guardian. We also wish to point out the extent to which the National Park Service as independent or collaborating research investigator is making use of these research materials. This accomplished we should like to sketch the broad outlines of National Park Service research needs, the general problems which have arisen, and possible ways of improving the research and development programs through reorganization and by collaborative undertakings or special research fellowships.

THE PRIMARY SOURCE MATERIALS IN HISTORY AND ARCHEOLOGY OF WHICH THE NATIONAL PARK SERVICE IS CUSTODIAN OR CURATOR

The type of research materials in history, archeology, and anthropology under National Park Service protection are many and varied and include not only man-made objects and structures but even man and society. However, the basic law establishing the National Park Service and the Executive Orders establishing the National Monuments make the preservation of man-made structures and objects the chief duty of the National Park Service.

In the purely archeological field, the National Park Service possesses an important portion of the rich prehistoric and historic remains relating both to the Indians of the Eastern States and those of the Southwest. While part of Ocmulgee National Monument and a minute portion of the Southwestern National Monuments have been studied archeologically, it is fair to say that these investigations hardly mark a beginning in the scientify study of the vast archeological reserves of the National Park Service. Even in the case of such long established areas as Mesa Verde, Chaco Canyon and Wupatki, although there have been a number of well-known excavation projects, many archeological sites of key importance within the parks not only have not been explored archeologically, but funds and scientific personnel have not even been available to permit the accurate spotting of the thousands of archeological sites on a map. The still unexplored archeological resources of the National Park Service, especially in

the Southwest, are truly vast. In the East, the potentialities of what might be termed the archeology of early American culture are just becoming known as the result of National Park Service partial excavation of such sites as Jamestown Island, Yorktown and Saratoga battlefields, Appomattox Court House National Historical Monument, and Hopewell Village National Historic Site.

We have already sketched the initial archeological projects of the National Park Service. Though this work is new--mostly dating from about 1933--the results of National Park Service excavations at Jamestown, Hopewell, Yorktown, Saratoga and elsewhere have brought into National Park Service possession a large and varied body of museum materials or cultural objects relating to American economic, military, and social history. In some cases, the extent of these archeological finds are sufficiently great to constitute distinct contributions to certain phases of American cultural or technological history, and in all cases the objects recovered by National Park Service archeological enterprise have basic value as authentic materials to be used in comparative studies. That is to say, though in a few fields the number and quality of objects recovered by National Park Service archeology might constitute a legitimate study in themselves, museum experts and social historians engaged in definitive studies should arrange to inform themselves with regard to the National Park Service collections generally. For example, the stocky of trade beads at the Jamestown archeological laboratory might be examined in a comparatively short time, but no one writing a dissertation on early American trade beads could afford to ignore the National Park Service collections.

In the field of architectural history, the National Park Service possesses a truly great array of structures beginning with the prehistoric pueblos and cliff dwellings of the Southwestern National Monuments and including type dwellings representative of almost every important period of American history. For example, the late sixteenth century is represented by the site of Fort Raleigh on Roanoke Island, never yet subjected to scientific archeological research. Among the seventeenth century structures preserved by the National Park Service are Fort Marion at St. Augustine, Florida, the ruins of the seventeenth century John Washington Site at George Washington Birthplace National Monument, and the ruins of historic Yorktown and Jamestown within Colonial National Historical Park, Virginia. The eighteenth century plantation house is exemplified by the Moore House at Yorktown, and the memorial mansion at George Washington Birthplace National Monument. The eighteenth century town houses are represented by numerous surviving or restored structures in the town of York itself. In nineteenth century architecture the Service boasts such important period structures as the Philadelphia Custom House, the Salem Custom House, the Lee Mansion at Arlington and the Vanderbilt Mansion at Hyde Park. The twentieth century styles are found in the Lincoln Memorial in Washington, D. C., and other memorial buildings administered

by the Service. In listing the resources for the study of architectural history, one must consider also the voluminous measured drawings and photographic records of the Historic American Buildings Survey which the National Park Service has conducted in collaboration with the American Institute of Architects and the Library of Congress.

The National Park Service and the Department of the Interior have in their care voluminous quantities of historical documents relating to the establishment and the history of both the National Park Service and the separate park units in the National Park System. This is true despite the transfer of a considerable body of National Park Service and Interior Department papers to the National Archives. The Branch of History of the National Park Service is endeavoring to supplement this general file data by collecting the private papers of former National Park Service officials, former park superintendents, and others associated with the National Park movement. That a definitive history of the National Park Service based on these general files and on other material still in private hands would be a useful aid is admitted by everybody. The history of the individual park areas, such as Yellowstone or Yosemite, would also be a distinct contribution to human knowledge. It is not too much to say that the establishment of the great scenic parks in the West is a part of the story of American Westward exploration and settlement. For instance, the discovery and establishment of the Rainbow Natural Bridge National Monument is a thrilling story of the exploration of a difficult country known only to Indians and perhaps one or two white men.

Also important are the research materials collected in the course of the Historic Sites Survey now being carried on under the authority of the Historic Sites Act of August 21, 1935. Included in this material are copies of rare maps, abstracts of early documents, and special studies bearing on the location of disputed sites, for in the final analysis each site of recognized national importance must be exactly located if possible. The claims made for the various sites must also be authenticated. A body of data similar to that of the site survey is contained also in the site study files of the Natchez Trace Parkway project of the National Park Service. Both bodies of material deal with prehistoric sites as well as with sites of the historic period.

Aside from the general files, and the site survey files, the historical manuscript collections of the National Park Service are admittedly small, but are nevertheless important. The documents relating to the Chesapeake and Ohio Canal in the National Park Service possession would furnish the basis for one or more good monographs, though outside collections would also have to be studied. The second largest collection of documents relates to Hopewell iron furnace. They are not sufficiently numerous to compile a dissertation therefrom, yet would afford a good starting point for an enterprising scholar.

But, if the National Park Service historical manuscript collection is small, the National Park Service can point to the historical areas themselves and to the physical remains on the areas as fundamental bodies of historical source material of basic importance. For instance, if our Hopewell manuscripts are limited in number, we have the physical remains of the Hopewell furnace and most of its dependent structures. We also have the archeological story of those Hopewell buildings or structures no longer visible to the eye. What is true of socio-economic historical areas such as Hopewell is also true of military areas. The terrain of Saratoga battlefield was as important a conditioning force in that great history-making conflict as many a dispatch or order given by the military leaders. Indeed, in the case of Gettysburg, can we not say that the terrain at and around Little Round Top was more far-reaching in influence than the courage of Pickett or the determination of Lee? We may conclude, therefore, that on many a National Park Service historical or military area, we may show physical geography or man-made fortifications that determined the course of history. No historian worthy of the name can disregard the basic values of this historical evidence.

In the Great Smoky Mountains National Park, along the Blue Ridge Parkway, and along the course of the Natchez Trace, study of folk ways, handicrafts, and community life would add measurably to our knowledge in the fields of American linguistics, folklore, anthropology, and social evolution. In a number of other National Park Service areas, the physical set-up remains for the reintroduction of distinctive American handicrafts and folk arts. Such areas are the Hopewell Village National Historic Site, Salem Maritime National Historic Site, Appomattox Court House National Historical Monument, and Fort Laramie National Monument.

THE NATIONAL PARK SERVICE AS INDEPENDENT OR COLLABORATING RESEARCH INVESTIGATOR

We have seen that the National Park Service is curator or custodian of six types of primary source materials: (1) unexcavated and unstudied prehistoric and historic archeologic remains; (2) cultural and technological objects derived from archeological excavation; (3) historical architecture; (4) manuscript material relating to the National Park Service, the history of the parks, and to historic sites throughout the country; (5) the physical remains on, and the physical geographyof, the developed historic sites; and (6) living folk culture.

The National Park Service must undertake independent research because many of the studies which are basic to the development and interpretive programs of the Service are of such a nature that they are not susceptible to use as college or university theses or dissertations and may interest learned and scientific institutions only

very indirectly. For instance, the historical sheets of the park Master Plans, the research that must be done in connection with road plans, historical tours, trailside museums, museum layouts for central park museums, building plans for restorations, material for park literature, and park interpretation generally, are National Park Service responsibilities that no one else will or can undertake. Sometimes collaborative research is possible and is always welcomed. The National Park Service has collaborated with Columbia University in linguistic studies in the Great Smoky Mountains, and is now working closely with the North Carolina Historical Commission in marking historic sites along the Blue Ridge Parkway and in other matters. The Oberlaender Trust has given marked assistance to the Service in its folk culture studies and in the study of museum problems. In the field of historic sites survey, the National Park Service has been able to obtain a measure of assistance from universities, interested individuals, or historians of recognized standing on State conservation commissions. Regional advisory boards on historical marker problems have been established for certain military or historical areas. Such commissions or boards often include in their membership local writers or historians whose opinions are highly valued. For instance, in Virginia, Dr. E. G. Swem and Dr. Douglas Southall Freeman have served on advisory commissions of this type.

NATIONAL PARK SERVICE RESEARCH NEEDS IN HISTORY AND ARCHEOLOGY

The research needs of the National Park Service are as broad as the six types of research materials in its possession. Adequate and inspirational interpretation of our historical and archeological areas presupposes the exhaustive and definitive use of the research materials available in them. In addition, there is the problem of comparison and evaluation which is basic to authentic interpretation. It is idle to think that the history of the great American historical areas can be learned from secondary works or monographs already written. Not only is it true that each generation must write its own history, i.e., interpret each past event according to its own lights, interests, and needs, but the local history with which the National Park Service deals has, in the most part, been written by local antiquarians or enthusiasts with special bias. Frequently, the National Park Service must begin at scratch to discover the true location of the site and the basic facts upon which interpretations are to be formulated. As a rule, the great universities have little interest in either military or local history. It is therefore difficult to get much assistance from them in writing the history of a proposed national historic site or a National Park Service area, though individual faculty members may show interest in some general phase of National Park Service work.

The National Park Service research effort makes its most substantial contribution in interpreting the physical geography and

historical remains on those historical areas in the National Park System already developed or now undergoing active development. As a guide to an understanding and authentic interpretation of the historical events or social processes which occurred on these areas, historical and archeological base maps and other historical sheets, together with interpretive statements and historical narratives, are being inserted in the park Master Plans. The National Park Service files contain many special memoranda and reports dealing with the development and interpretation of these areas. One problem is to organize these reports and memoranda (or at least the data in them) into a research file that can be used by the constantly shifting personnel of the National Park Service and by interested outsiders. Notes and note-taking must be standardized and filed for use by a successor. National Park Service research must be perceived to be not individual and personal but cumulative and collaborative. This will necessitate retyping much bibliographical, archeological, architectural, and historical research data on standard size note cards and the filing of this material in fireproof steel cases for ready reference by all categories of National Park Service technicians and interested scholars. This is a process which will necessitate added funds for equipment, stenographic service, and filing clerks if fully carried into execution.

The large quantity of museum pieces or cultural objects in National Park Service possession, mostly arising from archeological excavation of eastern sites, pose a great problem. There is literally no personnel available to do more than adequately store this material for future reference. No special studies of a definitive character on pipes, bottle seals, glassware, ironwork ceramics, etc., can be published for lack of personnel and funds with which to make comparative studies. No catalogs of artifacts can be published. The nearest approach to a National Park Service contribution in this field is the National Park Service multilithed illustrated articles on pottery types and pottery chronology issued collaboratively from Ocmulgee National Monument. The important point to be emphasized here is that the National Park Service eastern archeological excavations are bringing, and will continue to bring to light in increasing quantity, a type of source material hitherto neglected by students of American history but long used to great advantage by students of classical and ancient history. The American history profession can be made aware of this new source material only if catalogs and special studies are published.

As for the manuscript materials in our general files, site survey files, or in our historical collections, definitive histories of the National Park Service and its work, the story of the conservation movement, and the definitive park histories are still to be written. It is possible, however, that part of the Hopewell manuscripts will be used as basic material for a University of Pennsylvania PhD. dissertation. Admittedly, much remains to be done in securing out-

side assistance to work on these materials, rich though they obviously are in local or national interest.

In the special field of historical architecture, a real problem has arisen as a result of the fact that the National Park Service has been deprived of its ablest architectural historians who have one by one left the Service either for duty on defense projects or to engage in private practice. General research in this field is also cramped by the disappearance of the Historic American Buildings Survey as an operating organization. There is a real danger that Service restoration projects or even stabilization projects in architecture will suffer accordingly.

Study of folk culture in certain of the national parks and of the folk culture problem generally has been interrupted by the war. This important research, which may be so fruitful in preserving the more distinctive and creative of American handicrafts, and which may indicate the desirability of the "living museum" technique of historical interpretation in certain parks, or portions of certain parks, was begun as a collaborative undertaking financed with funds provided by the Oberlaender Trust.

The best guarantee of assured results in the case of the folk culture study would be to have at least one fully qualified man devote his entire time and attention to it for several years.

Undoubtedly, there is a need for special grants in aid or similar fellowships covering all categories of National Park Service archeological and historical source materials. Collaboration of the National Park Service with scientific foundation in the utilization of these resources would certainly make possible distinct contributions to the study of early American history and prehistory.

APPENDIX A

NEEDED WILDLIFE INVESTIGATIONS

NATIONAL PARK SYSTEM

Class I. Studies and problems requiring early attention.

1. Bison ecology (Yellowstone).
   A study of bison in park; range, habits, food preferences, effects of artificial feeding, disease, handling methods, history, etc., to determine managerial procedure. Under way.

2. Elk and deer (Glacier).
   Studies of over-population of elk and of mule and white-tailed deer and problem of winter forage shortages; deer study with emphasis on, and relation to, coyote and possibly wolf predation.

3. Bear-visitor relationships (Crater Lake).
   Study of bear depredations and problems at campgrounds as a basis for proper management. Under way.

4. Bear studies (Great Smoky Mountains).
   Abundance and distribution of black bear; relation to private properties in and adjacent to park; development of trapping or other techniques to produce more equitable distribution.

5. Bison disease studies (Wind Cave).
   Test bisons to determine extent of brucellosis or other possible infections. Under way.

6. Faunal studies (Joshua Tree National Monument).
   Influence of army use of monument on rare plant and animal life. Determine effect of proposed roads and other projects on welfare of burro deer and other endangered wildlife.

7. Elk studies (Olympic).
   Re-check on increase and spread of elk in relation to severe winter food shortages. Application of findings of John Schwartz in preparation of management program.

8. Aquatic resources survey (Big Bend National Park).
   Area due for establishment as national park in October 1943. In connection with planning for park development, a physical and biological survey of springs is needed. Spring areas are of tremendous importance to wildlife of this desert region. Data useful in connection with possible need to develop springs for human use. Under way.

9. Bighorn ecology (Yellowstone).
Study of distribution, migration and ecology of bighorns and factors affecting survival.

*10. Wildlife range studies (Rocky Mountain).
To determine carrying capacity for elk, deer and other animals of summer range in park and winter range in park and buffer area.

11. Bighorn studies (Rocky Mountain).
To study distribution and factors affecting survival.

12. Biological survey (Jackson Hole National Monument).
Inventory of wildlife, habitats, compilation of records, etc., upon which to base future management policy. Correlate data with proposed master plan. Data also useful in interpretive program. Under way.

13. Bighorn studies (Grand Teton).
To determine distribution, factors affecting abundance, and influence of buffer area.

14. Rainbow trout studies (Boulder Dam).
Preliminary investigation completed. Need for study to determine amount of natural trout propagation in Colorado River below Boulder Dam. Area receiving increasing fishing pressure. Findings will influence stocking program.

*15. Trumpeter Swan studies (Yellowstone).
Complete study initiated by Park staff on distribution, food habits, environmental relationships, mortality factors and stress on winter food supply.

16. Big Game survey (Organ Pipe Cactus National Monument).
Year-round ecological study of feeding, breeding, migration habits of desert bighorn, antelope and peccary as basis for future protection. Systematic and ecological study of deer to determine species and subspecies present and status of each.

17. Bighorn survey (Grand Canyon).
Year-round ecological study of all habitat relations as basis for protection.

18. Bear ecology (Yellowstone).
Under way by Fish and Wildlife Service. Study effects of artificial feeding on black and grizzly bears by post mortem, fecal examination and field observation. Determine natural food habits, bear-visitor relationships. Work out census method technique and determine population trends.

19. Elk and range studies (Yellowstone).
Under way by Fish and Wildlife Service and National Park Service. Study to appraise "game" carrying capacity of winter range; devise easy reconnaissance method of analyzing summer range put into operation. Determine composition of elk herd by sex and age; migration studies; relations of elk to other big game.

20. Lake survey (Yellowstone).
Under way by Dr. Wright, Fish and Wildlife Service. Study of Yellowstone Lake and other important lakes to determine fish cultural policy.

Class II. Studies of secondary importance.

*1. Restoration of extirpated species.
Research necessary to prepare plans for restoration of wildlife species extirpated in parks.

*2. Survey of original faunal conditions in parks.
To reconstruct the original faunal and floral picture of each park, information used in restoring or maintaining wildlife populations.

3. Revision of bird check list.
To revise the check list issued in December 1937 with the addition of Kings Canyon, Olympic, Isle Royale and Big Bend National Parks.

4. Mammal check lists.
To prepare a check list of mammals of 26 national parks and Big Bend National Park.

5. Stream survey (Glacier National Park).
Study of lakes and streams to serve as a basis for fish stocking and management of fish resources. Supplementary to work of Bureau of Fisheries in 1932 and 1934. Scheduled for 1942 by Division of Fishery Biology; project postponed due to war conditions.

6. Stream and lake survey (Rocky Mountain National Park).
Determine cause of failure of waters to produce adquate number of legal-size trout. Importance of park as recreational area justifies studies designed to bring game fishery to maximum production.

7. Aquatic resources survey (Mount McKinley National Park).
Complete the studies made on resources of park lakes and streams with emphasis on fish stocking program for barren lakes in accordance with National Park Service policy.

8. Bighorn study (Boulder Dam National Recreational Area).
Year-round study of all habitat relations as basis for protection. Influence of predators and burros on bighorn population.

9. Faunal survey (Crater Lake National Park).
Field investigations leading to publication on birds and mammals of park.

10. Rodent disease study (Lassen Volcanic National Park).
Management of rodents threatening transmission of relapsing fever to man.

11. Bighorn (Glacier National Park).
Life history study with emphasis on range, summer dispersal and reproduction rate.

12. Stream survey (Yellowstone National Park).
Study of all watersheds to determine basis for fish cultural operations.

13. Stream and lake survey (Grand Teton National Park).
Basic study upon which to base fish cultural operations.

14. Peccary ecology (Saguaro National Monument).
Year-round ecological study of all habitat relations as basis for protection.

15. Sea lions (Olympic National Park - coastal area).
Breeding status and protection needs of Steller's sea lion and other vertebrate life on coastal islands.

16. Furbearers (Sequoia National Park).
Distributional study of fisher, marten and wolverine to determine status and protective measures needed; special emphasis on migration of fisher outside park.

17. Fauna (Olympic National Park).
Faunal investigation leading to publication on the birds and mammals.

Class III. Studies which can be deferred.

1. Elk trapping methods.
To prepare a guide to elk trapping methods for use in national parks.

1a. Bear trapping methods.
To prepare a guide to methods of black and grizzly bear trapping for use in wildlife management in national parks.

2. Large mammals. (Colorado National Monument).
Year-round study of food habits of bison, elk and deer as basis for proper management.

3. Stream resources (Great Smoky Mountains National Park),
Continuation of study of park waters to determine basis for fish cultural operations and protection measures needed.

3a. Texas bighorn studies (Big Bend National Park).
To complete historical studies on former status of bighorn in park area and to obtain data on range and other needs for use in program to restore bighorns in Texas and Mexican sections of proposed international park.

3b. Study of acquatic resources of streams (Crater Lake National Park).
Study of park streams to serve as basis for fish stocking and management of fish resources.

3c. Sierra bighorn studies (Kings Canyon-Sequoia-Yosemite National Parks).
Status of Sierra bighorn in park areas with formulation of protection methods.

4. Stream survey (Dinosaur National Monument),
To determine existing conditions and make studies for fish cultural operations.

5. Status of exotics (Great Smoky Mountains National Park.
Distribution, effects and control of Chukar partridge.

6. Bird survey (Fort Jefferson National Monument).
Data on distribution and requirements of colonial and rare nesting birds; study as a basis for restoration of natural conditions modified by naval forces.

7. Bird survey (Santa Rosa Island National Monument),
Data on distribution and requirements of colonial and rare nesting birds; effcts of use by military forces.

8. Biological survey (Dinosaur National Monument),
To gather information on existing fauna, historical records, distribution of species, etc., for management and interpretation.

9. Merriam turkey. (Bandelier National Monument).
Study of migration, food and other habits to determine protection needs.

10. Resurvey of fauna (Bryce Canyon National Park).
To be studied in relation to grazing and present park boundary to determine what can be done to increase protection of fauna.

11. Rare species (Carlsbad Caverns National Park),
A study to determine status of Merriam turkey, Texas bighorn and Mearns quail in and near the park, and protective measures needed.

12. Waterbird studies (Lassen Volcanic National Park),
Study of effect of heavy fishing in areas used by rare nesting waterfowl and other birds; survey with recommendations for waterfowl protection in proposed park addition.

13. Faunal reconnaissance (Mount McKinley National Park).
Survey of fauna, especially birds and mammals, in unexplored sections of the park.

14. Biological survey (Zion National Park),
Resurvey of fauna to bring information up to date as basis for future management and study of specific problems; systematic study of flora and publication of bulletin on plants.

15. Biological survey (Arches National Monument),
Systematic study of fauna and flora primarily for the interpretive program; determine status of bighorn and protection needs.

16. Biological survey (Capitol Reef National Monument),
Systematic survey of plants and animals for use in interpretive program.

17. Biological survey (Cedar Breaks National Monument),
Systematic survey of plants and animals for use in interpretive program.

18. Survey of fauna (Black Canyon of the Gunnison National Monument),
Systematic study of fauna, including fish, for use in interpretive program.

19. Aquatic survey (Acadia National Park),
Study of several lakes as basis for fish management program.

20. Faunal survey (Shenandoah National Park),
Study of fauna to provide information for use in future management and in interpretive program.

21. Faunal survey (Blue Ridge Parkway.
To obtain data for use in proposed development.

22. Bird survey (Fort Pulaski National Monument).
To obtain data on distribution and requirements of colonial and rare nesting birds.

23. Parasites and diseases of elk (Wind Cave National Park).
To study tick or other infestations and diseases of elk, to determine management.

24. Stream and lake survey (Isle Royale National Park).
To determine basis for fish cultural operations.

25. Moose study (Isle Royale National Park.
To determine abundance, distribution, and utilization of food.

26. Biological survey (Isle Royale National Park).
An inventory of wildlife habitats, compilation of records, etc., upon which to base management and interpretation; study of feasibility of re-introduction of wolves.

27. Biological survey (Badlands National Monument).
To inventory wildlife as basis for interpretive program, management, and master planning. Include study of possibilities for re-introduction of antelope.

28. Deer (Carlsbad Caverns National Park).
Distribution and migration study to determine present status of species in park.

29. Predators (Grand Canyon National Park).
Food, habits and abundance of coyotes and bobcats and relation to other forms of life in park and to the stock interests outside of the park.

30. Stream survey (Grand Canyon National Park).
A resurvey of streams of the park to aid in formulating a program for future planting and management.

31. Porcupine (Mesa Verde National Park).
A winter study of habits and food as a basis for future management on this and other areas.

32. Porcupine (Black Canyon of the Gunnison National Monument).
Year-round study of food, breeding, and migration habits as a basis for future management.

33. Biological survey (Montezuma Castle National Monument).
Systematic survey of plants and animals for interpretive program.

34. Biological survey (Sunset Crater National Monument).
Systematic survey of plants and animals for interpretive program.

35. Biological survey (Tonto National Monument).
Systematic survey of plants and animals for interpretive program.

36. Biological survey (Walnut Canyon National Monument).
Systematic survey of plants and animals for interpretive program.

37. Ecological survey (White Sands National Monument).
Year-round study of interrelations of plants and animals to each other and to physical environment in the sand area.

38. Ecological survey (Wupatki National Monument).
Study of plant communities and relations of animals thereto for interpretive program.

39. Resurvey of fauna (Mt. Rainier National Park).
Field investigations to bring faunal information up to date and furnish data for revision of management program, etc. Publication of revised edition of Mammals and Birds of Mount Rainier National Park by Taylor and Shaw.

40. Porcupine (Mt. Rainier National Park).
Effect of porcupine utilization of white pine forest.